SANTA ANA RIVER WATERMASTER

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

WATERMASTER
P. Joseph Grindstaff
Douglas D. Headrick
Roy L. Herndon
Michael R. Markus
John V. Rossi

MAILING ADDRESS
c/o SBVMWD
380 East Vanderbilt Way
San Bernardino CA 92408-3593
Telephone (909) 387-9200
FAX (909) 387-9247

April 30, 2017

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

Re: Watermaster Report for Water Year October 1, 2015 - September 30, 2016

Ladies and Gentlemen:

We have the honor of submitting herewith the Forty-Sixth 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 2015-16 are as follows:

At Prado

1	Measured Outflow at Prado	115,023	acre-feet
2	Base Flow at Prado	71,225	acre-feet
3	Annual Weighted TDS in Base and Storm Flows	560	mg/L
4	Annual Adjusted Base Flow	79,535	acre-feet
5	Cumulative Adjusted Base Flow	5,435,749	acre-feet
6	Other Credits (Debits)	0	acre-feet
7	Cumulative Entitlement of OCWD	1,932,000	acre-feet
8	Cumulative Credit	3,543,757	acre-feet
9	One-Third of Cumulative Debit	0	acre-feet
10	Minimum Required Base Flow in 2015-16	34,000	acre-feet

At Riverside Narrows

1	Base Flow at Riverside Narrows	30,877	acre-feet
2	Annual Weighted TDS in Base Flow	635	mg/L
3	Annual Adjusted Base Flow	30,877	acre-feet
4	Cumulative Adjusted Base Flow	2,017,423	acre-feet
5	Cumulative Entitlement of IEUA and WMWD	701,500	acre-feet
6	Cumulative Credit	1,315,923	acre-feet
7	One-Third of Cumulative Debit	0	acre-feet
8	Minimum Required Base Flow in 2015-16	12,420	acre-feet

Based on these findings, the Watermaster concludes that there was full compliance with the provisions of the Stipulated Judgment in 2015-16.

At the end of the 2015-16 Water Year, Inland Empire Utilities Agency (formerly Chino Basin Municipal Water District) and Western Municipal Water District have a cumulative credit 3,543,757 acre-feet to their Base Flow obligation at Prado Dam. San Bernardino Valley Municipal Water District has a cumulative credit of 1,315,923 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: _____ _____
P. Joseph Grindstaff Michael R. Markus

_____ _____
Douglas D. Headrick John V. Rossi

_____
Roy L. Herndon

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

v. CITY OF CHINO, et al.

CASE NO. 117628 - COUNTY OF ORANGE

FORTY- SIXTH

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2015 - SEPTEMBER 30, 2016

APRIL 30, 2017

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-Sixth Annual Report of the Santa Ana River Watermaster covers Water Year 2015-16. 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).

For the Water Year 2015-16 the Watermaster consisted of P. Joseph Grindstaff, Douglas D. Headrick, Roy L. Herndon, Michael R. Markus, and John V. Rossi. Mr. Rossi was elected as Chairman, Mr. Herndon was elected as Vice Chairman, and Mr. Headrick was re-elected as Secretary/Treasurer at the January 13, 2017 meeting. The history of the Watermaster Committee 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 2015-16 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 2015-16 daily mean discharge records at Prado are rated "Good" 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, 571 cfs on January 15, 2016 and 51 cfs on September 30, 2016. The Water Year 2015-16 daily mean discharge record at Riverside Narrows was rated "poor" by the USGS. The maximum and minimum daily mean discharge values during the year were 2,060 cfs on January 7, 2016 and 17 cfs on December 21, 2015, respectively.

The water quality data at Prado consist of daily maximum and minimum and median 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 24 measured values (generally twice per month) for both EC and TDS. The maximum and minimum, daily, flow-weighted median EC values reported by the USGS for the River at Prado were 1,340 μs/cm on October 21, 2015 and 265 μs/cm on January 7, 2016, respectively. The corresponding calculated TDS concentrations were 806 and 159 mg/L.

At Riverside Narrows, the maximum and minimum EC values reported by the USGS were 1,250 μs/cm on October 23, 2015 and 437 μs/cm on January 6, 2016, respectively. The corresponding measured TDS concentrations were 617 and 308 mg/L. There were interruptions in the records at times due to malfunction of recording or sensing equipment. EC records were affected by releases from Prado Dam. Interruptions in records are at times due to malfunction of recording or sensing equipment. A portion of the chemical data were collected for the National Water-Quality Assessment (NAWQA) Program. EC records were rated "excellent" by the USGS except for October 1 to 13, November 17 to December 4, February 3 to 18 and September 23 to 28, which were rated "good"; October 14 to 27, December 5 to 7, February 19 to 25, which were rated "fair"; and October 28 to November 10 which were rated "poor".

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 2015-16, the total precipitation recorded at the Gilbert Street gage was 8.84 inches, or 49% 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 2015-16.

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 2015-16 there were no sources of Nontributary Flow in the River at Riverside Narrows. There was a source of Nontributary Flow in the River at Prado, which the Watermaster has not included in Base Flow.

- A total of 12,413 acre-feet of Nontributary Flow attributable to imported State Water Project water purchased by OCWD arrived at Prado. This water was released at the OC-59 turnout from MWDSC's Foothill Feeder into San Antonio Creek.

The determinations of the Watermaster for Water Year 2015-16 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 2015-16. 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]
1970-71	11.97	51,864	51,864	38,402	727	38,402	-3,598
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

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]
1970-71	11.97	42,732	24,112	17,061	704	17,012	1,762
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

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 streamflows. 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 6,000 acres of *Arundo* in the watershed.

TABLE 2

TREATED WASTEWATER EFFLUENT DISCHARGED ABOVE PRADO

(acre-feet)

	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 Ana River	Total Waste Water Discharged in the Watershed
Water Year	Redlands	Beaumont	Yucaipa	Subtotal (A)	San Bernardino	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)	Est. EMWD Arriving at Prado (2)	Temescal Valley[6] WRP (3)	Elsinore 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	44	-	6,611	35,390	42,045	31,996	9,406	10,647	-	5,388	5,015	6,994	69,446	2,727	502	502	650	1,654	113,144	126,351
2013-14	3,549	3,345	4,133	11,028	145	-	6,527	33,271	39,943	30,302	8,662	9,898	-	3,188	3,606	6,402	62,058	-	-	533	623	1,156	103,157	114,184
2014-15	3,149	3,428	2,920	9,497	0	-	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	46	-	6,420	32,343	38,809	29,074	10,425	12,531	-	2,910	3,368	7,097	65,405	-	-	174	644	818	105,032	115,443

1. RIX = Rapid Infiltration and Extraction Facility for San Bernadino 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.
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

The amounts shown in this table were determined from data provided by the agencies.

TABLE 3

HIGH SALINITY WATER EXPORTED
FROM THE SANTA ANA RIVER WATERSHED

Water Year	Inland Empire Utility Agency Non-Reclaimable Wastewater North System (acre-feet)	Santa Ana Watershed Project Authority Santa Ana Regional Interceptor (SARI)[1] 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

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.

Santa Ana River Watermaster Action Team

The parties IEUA, OCWD, SBVMWD and WMWD invited EMWD and other water agencies within the Santa Ana River Watershed to work together as the Santa Ana River Watermaster Action Team to explore concepts that may have watershed area-wide benefits and may involve projects that could be eligible for funding through the State of California grant processes. The cooperating agencies contracted a consultant and participated in collaborative discussions on numerous occasions. The current preferred concepts include reuse of water, conjunctive use, habitat enhancement and water conservation. The Santa Ana River Watermaster Action Team agencies are continuing to work together to better define the concepts and develop implementation procedures that may qualify for grant funding.

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 2015-16 fiscal year as well as the budget adopted for the 2016-17 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, 2015 to June 30, 2016 Budget	July 1, 2015 to June 30, 2016 Expenses	July 1, 2016 to June 30, 2017 Budget
Support Services	$15,000.00	$6,928.42*	$7,500.00
Reproduction of Annual Report	1,000.00	$648.63*	1,000.00
TOTAL	$16,000.00	$7,577.05*	$8,500.00

* The expenses of $7,577.05 for Fiscal Year 2015 -16 were paid during Fiscal Year 2016-17.

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 2015-16, 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, 2015 to September 30, 2016

	Total Cost	USGS Share	Parties' Share
USGS PRECIPITATION GAGING STATIONS			
Gilbert Street Gage at San Bernardino	$8,300	$0	$8,300
Middle Fork Lytle Creek Precipitation Gage	$8,300	$8,300	$0
USGS FLOW AND WATER QUALITY GAGING STATIONS			
Santa Ana River at MWD Crossing (Riverside Narrows)			
Surface Water Gage)	$30,150	$10,100	$20,050
Water Quality Monitoring/TDS Sampling	$12,500	$4,200	$8,300
Temescal Creek at Corona Lake	$16,000	$0	$16,000
Temescal Creek above Main St., near Corona	$21,450	$7,200	$14,250
Chino Creek at Schaefer	$21,450	$7,200	$14,250
Cucamonga Creek at Mira Loma	$21,450	$7,200	$14,250
Santa Ana River below Prado Dam			
Surface Water Gage	$23,750	$23,750	$0
Water Quality	$17,200	$5,750	$11,450
TDS Sampling	$11,450	$3,850	$7,600
Water Quality Conductance Program	$2,700	$0	$2,700
TOTAL COST AND SHARES	$194,700	$77,550	$117,150
COST DISTRIBUTION AMONG PARTIES			
Inland Empire Utilities Agency	20%		$23,430
Orange County Water District	40%		$46,860
San Bernardino Valley Municipal Water District	20%		$23,430
Western Municipal Water District	20%		$23,430

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 2015-16, the flow of the River as measured at the USGS gaging station below Prado Dam amounted to 115,023 acre-feet. There was 1,725* acre-feet of water in storage at the beginning of the Water Year, and no water remained in storage at the end of the Water Year. Inflow to the reservoir included 71,225 acre-feet of Base Flow and 29,660 acre-feet of Storm Flow. Nontributary flows consisted of 12,413 acre-feet of State Water Project (SWP) water discharged from OC-59. There was no San Jacinto Watershed water that reached Prado. The monthly components of flow of the River at Prado Dam for Water Year 2015-16 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 2015-16 are presented on Plate 5.

*An error was found in the previous report, 2014-15, where the end of year storage was stated as 1,900 acre-feet, whereas the correct amount is 1,725 acre-feet.

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 2015-16 nontributary flow included State Water Project water imported by OCWD and released to San Antonio Creek via OC-59. There were no flows from the San Jacinto Watershed that were determined to have reached Prado. 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.

TABLE 6

COMPONENTS OF FLOW AT PRADO DAM
WATER YEAR 2015-16
(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
2015							
October	9,788	(1,724)	8,064	0	0	2,716	5,348
November	7,527	12	7,539	0	0	949	6,590
December	8,922	193	9,115	0	0	1,687	7,428
2016							
January	21,848	3,018	24,866	0	0	16,196	8,670
February	12,950	(3,218)	9,732	0	0	1,644	8,088
March	12,910	0	12,910	0	0	4,832	8,078
April	7,444	(1)	7,443	0	0	782	6,661
May	6,785	(5)	6,780	0	0	854	5,926
June	8,027	5	8,032	0	3,917	0	4,115
July	7,131	(1)	7,130	0	4,083	0	3,047
August	7,597	2	7,599	0	4,300	0	3,299
September	4,094	(6)	4,088	0	113	0	3,975
Total	115,023	(1,725)	113,298	0	12,413	29,660	71,225

(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.

During Water Year 2015-16, 12,780 acre-feet of State Water Project water was released from the Foothill Feeder at turnout OC-59 for OCWD. Total monthly deliveries and daily flow rates were provided by the MWDSC. Water loss between OC-59 and Prado Dam was calculated per the procedures set forth in the Twelfth Annual Report (1981-82), Appendix C. It was determined that of the OC-59 water released, a total of 12,413 acre-feet arrived at Prado Reservoir, and 367 acre-feet (2.9%) was lost to evaporation and evapotranspiration. A monthly summary of Nontributary Flow released from OC-59 into San Antonio Creek is contained in Appendix D.

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 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 2015-16, there was no water discharged to Temescal Wash by EMWD.

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 2015-16, the maximum volume of water stored in Prado Reservoir reached 12,300 acre-feet on January 8, 2016. The maximum daily mean flow released from Prado Dam to the River during the Water Year was 571 cfs on January 15, 2016.

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 2015-16 did not include discharges from the San Jacinto Watershed. The general procedure used by the Watermaster to separate the Water Year 2015-16 flow components was the same as used for previous years and is fully described in the Fifth (1974-75) and the Twelfth (1981-82) Annual Reports. 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 560 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-tree (33) grab samples for EC collected by the USGS and analyzed for TDS. Seven other grab samples were analyzed for TDS and not EC.

For Water Year 2015-16 a correlation between TDS and EC yields the following best fit equation:

$$TDS = EC \times 0.6013$$

(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 541 mg/L represents the quality of the total flow including releases to San Antonio Creek. 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

During Water Year 2015-16, 12,413 acre-feet of water released from OC-59 to San Antonio Creek was calculated to have reached Prado Dam. A flow-weighted average TDS of 385 mg/L was calculated for State Water Project water reaching Prado Dam. A summary of these calculations is contained in Appendix D.

Adjustment for San Jacinto Watershed Discharge

There was no discharge from the San Jacinto Watershed during Water Year 2015-16 reaching Prado Reservoir. Therefore, no water quality adjustment was necessary.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow X Average TDS
1. Measured Outflow	115,023	541	62,227,443
2. Less Nontributary Flow San Antonio Creek	(12,413)	385	(4,779,005)
3. Less San Jacinto Watershed Discharge	0	---	---
4. Measured Outflow less lines 2 and 3	102,610		57,448,438
Average TDS in Total Base and Storm Flow	57,448,438 ÷ 102,610 = 560 mg/L		

As shown above, the flow-weighted average annual TDS of Storm Flow and Base Flow for Water Year 2015-16 is 560 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 560 mg/L is less than 700 mg/L. Therefore, the Base Flow of 71,225 acre-feet must be adjusted by the above equation for TDS less than 700 mg/L. Thus, the Adjusted Base Flow is as follows:

$$(71,225 \text{ acre-feet}) + \frac{35}{42,000} \times (71,225 \text{ acre-feet}) \times (700 - 560) = 79,535$$

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 2015-16 required under the Judgment are as follows:

1.	Measured Outflow at Prado	115,023 acre-feet
2.	Base Flow at Prado	71,225 acre-feet
3.	Annual Weighted TDS of Base and Storm Flow	560 mg/L
4.	Annual Adjusted Base Flow	79,535 acre-feet
5.	Cumulative Adjusted Base Flow	5,435,749 acre-feet
6.	Other Credits (Debits) [1]	0 acre-feet
7.	Cumulative Entitlement of OCWD	1,932,000 acre-feet
8.	Cumulative Credit	3,543,757 acre-feet
9.	One-Third of Cumulative Debit	0 acre-feet
10.	Minimum Required Base Flow in 2015-16	34,000 acre-feet

1. Other Credits (Debits) are comprised of San Jacinto Watershed outflow.
2. Cumulative Credit includes 40,008 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
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

TABLE 7 (Continued)

(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 40,008 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 41,007 acre-feet, measured at the USGS gaging station near the MWD Crossing. Separated into its components, Base Flow was 30,877 acre-feet and Storm Flow was 12,312 acre-feet. Included in Base Flow is 2,182 acre-feet of treated wastewater from Rubidoux Community Services District 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 2015-16 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 2015-16 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 2015-16, 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 Community Services District made the first delivery of treated wastewater to the regional treatment plant at Riverside. Prior to that time, Rubidoux had discharged to the River upstream of the Riverside Narrows gaging station. Treated wastewater from Rubidoux during Water Year 2015-16, in the amount of 2,182 acre-feet, has been added to the Base Flow as measured at the gaging station. A summary of Rubidoux discharges is contained in Appendix G.

TABLE 8

COMPONENTS OF FLOW AT RIVERSIDE NARROWS
WATER YEAR 2015-16
(acre-feet)

	Month	USGS Measured Flow	Storm Flow	Rubidoux Waste-water	Base Flow [1]
2015	October	2,436	230	188	2,394
	November	3,045	84	178	3,138
	December	2,606	653	183	2,137
2016	January	12,301	9,775	183	2,710
	February	3,138	103	171	3,206
	March	4,243	900	184	3,526
	April	3,229	438	177	2,968
	May	2,799	129	183	2,853
	June	2,182	0	184	2,366
	July	1,583	0	184	1,767
	August	1,682	0	191	1,873
	September	1,763	0	176	1,939
Total		41,007	12,312	2,182	30,877

(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 is further upstream and is not representative of stream flow at the Riverside Narrows. Therefore, no samples from the City of Riverside are used in the water quality adjustments during Water Year 2015-16.

Adjustment for Nontributary Flow

During Water Year 2015-16, 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 was 849 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 treated wastewater are shown in the following table, and resulted in a Base Flow TDS of 619 mg/L.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow x Average TDS
1. Base Flow plus Nontributary Flow	28,695	619	17,762,205
2. Less Nontributary Flow	0	---	---
3. Plus Rubidoux Treated Wastewater	2,182	849	1,852,518
4. Base Flow (line 1 less lines 2 and 3 plus line 4)	30,877		19,614,723
Average TDS of Base Flow		19,614,723 ÷ 30,877= 635 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 2015-16 was 635 mg/L. Therefore, no adjustment is necessary, and the Adjusted Base Flow for Water Year 2015-16 is 30,877 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 2015-16 required under the Judgment are as follows:

1.	Base Flow at Riverside Narrows	30,877 acre-feet
2.	Annual Weighted TDS of Base Flow	635 mg/L
3.	Annual Adjusted Base Flow	30,877 acre-feet
4.	Cumulative Adjusted Base Flow	2,017,423 acre-feet
5.	Cumulative Entitlement of IEUA and WMWD	701,500 acre-feet
6.	Cumulative Credit	1,315,923 acre-feet
7.	One-Third of Cumulative Debit	0 acre-feet
8.	Minimum Required Base Flow in 2015-16	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. On January 13, 2017, a new Vice Chairman position was created by the Committee.

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

Santa Ana River Watershed

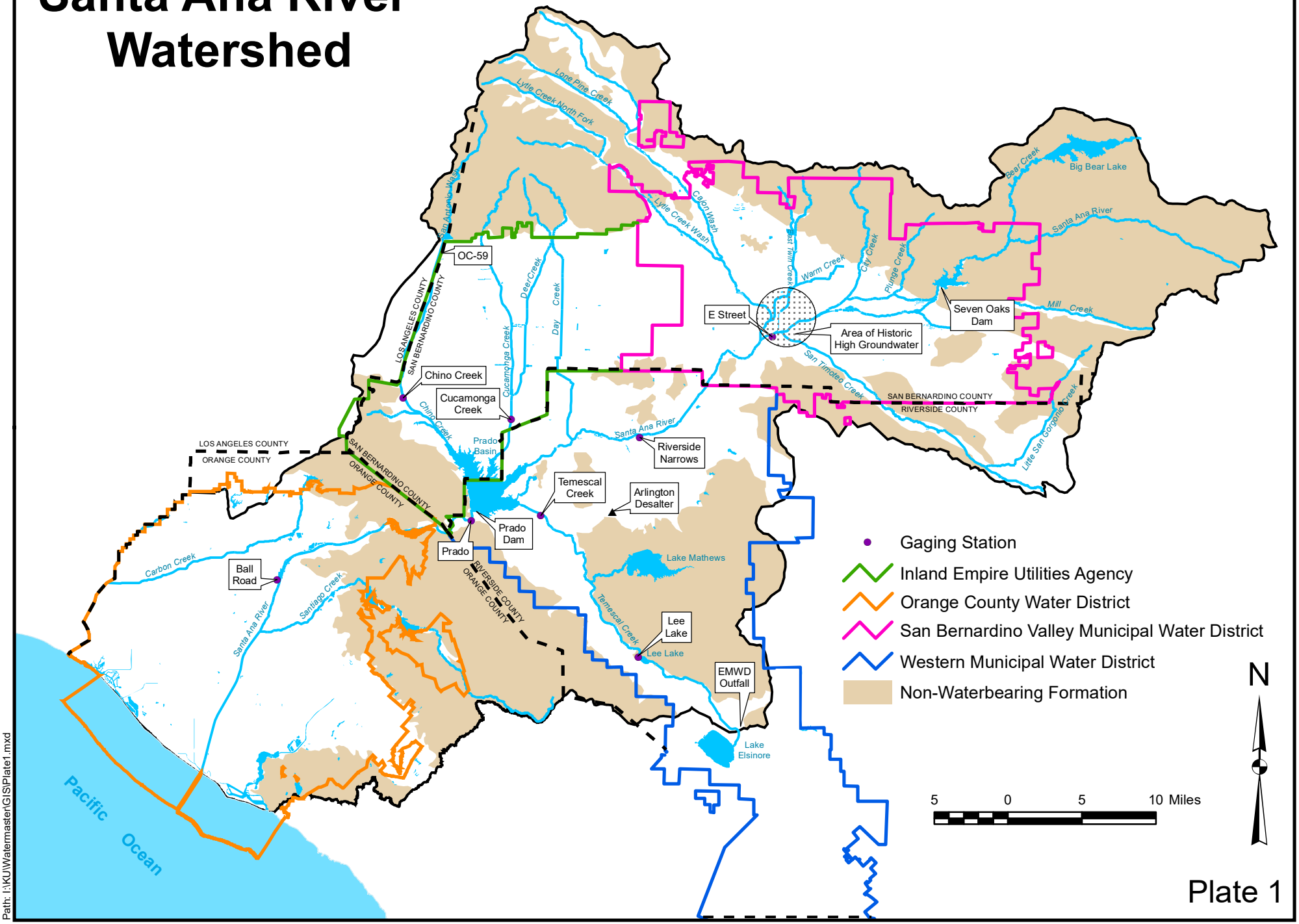
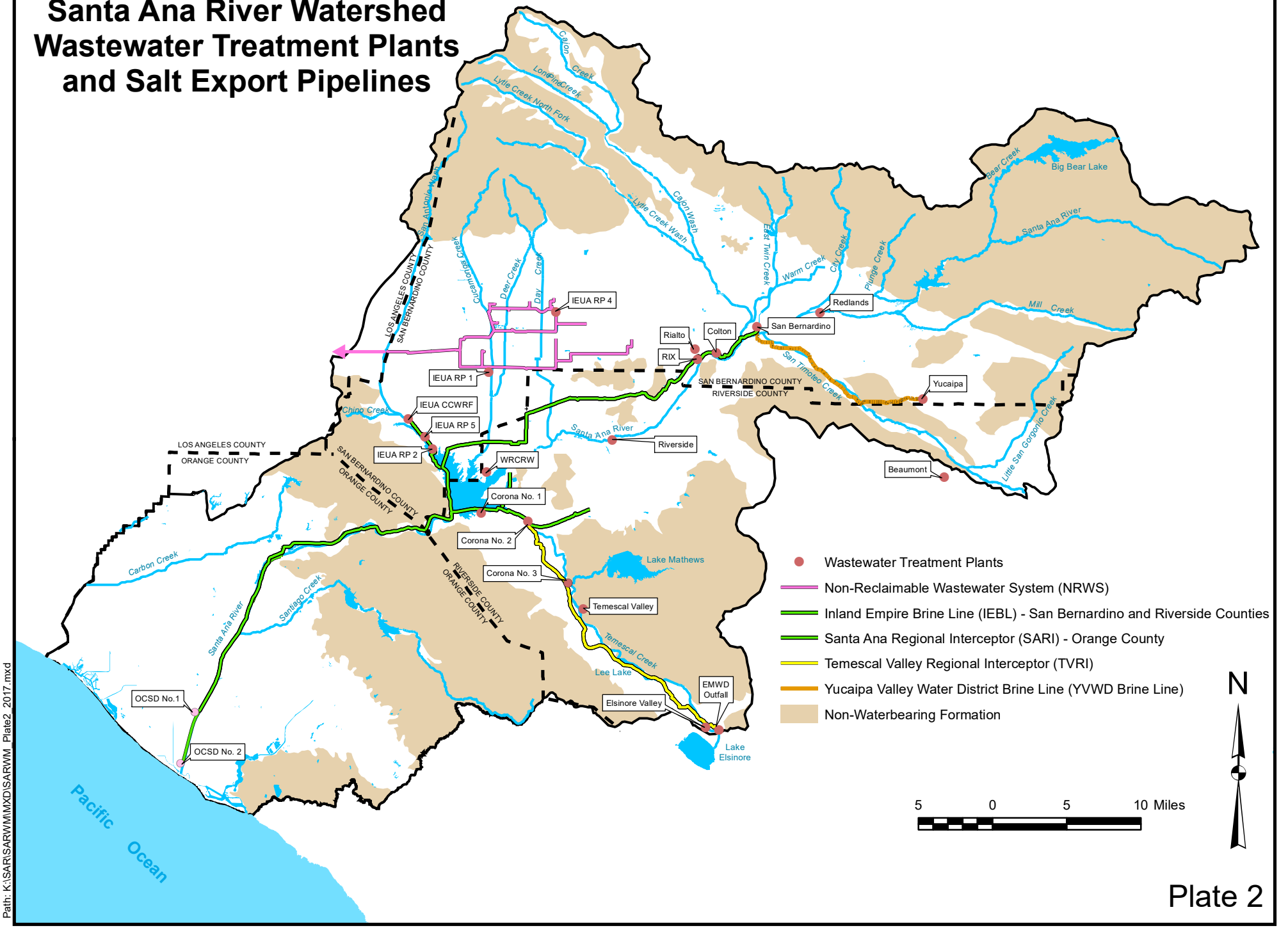


Plate 1

Path: I:\KJWatermaster\GIS\Plate1.mxd

Santa Ana River Watershed Wastewater Treatment Plants and Salt Export Pipelines



Path: K:\SAR\SARWMMXD\SARWM_Plate2_2017.mxd

Plate 2

PRECIPITATION AT SAN BERNARDINO STARTING WITH 1934-35

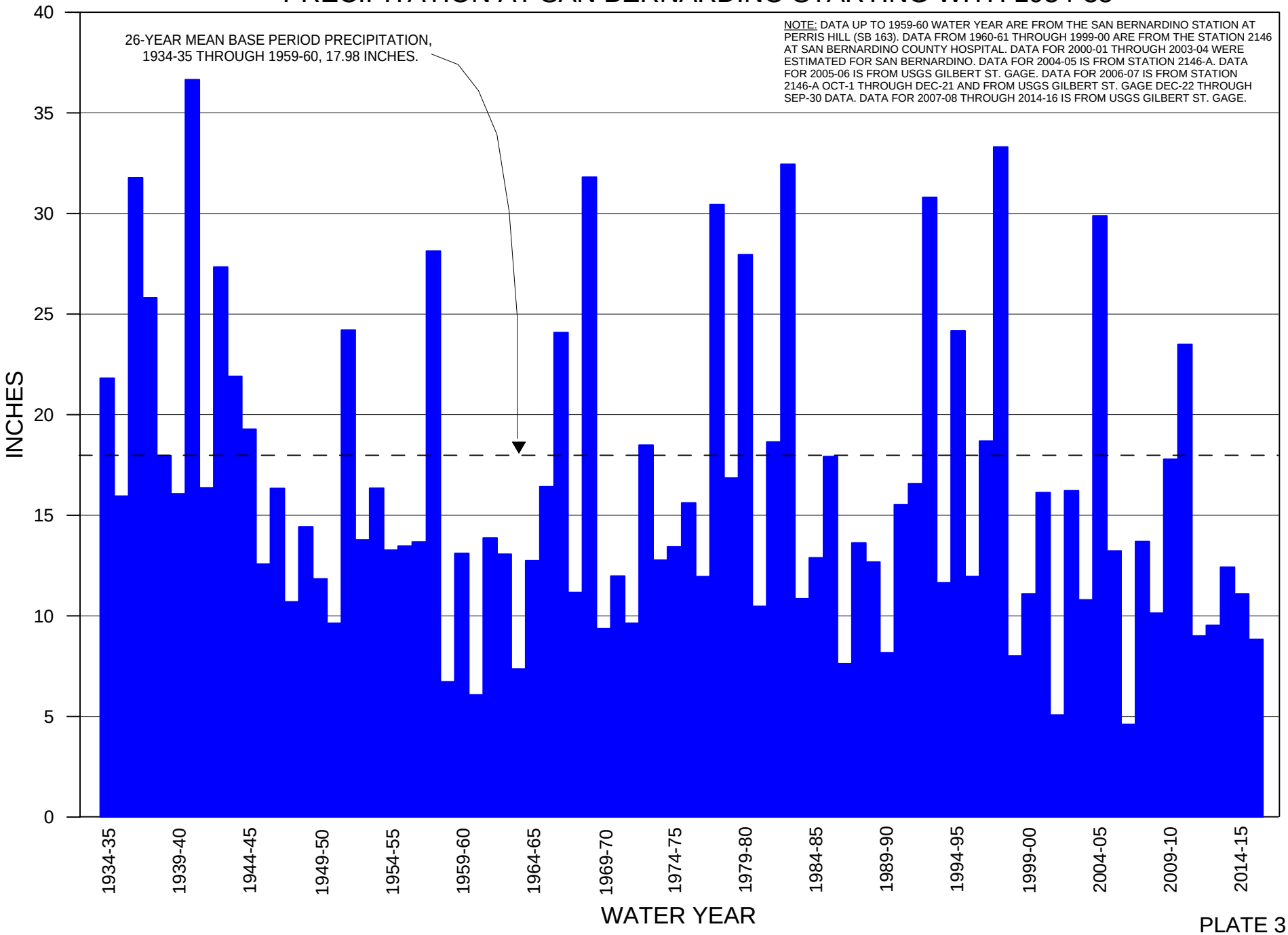


PLATE 3

2015-16 SAN BERNARDINO PRECIPITATION
USGS GILBERT STREET GAGE
TOTAL = 8.84"

INCHES

0.86" 0.55" 1.13" 3.41" 0.32" 1.46" 0.98" 0.13" 0.00" 0.00" 0.00" 0.00"

PERIODS OF OC-59 DELIVERY TO OCWD

PERIODS OF WATER STORAGE GREATER THAN 100 ACRE-FEET BEHIND PRADO DAM

CUBIC FEET PER SECOND

RED AREA DENOTES STORM FLOW

INFLOW TO PRADO DAM LESS NONTRIBUTARY FLOWS REACHING PRADO

USGS MEASURED OUTFLOW

October November December January February March April May June July August September

DISCHARGE OF THE SANTA ANA RIVER AT PRADO DAM & SAN BERNARDINO PRECIPITATION
WATER YEAR 2015-16

Plate 4

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

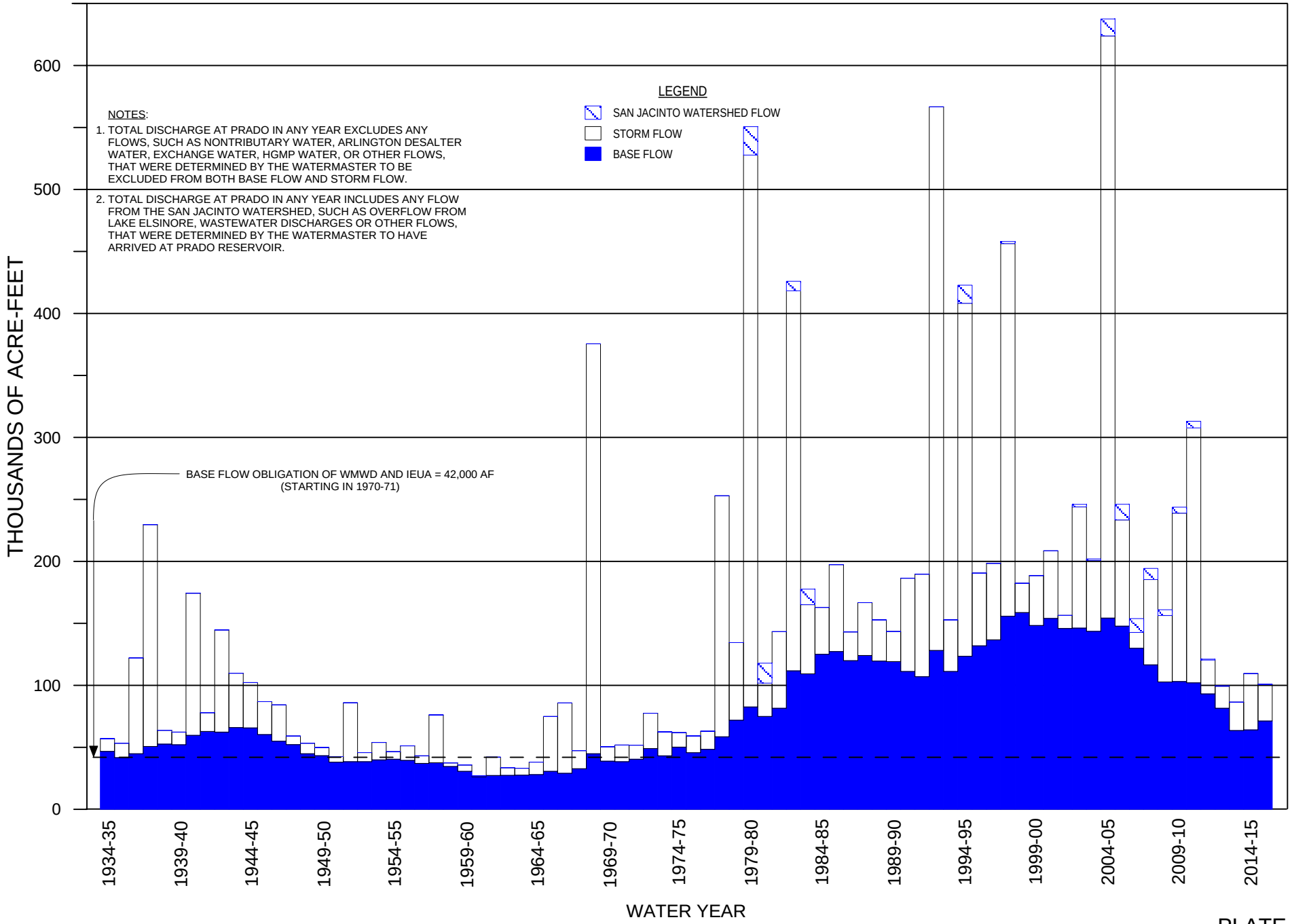
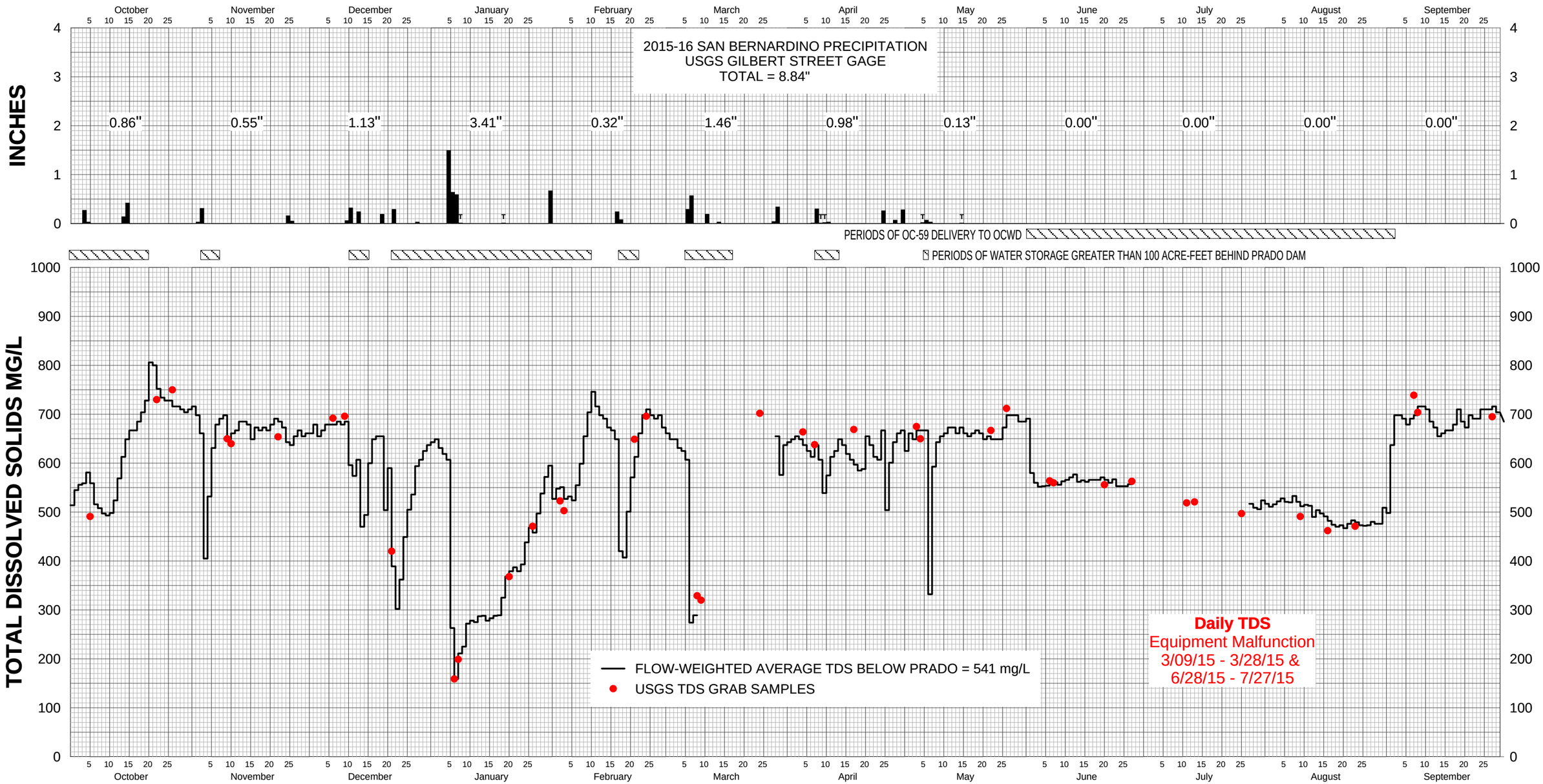
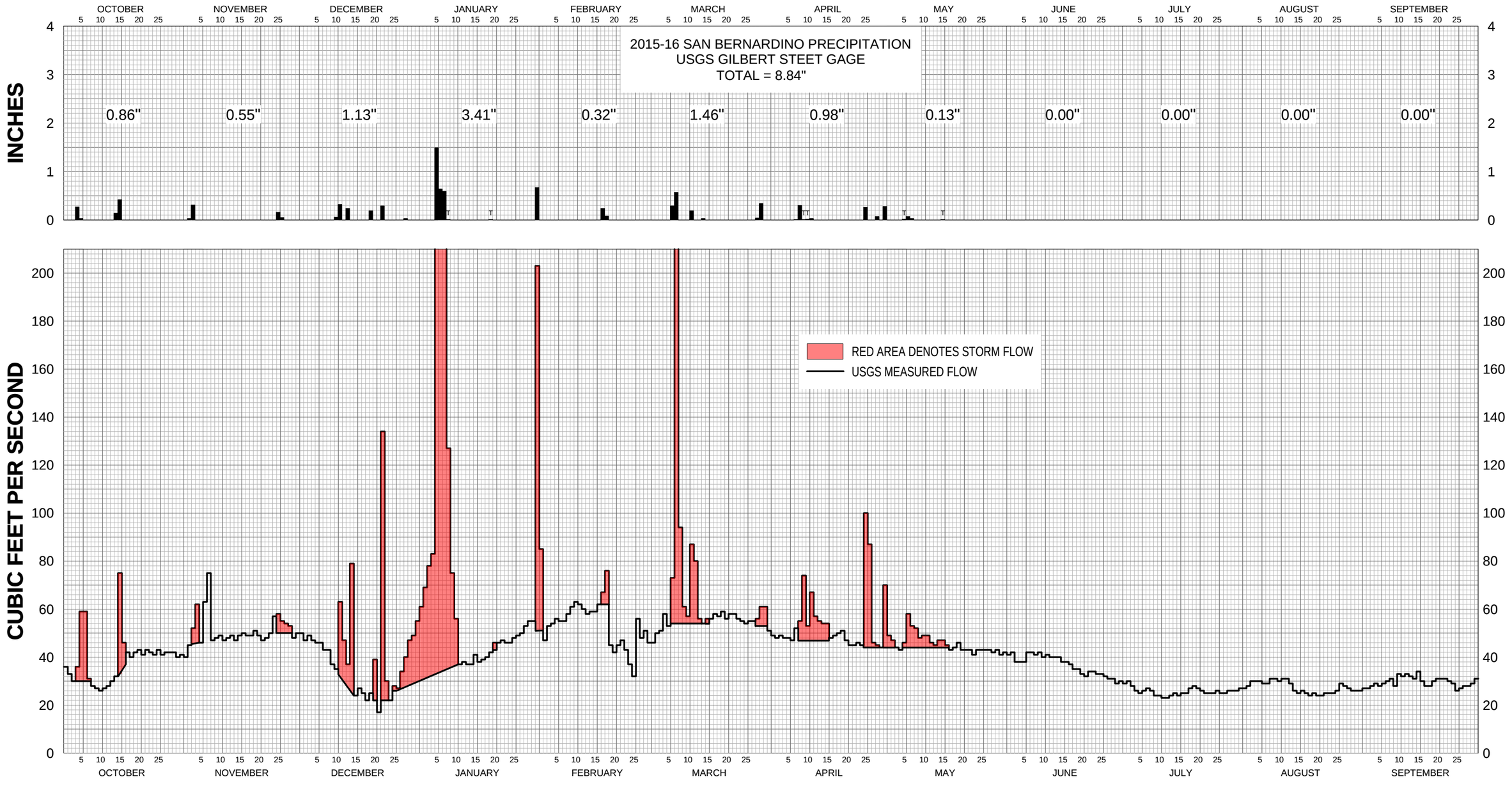


PLATE 5



DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM
WATER YEAR 2015-16

Plate 6



DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS & SAN BERNARDINO PRECIPITATION
WATER YEAR 2015-16

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

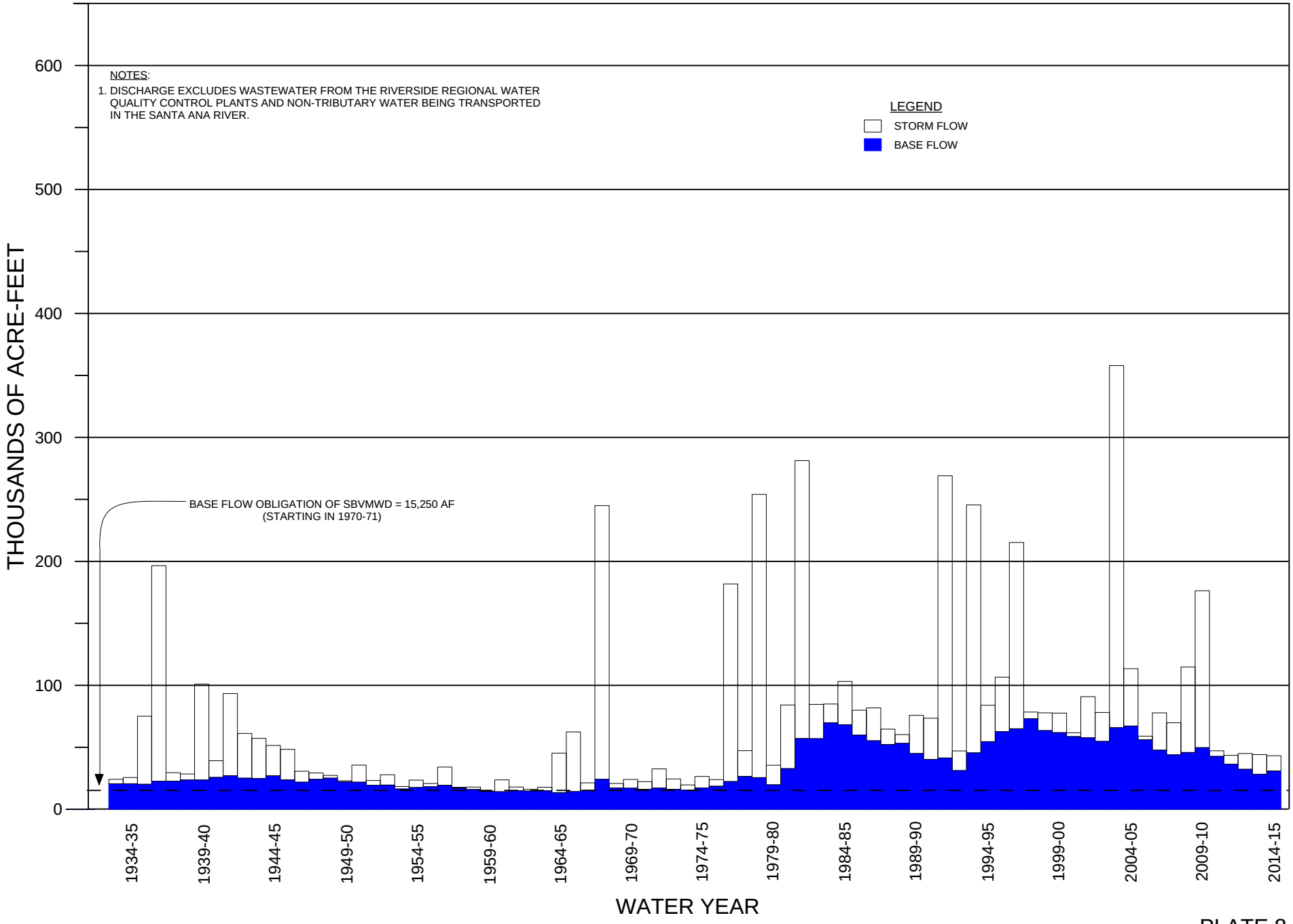


PLATE 8

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- SIXTH ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2015 - SEPTEMBER 30, 2016

April 30, 2017

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 2015-16

USGS Water-Year Summary 2016

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.

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.

REVISED RECORDS - 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.

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 - Records good. 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

Water-Data Report 2016

11074000 Santa Ana River below Prado Dam, CA -- Continued

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2015-10-01 to 2016-09-30
DAILY MEAN VALUES

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
1	183	82	121	143	352	144	147	112	70	126	118	135
2	184	97	112	136	445	138	145	102	128	127	119	74
3	182	116	118	134	438	122	144	92	149	132	117	67
4	180	161	113	139	342	129	139	85	141	125	122	70
5	194	170	109	162	292	138	132	83	135	123	125	69
6	208	167	109	177	288	166	130	140	134	124	118	70
7	206	154	110	238	280	206	110	345	141	122	107	63
8	204	143	109	400	271	358	120	194	146	116	113	66
9	201	133	110	400	262	421	132	129	141	116	119	67
10	200	131	102	401	247	404	140	116	137	117	121	64
11	195	122	125	430	298	281	139	109	136	114	131	66
12	190	117	144	449	160	207	167	105	140	111	132	67
13	188	115	145	450	143	210	182	103	142	109	124	64
14	186	114	161	514	143	310	168	97	149	110	127	75
15	185	114	204	571	139	390	111	103	151	110	128	76
16	184	146	230	561	132	380	105	114	148	108	128	72
17	183	110	155	553	121	378	104	104	147	111	125	69
18	181	113	109	543	208	308	115	98	136	113	122	68
19	213	118	100	533	233	145	106	99	136	113	120	71
20	205	116	164	456	223	135	103	104	126	118	122	64
21	146	112	157	413	215	137	96	98	129	115	120	71
22	121	114	150	405	302	135	100	100	124	112	124	71
23	109	111	162	399	206	126	98	97	133	110	126	71
24	102	116	163	392	132	115	99	87	131	113	123	67
25	93	140	164	385	128	119	105	88	133	118	123	66
26	86	145	161	376	126	120	190	90	133	114	124	62
27	84	136	157	371	130	134	121	88	137	112	126	61
28	84	126	174	270	134	140	112	86	139	111	131	53
29	87	132	218	209	139	133	97	81	121	111	126	54
30	87	124	195	204		222	96	87	134	113	128	51
31	84		147	201		158		85		121	141	
Total	4,935	3,795	4,498	11,010	6,529	6,509	3,753	3,421	4,047	3,595	3,830	2,064
Mean	159	127	145	355	225	210	125	110	135	116	124	68.8
Max	213	170	230	571	445	421	190	345	151	132	141	135
Min	84	82	100	134	121	115	96	81	70	108	107	51
Ac-ft	9,788	7,527	8,922	21,850	12,950	12,910	7,443	6,785	8,027	7,131	7,597	4,094

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2016, BY WATER YEAR (WY)

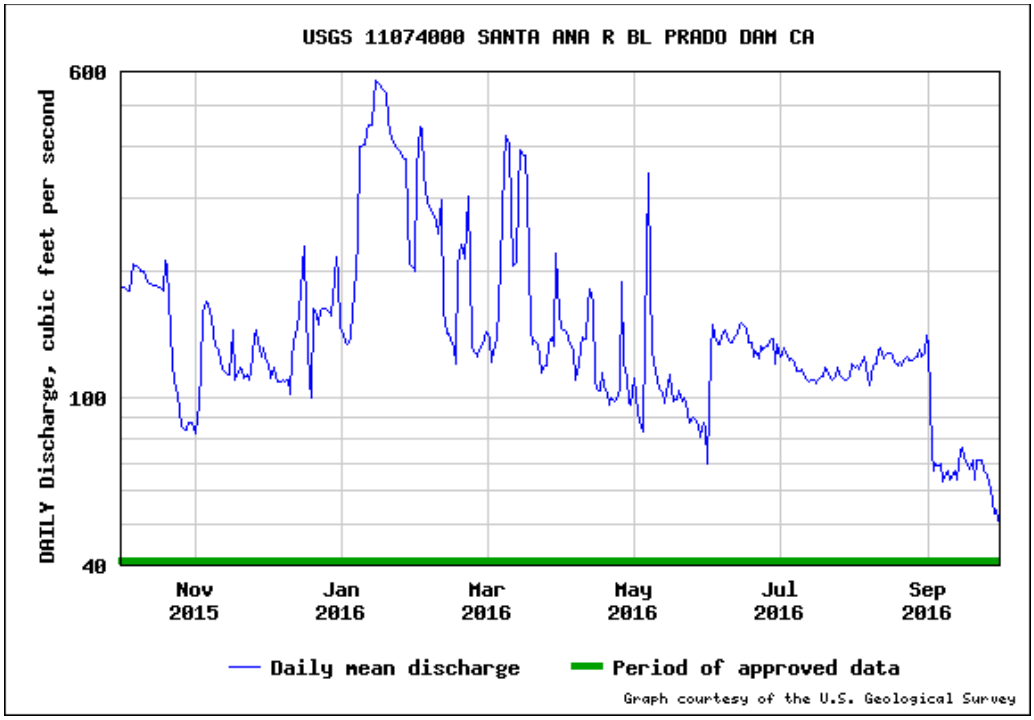
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	129	150	238	385	431	390	258	187	153	126	107	102
Max	910	322	1,300	3,543	2,733	2,556	1,101	915	736	446	403	372
(WY)	(2005)	(1997)	(2011)	(1993)	(1998)	(1980)	(1980)	(1998)	(1983)	(1998)	(2005)	(1997)
Min	22.4	33.5	39.5	49.2	49.8	54.3	43.3	35.2	29.0	17.7	14.8	16.2
(WY)	(1962)	(1963)	(1963)	(1963)	(1961)	(1961)	(1961)	(1961)	(1961)	(1960)	(1960)	(1960)

Water-Data Report 2016
11074000 Santa Ana River below Prado Dam, CA -- Continued

SUMMARY STATISTICS

	Water Year 2016		Water Years 1941 - 2016	
Annual total	57,990			
Annual mean	158.4		220.5	
Highest annual mean			882.0	2005
Lowest annual mean			36.4	1961
Highest daily mean	571.0	Jan 15	11,400	Jan 14, 2005
Lowest daily mean	51.0	Sep 30	2.40	Jul 29, 1978
Annual 7-day minimum	59.1	Sep 24	3.00	Sep 24, 1973
Maximum peak flow	578[a]	Jan 14	13,200[a]	Jan 15, 2005
Maximum peak stage	4.02	Jan 14	8.73	Jan 15, 2005
Annual runoff (cfsm)	0.070		0.098	
Annual runoff (inches)	0.955		1.33	
10 percent exceeds	289.2		381.0	
50 percent exceeds	128.0		137.0	
90 percent exceeds	84.7		43.0	

[a] Discharge affected by Regulation or Diversion



USGS Water-Year Summary 2016

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.

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.

REMARKS - Specific conductance and water temperature records are affected by releases from Prado Dam. Interruptions in record at times due to malfunction of recording or sensing equipment. Sediment data and a portion of chemical data collected for the National Water-Quality Assessment (NAWQA) Program. Specific conductance records excellent except for Oct. 1-13, Nov. 17 to Dec. 4, Feb. 3-18 and Sep. 23-28, which are good; Oct. 14-27, Dec. 5-7, Feb. 19-25, which are fair; and Oct. 28 to Nov. 10 which are poor. Temperature records excellent for 2016WY.

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

Suggested citation: U.S. Geological Survey, 2017, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [March 9, 2017], at URL //nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8184_8185_8187&adr_begin_date=2015-10-01&adr_end_date=2016-09-30&site_no=11074000&agency_cd=USGS

Water-Data Report 2016

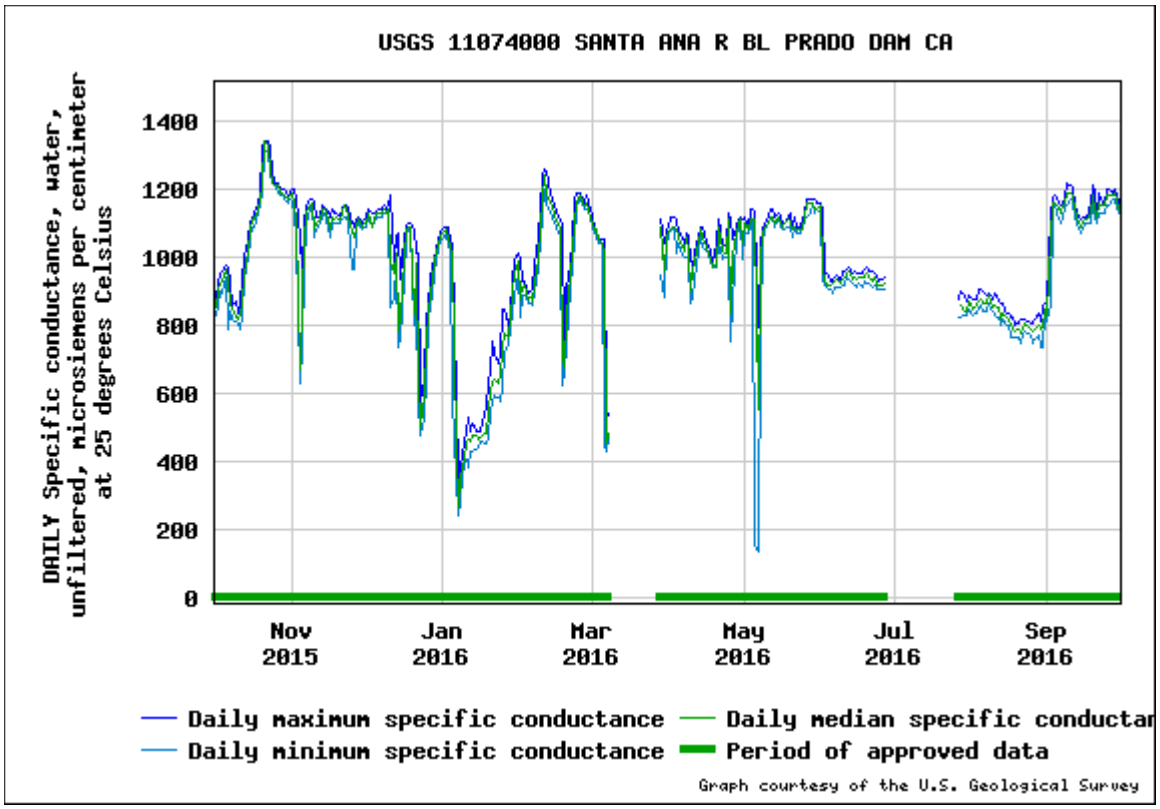
11074000 Santa Ana River below Prado Dam, CA -- Continued

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
YEAR 2015-10-01 to 2016-09-30
DAILY VALUES

Day	Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median
	October			November			December			January		
1	872	831	854	1,200	1,160	1,190	1,120	1,090	1,100	1,080	1,050	1,070
2	928	853	906	1,200	1,130	1,160	1,140	1,120	1,130	1,090	1,070	1,080
3	947	898	925	1,170	1,050	1,100	1,130	1,090	1,090	1,090	1,030	1,050
4	959	896	929	1,050	628	673	1,130	1,100	1,110	1,040	1,020	1,030
5	977	940	966	959	740	884	1,130	1,120	1,130	1,040	585	1,010
6	968	791	930	1,100	959	1,050	1,140	1,120	1,130	585	354	437
7	923	842	858	1,150	1,100	1,130	1,140	1,120	1,130	354	239	265
8	856	819	845	1,170	1,140	1,150	1,150	1,130	1,140	375	285	351
9	871	811	826	1,170	1,150	1,160	1,140	1,130	1,130	423	358	375
10	833	798	820	1,160	1,060	1,080	1,150	1,140	1,140	487	408	452
11	864	791	829	1,120	1,080	1,100	1,180	850	991	531	385	462
12	936	831	871	1,120	1,100	1,110	987	884	954	490	430	458
13	1,000	936	946	1,150	1,120	1,140	1,060	981	1,010	511	428	478
14	1,050	1,000	1,020	1,140	1,130	1,140	1,070	737	781	491	438	479
15	1,100	1,050	1,080	1,140	1,110	1,130	937	756	821	486	440	463
16	1,110	1,090	1,110	1,120	1,060	1,080	1,060	937	998	491	457	470
17	1,130	1,090	1,110	1,140	1,100	1,120	1,090	1,060	1,080	513	458	479
18	1,160	1,130	1,140	1,130	1,100	1,110	1,100	1,080	1,090	559	456	481
19	1,180	1,160	1,170	1,130	1,100	1,120	1,100	1,080	1,090	628	464	541
20	1,320	1,180	1,210	1,120	1,100	1,110	1,080	799	838	664	549	612
21	1,340	1,320	1,340	1,140	1,110	1,130	1,010	877	981	754	572	630
22	1,340	1,310	1,330	1,150	1,120	1,150	1,010	569	647	718	594	644
23	1,320	1,240	1,250	1,150	1,120	1,140	571	475	502	691	586	631
24	1,250	1,220	1,220	1,140	1,100	1,120	640	521	602	709	578	654
25	1,220	1,210	1,210	1,100	963	1,070	823	640	747	845	617	728
26	1,220	1,190	1,210	1,090	965	1,060	852	823	840	847	726	778
27	1,200	1,180	1,190	1,110	1,080	1,090	943	846	891	798	739	762
28	1,200	1,180	1,190	1,120	1,100	1,110	1,000	940	988	842	787	827
29	1,200	1,170	1,180	1,100	1,080	1,090	1,020	1,000	1,010	926	835	894
30	1,180	1,160	1,170	1,110	1,090	1,100	1,050	1,020	1,040	995	889	952
31	1,190	1,170	1,180				1,070	1,050	1,060	1,010	954	989
Max	1340	1320	1340	1200	1160	1190	1180	1140	1140	1090	1070	1080
Min	833	791	820	959	628	673	571	475	502	354	239	265

Max	Min	Median	Max	Min	Median	Max	Min	Median	Max	Min	Median
February			March			April			May		
989	822	876	1,120	1,080	1,100	1,090	1,060	1,070	1,110	995	1,040
930	887	912	1,090	1,080	1,080	1,120	1,080	1,080	1,120	1,070	1,100
927	891	917	1,080	1,050	1,080	1,120	1,080	1,090	1,090	1,070	1,080
893	867	876	1,050	1,040	1,050	1,110	1,010	1,080	1,140	1,080	1,110
902	864	884	1,050	1,040	1,040	1,070	1,040	1,060	1,140	1,110	1,110
903	860	871	1,050	448	1,010	1,070	1,020	1,040	1,130	151	1,110
974	893	923	520	431	456	1,040	1,000	1,020	793	135	552
1,060	968	996	539	464	481	1,070	999	1,060	1,040	793	987
1,140	1,050	1,090	---	---	---	1,060	991	1,010	1,080	1,040	1,070
1,240	1,120	1,170	---	---	---	991	867	897	1,100	1,080	1,090
1,260	1,200	1,240	---	---	---	977	884	957	1,120	1,100	1,100
1,250	1,150	1,190	---	---	---	1,040	976	1,020	1,140	1,110	1,120
1,180	1,130	1,160	---	---	---	1,060	1,020	1,040	1,140	1,110	1,120
1,170	1,120	1,150	---	---	---	1,090	1,060	1,080	1,120	1,090	1,100
1,150	1,100	1,120	---	---	---	1,090	1,030	1,060	1,130	1,110	1,120
1,130	1,090	1,110	---	---	---	1,040	1,020	1,030	1,120	1,090	1,100
1,110	1,060	1,080	---	---	---	1,030	1,010	1,010	1,100	1,080	1,090
1,090	623	699	---	---	---	1,020	984	993	1,100	1,080	1,100
742	657	677	---	---	---	984	969	973	1,120	1,090	1,110
904	742	834	---	---	---	1,040	972	978	1,130	1,090	1,100
983	903	949	---	---	---	1,110	1,040	1,090	1,090	1,060	1,080
1,040	983	1,020	---	---	---	1,080	1,020	1,060	1,120	1,080	1,090
1,170	1,040	1,100	---	---	---	1,030	996	1,020	1,090	1,070	1,080
1,190	1,150	1,160	---	---	---	1,040	1,000	1,010	1,090	1,070	1,080
1,190	1,170	1,180	---	---	---	1,130	996	1,110	1,110	1,080	1,080
1,170	1,150	1,160	---	---	---	1,110	755	838	1,130	1,110	1,120
1,160	1,140	1,150	---	---	---	1,050	865	1,000	1,170	1,120	1,160
1,180	1,140	1,160	---	---	---	1,090	1,050	1,070	1,170	1,130	1,160
1,140	1,120	1,120	1,110	947	1,090	1,110	1,090	1,100	1,170	1,150	1,160
			1,040	880	958	1,120	1,100	1,110	1,170	1,130	1,140
			1,080	1,040	1,060				1,160	1,140	1,140
1260	1200	1240				1130	1100	1110	1170	1150	1160
742	623	677				977	755	838	793	135	552

Max	Min	Median	Max	Min	Median	Day	Max	Min	Median	Max	Min	Median
June			July			August				September		
1,160	1,130	1,150	---	---	---	**1**	880	835	859	863	814	828
1,140	929	965	---	---	---	**2**	875	832	849	1,130	863	1,060
940	916	932	---	---	---	**3**	876	838	858	1,170	1,130	1,160
951	910	918	---	---	---	**4**	907	849	868	1,180	1,150	1,160
930	904	920	---	---	---	**5**	906	859	878	1,170	1,130	1,150
928	896	921	---	---	---	**6**	902	840	867	1,150	1,100	1,130
944	913	932	---	---	---	**7**	890	839	864	1,160	1,110	1,150
947	914	933	---	---	---	**8**	893	863	886	1,170	1,150	1,160
932	914	925	---	---	---	**9**	886	849	867	1,220	1,150	1,190
956	920	937	---	---	---	**10**	877	839	851	1,210	1,170	1,190
958	916	941	---	---	---	**11**	896	829	856	1,200	1,160	1,180
962	939	949	---	---	---	**12**	870	826	853	1,160	1,120	1,140
973	935	959	---	---	---	**13**	862	802	815	1,130	1,100	1,120
950	922	935	---	---	---	**14**	863	817	838	1,110	1,070	1,090
961	915	939	---	---	---	**15**	840	804	827	1,120	1,080	1,100
954	914	934	---	---	---	**16**	834	798	816	1,120	1,100	1,110
952	922	941	---	---	---	**17**	822	764	802	1,120	1,100	1,110
952	913	941	---	---	---	**18**	821	763	788	1,160	1,100	1,130
965	927	942	---	---	---	**19**	802	764	781	1,210	1,150	1,180
968	923	950	---	---	---	**20**	803	765	787	1,190	1,120	1,140
961	926	941	---	---	---	**21**	815	745	777	1,130	1,100	1,120
957	912	932	---	---	---	**22**	816	773	791	1,190	1,130	1,160
951	919	943	---	---	---	**23**	818	781	803	1,160	1,130	1,150
945	905	920	---	---	---	**24**	814	778	796	1,160	1,130	1,150
927	908	919	---	---	---	**25**	807	770	786	1,200	1,150	1,180
934	903	919	---	---	---	**26**	807	747	785	1,200	1,150	1,180
940	904	926	879	825	---	**27**	817	757	787	1,190	1,170	1,180
---	---	---	898	825	860	**28**	833	773	798	1,200	1,170	1,190
---	---	---	896	827	847	**29**	813	735	791	1,180	1,140	1,170
---	---	---	868	828	842	**30**	851	735	792	1,160	1,130	1,140
			888	847	871	**31**	864	833	846			
						Max	907	863	886	1220	1170	1190
						Min	802	735	777	863	814	828


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
Nov 2015
Jan 2016
Mar 2016
May 2016
Jul 2016
Sep 2016
Daily maximum specific conductance
Daily median specific conductar
Daily minimum specific conductance
Period of approved data
Graph courtesy of the U.S. Geological Survey

USGS Water-Year Summary 2016

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.

SURFACE-WATER RECORDS

PERIOD OF RECORD - March 1970 to current year.

REVISED RECORDS - WDR CA-83-1: Drainage area.

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 - Records poor. 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, 2017, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [January 31, 2017], at URL //nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8098&adr_begin_date=2015-10-01&adr_end_date=2016-09-30&site_no=11066460&agency_cd=USGS

Water-Data Report 2016

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

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2015-10-01 to 2016-09-30
DAILY MEAN VALUES

[e, Value has been estimated.]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2015	2015	2015	2016	2016	2016	2016	2016	2016	2016	2016	2016
1	36	40	50	61	85	e46	49	49	41	29	27	27
2	33	45	47	69	47	e50	48	47	42	30	28	27
3	30	52	49	78	53	e51	49	44	38	28	30	28
4	36	62	47	83	54	e58	48	43	38	26	30	29
5	59	46	46	1,200	56	e53	48	46	38	25	30	28
6	59	63	46	1,300	55	e73	47	58	42	26	29	29
7	31	75	43	2,060	55	e357	52	53	42	27	29	30
8	28	47	43	127	58	e94	55	52	41	26	31	31
9	27	48	37	75	61	e61	74	48	42	24	31	28
10	26	49	35	56	63	57	53	49	40	24	30	33
11	27	47	63	37	62	87	67	49	41	23	31	32
12	28	48	47	38	60	80	57	46	40	23	31	33
13	30	49	37	37	58	56	55	45	40	24	29	32
14	32	47	79	37	59	54	54	47	40	25	26	31
15	75	49	24	41	59	56	54	47	38	24	25	34
16	46	50	27	38	62	56	48	45	38	25	26	30
17	42	49	25	39	67	58	49	43	37	25	25	28
18	40	49	22	40	76	57	50	44	35	27	24	28
19	42	51	25	42	45	59	51	46	35	28	25	30
20	43	49	39	46	42	56	47	43	33	27	24	31
21	41	47	17	46	45	58	45	43	32	26	24	31
22	43	48	134	47	47	58	45	43	34	25	25	31
23	42	50	30	46	43	56	46	41	34	25	25	30
24	41	57	22	46	37	55	45	43	33	25	25	29
25	43	58	28	48	e32	54	100	43	33	26	26	26
26	41	55	27	49	e56	55	87	43	32	25	29	27
27	42	54	34	50	e48	55	46	43	31	25	28	28
28	42	53	40	53	e51	56	e45	42	31	26	27	28
29	42	48	47	55	e46	61	e44	43	29	26	26	29
30	40	50	49	55		61	70	41	30	26	26	31
31	41		55	203		51		42		27	26	
Total	1,228	1,535	1,314	6,202	1,582	2,139	1,628	1,411	1,100	798	848	889
Mean	39.6	51.2	42.4	200	54.6	69.0	54.3	45.5	36.7	25.7	27.4	29.6
Max	75	75	134	2060	85	357	100	58	42	30	31	34
Min	26	40	17	37	32	46	44	41	29	23	24	26
Ac-ft	2,436	3,045	2,606	12,300	3,138	4,243	3,229	2,799	2,182	1,583	1,681	1,763

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2000 - 2016, BY WATER YEAR (WY)

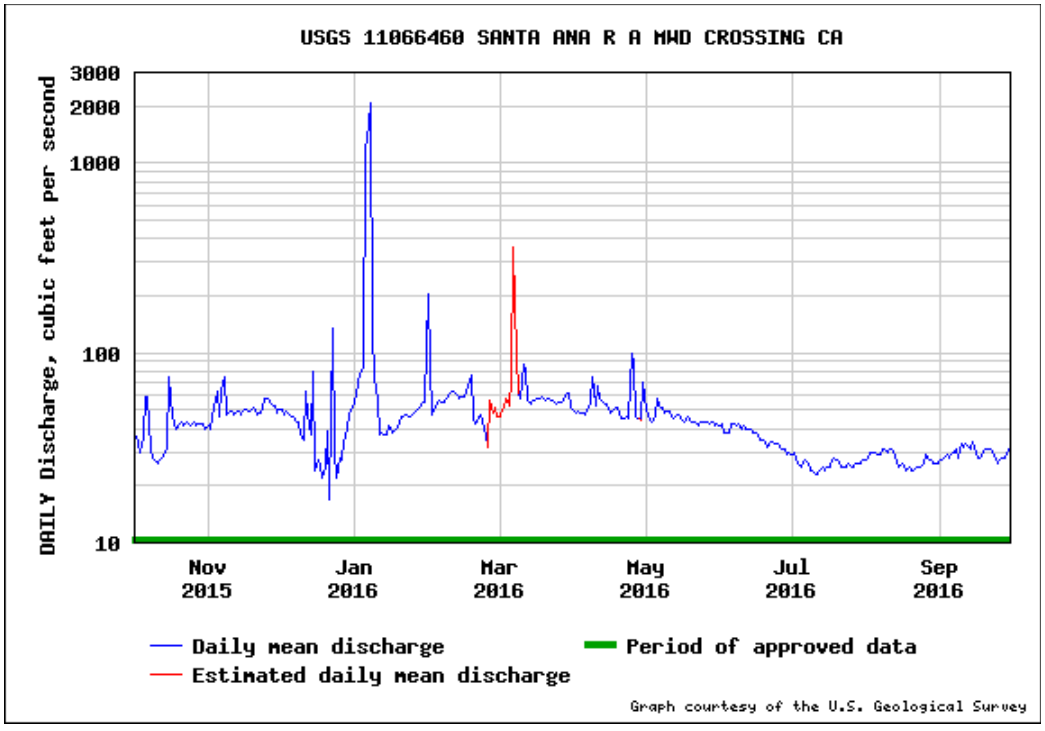
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	94.9	88.4	226	285	208	142	135	87.9	68.8	61.3	65.7	63.0
Max	498	141	1,729	2,350	756	498	501	314	192	137	201	97.6
(WY)	(2005)	(2003)	(2011)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2015)
Min	33.8	37.5	42.4	37.0	54.6	32.1	38.2	41.2	32.2	25.7	27.4	29.6
(WY)	(2015)	(2015)	(2016)	(2014)	(2016)	(2015)	(2015)	(2015)	(2014)	(2016)	(2016)	(2016)

Water-Data Report 2016
11066460 Santa Ana River at Metropolitan Water District Crossing, near Arlington, CA -- Continued

SUMMARY STATISTICS

	Water Year 2016		Water Years 2000 - 2016	
Annual total	20,670			
Annual mean	56.5		127.0	
Highest annual mean			491.0	2005
Lowest annual mean			56.6	2016
Highest daily mean	2,060	Jan 07	22,000	Jan 11, 2005
Lowest daily mean	17.0	Dec 21	17.0	Dec 21, 2015
Annual 7-day minimum	23.9	Jul 09	23.1	Aug 22, 2013
Maximum peak flow	6,060[a,b]	Jan 07	49,100[a,b]	Dec 21, 2010
Maximum peak stage	9.77	Jan 07	16.83	Dec 21, 2010
Annual runoff (cfsm)	0.066		0.149	
Annual runoff (inches)	0.902		2.02	
10 percent exceeds	61.0		122.0	
50 percent exceeds	43.0		72.0	
90 percent exceeds	26.0		38.0	

[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



Water-Data Report 2016

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 mi^2.

WATER-QUALITY RECORDS

PERIOD OF RECORD - Water years 1970 to current year. CHEMICAL DATA: Water years 1970 to current year. SPECIFIC CONDUCTANCE: Water years 1970-78, 1999-2000. WATER TEMPERATURE: Water years 1999-2000. SEDIMENT DATA: Water years 1999-2000.

SAR@MWDXing Water Quality				
	EC (um/cm)	TDS (mg/L)		TDS/EC Ratio
Date			**Source**	
10/6/2015	930	523	USGS	0.56
10/23/2015	1250	617	USGS	0.49
11/10/2015	1080	602	USGS	0.56
11/23/2015	1140	617	USGS	0.54
12/7/2015	1130	615	USGS	0.54
12/22/2015	647	240	USGS	0.37
1/6/2016	437	308	USGS	0.70
1/27/2016	762	611	USGS	0.80
2/3/2016	917	587	USGS	0.64
2/25/2016	1180	622	USGS	0.53
4/7/2016	1020	610	USGS	0.60
4/25/2016	1110	627	USGS	0.56
5/5/2016	1110	621	USGS	0.56
5/27/2016	1160	638	USGS	0.55
6/7/2016	932	638	USGS	0.68
8/10/2016	851	645	USGS	0.76
8/24/2016	796	635	USGS	0.80
9/9/2016	1190	634	USGS	0.53
9/21/2016	1120	639	USGS	0.57
Average	**987**	**580**		**0.60**

USGS Water-Year Summary 2016

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 - Records fair. 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, 2017, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [March 9, 2017], at URL //nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8056&adr_begin_date=2015-10-01&adr_end_date=2016-09-30&site_no=11059300&agency_cd=USGS

Water-Data Report 2016

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

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2015-10-01 to 2016-09-30
DAILY MEAN VALUES

[e, Value has been estimated.]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2015	2015	2015	2016	2016	2016	2016	2016	2016	2016	2016	2016
1	1.5	4.4	5.6	12	23	2.8	0.82	1.8	1.7	0.11	0.18	0.39
2	1.4	6.9	4.0	7.1	2.2	3.9	0.60	1.6	0.81	0.08	0.84	0.09
3	1.6	9.0	3.2	7.2	2.3	3.9	3.1	1.7	0.28	0.00	0.22	0.78
4	17	6.3	4.3	8.4	1.9	6.6	1.6	3.3	1.3	0.06	0.12	0.69
5	16	3.0	3.1	546	1.7	5.7	1.2	6.5	1.4	0.00	0.04	0.01
6	3.5	2.1	2.4	670	2.3	25	5.5	18	0.78	0.01	0.53	0.06
7	2.6	3.6	3.0	794	3.6	203	8.4	29	0.37	0.11	0.00	0.00
8	2.3	5.0	2.4	77	2.1	25	33	11	0.12	0.12	0.00	0.03
9	2.0	6.7	2.6	11	2.4	0.98	41	10	0.26	0.17	0.52	0.06
10	1.3	8.5	4.9	6.6	4.9	0.59	8.3	9.9	1.4	0.03	0.85	0.09
11	1.6	8.0	42	6.5	2.6	22	55	7.6	0.07	0.04	0.01	0.06
12	2.5	8.3	13	4.5	2.0	11	15	4.4	2.6	0.02	0.23	0.03
13	1.5	7.1	8.6	2.7	1.4	1.4	7.2	2.4	0.76	0.39	0.84	0.06
14	0.92	7.7	33	2.9	5.8	5.4	10	1.2	0.42	0.89	0.54	0.95
15	37	8.7	6.9	1.6	1.5	2.0	7.9	7.1	0.15	0.55	0.38	0.53
16	1.2	8.7	4.5	1.6	0.81	1.1	4.2	13	0.11	0.12	0.05	1.2
17	1.9	6.2	5.5	1.8	5.7	0.84	4.1	5.4	0.22	0.04	0.57	0.29
18	1.1	3.2	4.3	2.3	14	0.87	6.0	4.3	e0.25	0.10	0.71	0.56
19	3.4	5.8	9.1	2.8	5.2	0.92	4.4	4.1	e0.22	0.34	0.38	0.52
20	4.7	4.8	18	1.9	2.6	0.73	2.1	3.3	e1.7	0.93	0.00	1.7
21	4.3	4.6	7.8	1.9	3.1	1.2	3.6	7.5	0.01	0.51	0.00	1.2
22	3.8	3.7	27	0.90	2.4	0.71	3.1	6.4	0.00	0.77	0.73	0.04
23	5.5	4.9	16	1.8	1.3	0.67	6.3	7.3	0.02	0.55	0.00	0.43
24	4.4	8.5	4.6	1.6	1.7	0.91	8.1	5.4	0.00	1.1	0.09	2.2
25	5.9	7.3	16	4.4	1.5	0.08	43	3.5	0.00	0.73	1.7	1.2
26	6.6	6.2	6.3	2.3	1.5	0.58	8.1	2.2	0.00	0.46	0.48	1.2
27	5.7	6.9	6.4	1.6	1.7	0.78	0.77	3.1	0.30	0.23	0.40	0.30
28	5.0	6.7	7.9	1.2	3.6	1.2	1.8	3.2	0.28	0.52	1.2	0.61
29	5.5	7.7	4.3	1.0	3.3	14	4.7	3.2	0.23	0.41	0.17	0.75
30	4.9	7.4	6.6	1.4		12	25	3.0	0.21	0.41	1.3	0.10
31	5.2		11	69		1.8		3.9		0.02	0.68	
Total	162	188	294	2,255	108	358	324	194	16.0	9.82	13.8	16.1
Mean	5.22	6.26	9.49	72.7	3.73	11.5	10.8	6.27	.53	.32	.44	.54
Max	37	9.0	42	794	23	203	55	29	2.6	1.1	1.7	2.2
Min	0.92	2.1	2.4	0.90	0.81	0.08	0.60	1.2	0.00	0.00	0.00	0.00
Ac-ft	321	373	584	4,473	214	709	642	385	31.7	19.5	27.3	32.0

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2000 - 2016, BY WATER YEAR (WY)

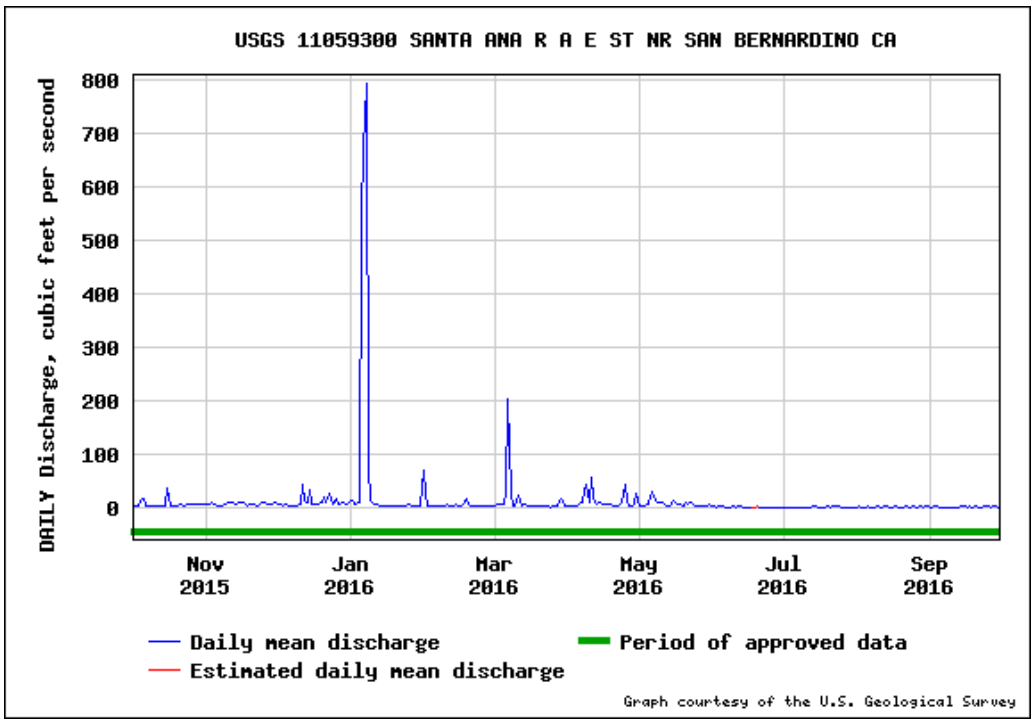
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	16.2	13.4	76.7	106	82.2	58.0	54.2	23.6	6.89	6.09	7.90	4.51
Max	200	47.1	764	1,185	376	398	351	247	112	52.9	102	40.6
(WY)	(2005)	(2014)	(2011)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)
Min	.000	.67	1.16	.000	.82	4.10	.040	.000	.000	.000	.000	.000
(WY)	(2003)	(2001)	(2001)	(2003)	(2002)	(2008)	(2002)	(2002)	(2002)	(2002)	(2002)	(2002)

Water-Data Report 2016
11059300 Santa Ana River at E Street, near San Bernardino, CA -- Continued

SUMMARY STATISTICS

	Water Year 2016		Water Years 2000 - 2016	
Annual total	3,939			
Annual mean	10.8		37.9	
Highest annual mean			264.8	2005
Lowest annual mean			1.70	2002
Highest daily mean	794.0	Jan 07	12,500	Jan 11, 2005
Lowest daily mean	0.0	Jun 22	0.0	May 14, 2000
Annual 7-day minimum	0.044	Sep 05	0.0	Sep 11, 2000
Maximum peak flow	3,480[a,b]	Jan 05	35,700[a,b]	Jan 11, 2005
Maximum peak stage	5.41	Jan 05	9.04	Jan 11, 2005
Annual runoff (cfsm)	0.020		0.070	
Annual runoff (inches)	0.271		0.951	
10 percent exceeds	11.0		40.0	
50 percent exceeds	2.10		0.955	
90 percent exceeds	0.090		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



retrieved: 2017-03-09 18:17:22 EST (vaww01)
Data for the following 1 site(s) are contained in this file
 # USGS 11072100 TEMESCAL C AB MAIN ST A CORONA CA

Data-value qualification codes included in this output:
A Approved data from 10/01/15 - 04/06/16
P Provisional data from 04/07/16 - 09/30/16

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sept 2016
1	1.2	1.1	0.72	0.67	2.1	1.5	1.1	0.38	0.79	1.5	1.4	2.5
2	1.1	3.6	0.88	0.92	1.6	2.3	1.9	0.47	1.1	1.6	1.7	3.3
3	1.3	9.7	1.1	1.1	2.8	2.1	2.2	0.51	1.1	1.4	2.1	3.5
4	13	2.2	1	1.5	3.1	1.5	2.3	0.43	0.82	1.4	2.1	3.8
5	80	1.1	1	149	2.7	1.5	1.1	0.54	0.88	1.6	1.8	4.4
6	3.2	1.3	1.8	227	2	21	1.2	5.4	0.79	2.1	1.8	4
7	1.5	1.3	1.8	265	2.2	54	1.5	1.2	0.77	2.2	2	4
8	1.1	1	1.3	3.6	2	3.3	5.2	0.63	0.78	1.8	1.9	7.1
9	1.6	1.1	1.5	2.4	3.2	1.3	4.8	0.4	0.98	1.2	1.9	4
10	1.5	1.1	1.5	1.9	3.1	1.3	21	0.66	0.93	1.3	2.7	4.2
11	1.3	1.1	3	1.7	2.5	45	4.4	0.49	0.89	1.5	3	4.6
12	1.5	1.1	1.1	1.4	2.7	1.9	2.4	0.58	0.92	1.3	3.6	4.3
13	1.7	1.6	3.8	1.4	2.3	1.4	1	0.6	0.89	1.6	4.2	5.3
14	1.7	1.2	3.1	1.5	1.9	1.5	0.99	0.66	0.91	1.5	3.1	6.2
15	1.6	1.2	1.4	1.7	1.7	1.2	0.92	0.63	0.77	1.4	2.4	6.2
16	1.4	1.3	1.7	1.9	3.8	1	0.74	0.72	0.86	1.7	3.1	7
17	1.4	1.2	1.2	2.3	25	1.1	0.84	0.58	4.2	1.4	4.4	5.5
18	1.6	1.1	0.88	1.9	13	1.2	0.86	0.45	1.5	1.8	3	5.2
19	1.5	1.2	16	1.7	1.4	1.4	0.92	1.2	1.6	3.1	3.2	5.7
20	1.3	1.2	2.8	1.9	1.3	1.2	0.99	0.62	2.3	1.7	3.6	5
21	1.5	1.5	1.1	1.6	1.3	1.4	0.59	0.56	1.4	1.6	4.4	5.6
22	1.4	1.9	38	1.5	1.3	1.1	1.3	0.51	1.9	1.8	5.1	4.8
23	1.3	1.1	1.3	1.6	1.4	1.2	0.61	1.7	2.5	1.6	5.5	3.2
24	1.7	1.4	1.2	1.7	1.4	1.5	0.49	0.41	1.6	1.8	7	3.1
25	1.8	4.2	0.75	1.7	1.5	1.4	5.2	0.39	1.8	1.4	6.9	2.7
26	1.4	1.8	0.56	1.8	1.5	1.8	1.2	0.43	1.4	1.7	6.6	2.8
27	1.4	2.4	0.53	2	1.6	1	0.58	0.49	2.2	1.6	6.5	2.4
28	1.5	0.93	1.7	2	1.5	0.96	0.62	0.57	1.4	1.6	5.7	2
29	1.4	0.96	1.1	2.3	1.3	47	0.51	0.73	1.7	1.8	5.5	2.3
30	1.1	0.74	0.97	2.4		4.9	0.77	0.67	1.6	2.2	4.7	2.6
31	1.1		0.91	54		1.1		0.89		2.6	4.2	

USGS Water-Year Summary 2016

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 mi².

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 - Records fair except for estimated daily discharges which are considered poor. No flow for water year 2014 and 2015. 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, 35 ft³/s, Feb. 23, 2013, gage height, 37.35 ft; minimum discharge, 0.00 ft³/s, on many days, gage height, 17.37 ft. on Aug. 13, 2015. No peaks greater than 35 ft³/s occurred outside of period of published record during this water year.

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

Suggested citation: U.S. Geological Survey, 2017, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 1, 2017], at URL //nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8159&adr_begin_date=2015-10-01&adr_end_date=2016-09-30&site_no=11071900&agency_cd=USGS

Water-Data Report 2016

11071900 Temescal Creek at Corona Lake, near Corona, CA -- Continued

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2015-10-01 to 2016-09-30
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2015	2015	2015	2016	2016	2016	2016	2016	2016	2016	2016	2016
1	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	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	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00
29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00		0.00		0.00		0.00	0.00	
Total	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Mean	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
Max	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ac-ft	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

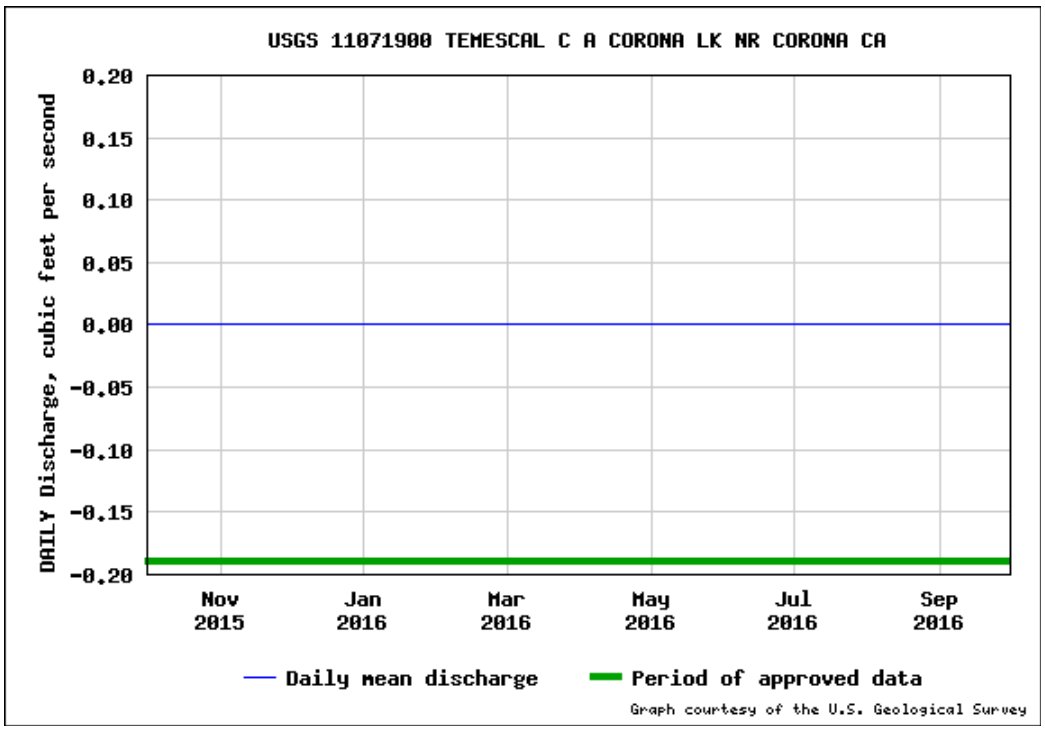
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2013 - 2016, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	.000	.000	.000	.48	3.25	.47	.000	.000	.000	.000	.000	.000
Max	.000	.000	.000	1.90	13.0	1.87	.000	.000	.000	.000	.000	.000
(WY)	(2014)	(2014)	(2013)	(2013)	(2013)	(2013)	(2013)	(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)

Water-Data Report 2016
11071900 Temescal Creek at Corona Lake, near Corona, CA -- Continued

SUMMARY STATISTICS

	Water Year 2016		Water Years 2013 - 2016	
Annual total	0.0			
Annual mean	0.0		0.0	
Highest annual mean			0.0	2014
Lowest annual mean			0.0	2014
Highest daily mean	0.0	Oct 01	32.0	Feb 22, 2013
Lowest daily mean	0.0	Oct 01	0.0	Nov 06, 2012
Annual 7-day minimum	0.0	Oct 01	0.0	Nov 06, 2012
Maximum peak flow	0.0	2016	35	Feb 23, 2013
Maximum peak stage			37.35	Feb 23, 2013
Annual runoff (cfsm)	0.0		0.006	
Annual runoff (inches)	0.0		0.079	
10 percent exceeds	0.0		0.0	
50 percent exceeds	0.0		0.0	
90 percent exceeds	0.0		0.0	



retrieved: 2017-03-09 19:17:30 EST (sdww01)
Data for the following 1 site(s) are contained in this file
 # USGS 11073495 CUCAMONGA C NR MIRA LOMA CA

Data provided for site 11073495
Data-value qualification codes included in this output:
A Approved data from 10/01/15 - 10/13/15
P Provisional data from 10/14/15 - 09/30/16

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
1	15	28	7.5	15	26	24	12	13	16	4.7	3.8	0.78
2	14	39	22	32	13	21	11	10	8.3	6.1	4.2	3.4
3	23	73	13	43	9.2	25	12	4.8	7.5	5.8	2.8	4.7
4	71	33	7.9	51	11	33	22	11	5.4	5.7	2.7	5.4
5	193	27	7.8	406	12	32	24	19	5.4	8.8	1.8	4.6
6	48	26	10	495	7.5	272	27	461	5.3	16	2.1	1.3
7	24	21	6.1	193	11	171	38	48	4.8	7.4	6.5	0.64
8	15	24	8	27	9.2	43	45	32	5.6	6.3	5	2
9	14	31	4.6	25	6.7	41	44	30	4.2	10	3.3	2.9
10	13	29	9	28	4.9	44	49	22	3.2	10	3.2	3.2
11	14	25	64	26	3.7	151	38	13	3.1	6.6	2.2	5.3
12	12	19	45	20	3.5	33	19	15	9	5.6	1.4	6.8
13	18	17	92	9.9	5.1	29	4.8	15	11	5.6	3.1	6.7
14	21	21	33	9.8	16	33	6.5	8.8	5.5	4.5	8.2	5.6
15	31	28	18	11	8.2	24	12	15	6.7	3.6	3.2	3
16	39	25	20	12	12	26	4.9	17	4.7	3.3	1.8	3.9
17	55	18	13	14	62	19	9.2	8.5	4.1	5.6	1.9	6.1
18	54	22	15	15	68	8.5	5	9.2	4.1	5	1.7	5.3
19	33	18	44	23	27	14	3.1	12	4.4	5.6	4.9	3.6
20	11	22	35	16	21	18	5.4	25	3.4	6.9	3.2	2.5
21	10	30	36	8.5	22	17	4.9	18	3.5	4.8	5.8	6.2
22	8.3	31	171	9.4	17	11	5.8	27	3.3	3.5	4	6.1
23	15	32	38	8.9	13	7.1	4.2	12	4.3	7.9	2.7	2.7
24	9.9	37	25	17	7.4	4.4	5.7	5.9	3.7	9.1	3.6	1.6
25	6.7	41	20	14	16	4.4	25	5.2	3.9	5.4	4.7	4.6
26	14	31	18	9.1	7.9	10	39	10	6.7	4.7	2	3.2
27	8.8	26	23	14	5.7	15	42	9.4	6.3	4.4	6.2	2.6
28	14	26	28	26	16	8.9	16	13	4.8	6.5	3.8	2.4
29	13	23	27	49	17	22	8.6	14	7.1	4.4	0.94	2.9
30	19	16	33	55		18	12	14	6	4.8	1	6
31	27		22	283		15		11		5.9	1.6	

USGS Water-Year Summary 2016

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.

SURFACE-WATER RECORDS

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

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

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 - Records rated good, except when estimated is considered fair. 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 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 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, 2017, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 1, 2017], at URL //nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8167&adr_begin_date=2015-10-01&adr_end_date=2016-09-30&site_no=11073360&agency_cd=USGS

Water-Data Report 2016
11073360 Chino Creek at Schaefer Avenue, near Chino, CA -- Continued

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2015-10-01 to 2016-09-30
DAILY MEAN VALUES

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
1	0.09	0.20	0.15	0.32	0.37	0.24	0.32	0.22	35	65	65	31
2	0.12	2.3	0.17	0.33	0.25	0.23	0.50	0.25	72	63	65	0.85
3	0.08	114	0.19	0.31	0.22	0.22	0.30	0.26	66	64	65	0.71
4	3.4	0.63	0.22	0.38	0.22	0.19	0.32	0.23	60	65	65	0.58
5	95	0.74	0.22	172	0.22	0.19	1.4	0.21	61	63	63	0.55
6	1.4	0.56	0.19	146	0.23	54	0.27	0.25	61	60	60	0.61
7	0.40	0.37	0.23	68	0.25	114	0.24	0.21	67	57	60	0.86
8	0.83	0.23	0.24	0.59	0.24	1.00	0.42	0.18	71	58	61	0.52
9	2.0	0.25	0.41	0.43	0.26	0.45	7.7	0.22	69	60	63	0.46
10	1.9	0.22	16	0.40	0.24	0.34	0.24	0.26	66	62	64	0.41
11	2.0	0.20	8.0	0.42	0.24	62	0.23	0.24	64	64	65	0.36
12	1.9	0.31	0.39	0.36	0.25	0.51	0.26	0.27	65	60	66	0.37
13	1.9	0.18	19	0.36	0.23	0.32	0.21	0.29	72	57	66	0.42
14	2.0	0.18	1.3	0.40	0.22	0.39	0.24	0.22	74	59	66	0.39
15	1.8	0.22	0.35	0.42	0.25	0.34	0.23	0.18	73	61	67	0.39
16	1.8	0.73	0.28	0.41	0.24	0.33	0.23	0.21	73	62	66	0.39
17	1.6	0.18	0.31	0.40	37	0.33	0.21	0.23	74	62	66	0.36
18	1.2	0.21	0.32	0.40	11	0.31	0.24	0.27	74	60	65	0.32
19	1.5	0.22	19	0.43	0.33	0.31	0.25	0.31	71	65	64	0.33
20	1.4	0.21	0.80	0.45	0.22	0.29	0.24	0.31	70	67	65	0.37
21	1.5	0.22	0.42	0.39	0.19	0.39	0.24	0.20	75	68	65	0.37
22	1.4	0.20	20	0.39	0.21	0.31	0.24	0.18	75	65	64	0.34
23	1.1	0.25	0.54	0.37	0.22	0.32	0.25	0.22	74	65	63	0.32
24	0.27	0.23	0.42	0.40	0.21	0.32	0.23	0.29	73	64	65	0.25
25	0.22	3.6	0.34	0.52	0.21	0.31	11	0.28	71	63	66	0.21
26	0.25	0.25	0.33	0.38	0.21	0.32	0.31	0.36	70	65	69	0.24
27	0.86	0.27	0.26	0.40	0.20	0.28	0.24	0.23	70	62	70	0.29
28	2.0	0.19	0.36	0.38	0.19	0.42	0.28	0.21	70	63	70	0.83
29	1.4	0.16	0.34	0.39	0.21	0.77	0.21	0.22	69	65	69	0.25
30	1.2	0.21	0.32	0.39		0.33	0.29	0.20	62	63	70	0.22
31	0.37		0.33	67		0.31		0.22		65	70	
Total	133	128	91.4	464	54.3	240	27.3	7.43	2,047	1,942	2,028	43.6
Mean	4.29	4.26	2.95	15.0	1.87	7.74	.91	.24	68.2	62.6	65.4	1.45
Max	95	114	20	172	37	114	11	0.36	75	68	70	31
Min	0.08	0.16	0.15	0.31	0.19	0.19	0.21	0.18	35	57	60	0.21
Ac-ft	264	253	181	920	108	476	54.2	14.7	4,060	3,852	4,022	86.4

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 2016, BY WATER YEAR (WY)

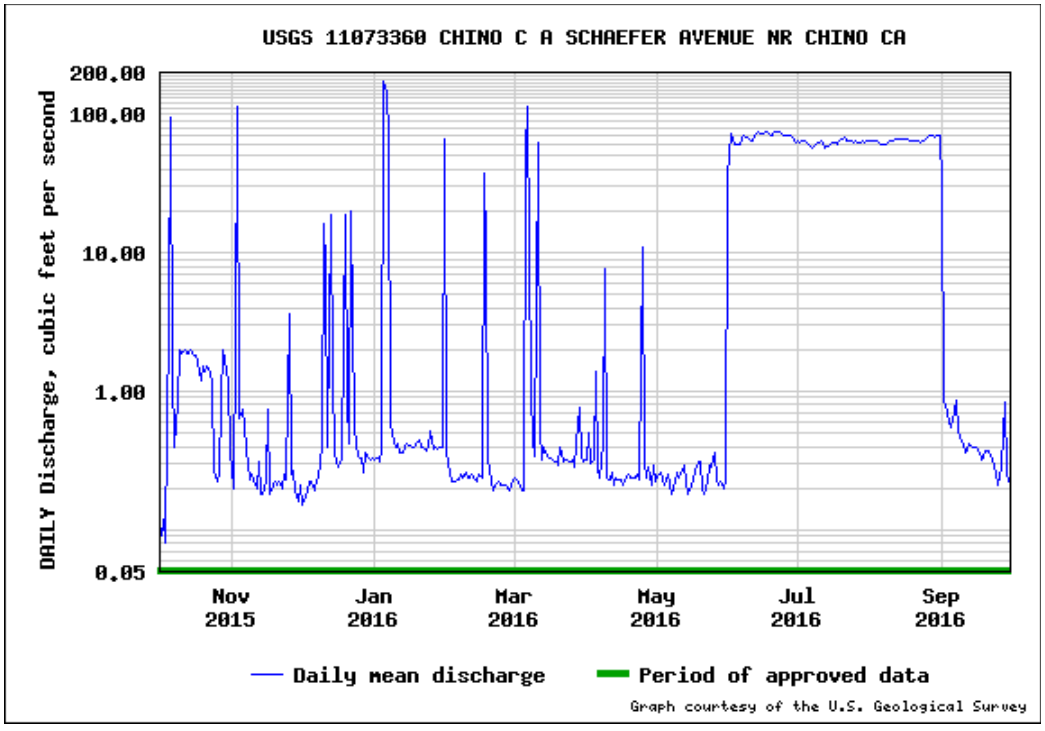
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	14.9	14.2	24.0	31.9	35.0	23.4	8.62	10.5	15.4	17.4	15.2	12.2
Max	126	113	189	221	193	257	68.6	104	184	176	191	198
(WY)	(1979)	(1976)	(1976)	(2005)	(1980)	(1978)	(1974)	(1997)	(1976)	(1974)	(1974)	(1997)
Min	.061	.23	.53	.48	.33	.30	.14	.22	.062	.069	.12	.13
(WY)	(1978)	(1978)	(1970)	(2014)	(1972)	(1972)	(1977)	(1973)	(1977)	(1977)	(2015)	(1977)

Water-Data Report 2016
11073360 Chino Creek at Schaefer Avenue, near Chino, CA -- Continued

SUMMARY STATISTICS

	Water Year 2016		Water Years 1970 - 2016	
Annual total	7,206			
Annual mean	19.7		18.5	
Highest annual mean			92.4	1974
Lowest annual mean			2.25	2014
Highest daily mean	172.0	Jan 05	2,060	Mar 01, 1978
Lowest daily mean	0.080	Oct 03	0.0	May 21, 1977
Annual 7-day minimum	0.184	Nov 28	0.024	Oct 28, 1977
Maximum peak flow			13,100[a,b]	Feb 27, 1983
Maximum peak stage			10.32	Feb 27, 1983
Annual runoff (cfsm)	0.403		0.379	
Annual runoff (inches)	5.48		5.14	
10 percent exceeds	67.0		60.0	
50 percent exceeds	0.390		1.20	
90 percent exceeds	0.210		0.320	

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



retrieved: 2017-03-09 19:31:50 EST (vaww01)
Data for the following 1 site(s) are contained in this file
 # USGS 11065000 LYTLE C A COLTON CA

Data provided for site 11065000
Data-value qualification codes included in this output:
A Approved data from 10/01/15 - 10/06/15
P Provisional data 10/07/16 - 09/30/16

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
1	1.1	1.3	2.1	1.9	2.3	0.15	0.21	0.08	0.34	0.2	0.27	0.1
2	1	1.3	2.1	2	1.3	0.14	0.18	0.06	0.29	0.87	0.22	0.05
3	1.3	7.2	2.2	2.2	0.94	0.14	0.15	0.06	0.25	0.52	0.2	0.09
4	2.8	1.2	2.4	2.2	0.64	0.13	0.2	0.07	0.3	0.84	0.26	0.11
5	2.2	1.2	2.3	112	0.47	0.15	0.24	0.12	0.41	0.41	0.36	0.08
6	1.2	1.3	2.1	95	0.28	4.7	0.2	0.79	0.62	0.26	0.34	0.04
7	1.1	1.3	2.3	46	0.2	21	0.13	0.12	0.41	0.87	0.28	0.04
8	1.1	1.4	2.4	1.7	0.14	0.31	0.18	0.16	0.32	0.52	0.4	0.05
9	0.98	1.4	2.5	1.6	0.19	0.15	0.16	0.09	0.33	0.74	0.67	0.05
10	0.98	1.4	2.5	1.7	0.18	0.17	0.67	0.09	0.25	0.57	0.63	0.05
11	1.1	1.3	6.5	1.7	0.14	3.5	0.1	0.09	0.34	0.53	0.62	0.06
12	0.99	1.3	1.8	1.6	0.16	0.16	0.07	0.09	0.34	0.45	0.28	0.08
13	0.93	1.3	8.3	1.6	0.11	0.17	0.06	0.11	0.4	0.38	0.17	0.07
14	0.93	1.3	2.5	1.5	0.1	0.14	0.06	0.12	0.39	0.37	0.13	0.05
15	2.2	1.5	1.7	1.6	0.13	0.15	0.08	0.11	0.46	0.39	0.09	0.06
16	0.93	1.4	1.9	1.5	0.18	0.18	0.16	0.12	0.38	0.47	0.1	0.06
17	0.86	1.5	1.7	1.3	3.6	0.19	0.15	0.11	0.12	0.49	0.18	0.06
18	0.92	1.4	1.9	1.5	0.68	0.17	0.17	0.12	0.12	0.13	0.16	0.07
19	1.1	1.3	7.4	1.6	0.16	0.23	0.17	0.16	0.09	0.29	0.15	0.08
20	1	1.2	2.5	1.7	0.16	0.2	0.29	0.18	0.09	0.46	0.12	0.08
21	1	1.4	1.9	1.5	0.15	0.19	0.32	0.2	0.16	0.52	0.13	0.07
22	1.2	2.2	30	1.4	0.16	0.15	0.19	0.2	0.16	0.68	0.06	0.06
23	1.1	2.4	1.9	1.5	0.19	0.36	0.17	0.21	0.13	0.36	0.06	0.03
24	1.1	2.2	1.7	1.3	0.19	0.35	0.17	0.22	0.13	0.2	0.07	0.03
25	1.3	4.3	1.6	1.4	0.17	0.32	17	0.33	0.14	0.18	0.08	0.28
26	1.2	2.5	1.6	1.6	0.14	0.37	0.13	0.36	0.14	0.17	0.12	0.32
27	1.3	2.2	1.7	1.6	0.12	0.45	0.1	0.35	0.12	0.27	0.1	0.03
28	1.3	1.8	1.6	1.6	0.14	0.42	0.11	0.42	0.15	0.53	0.05	0.03
29	1.3	1.9	1.9	1.7	0.15	3.5	0.1	0.47	0.17	0.37	0.09	0.02
30	1.2	2	1.8	1.9		0.15	5	0.25	0.18	0.43	0.16	0.02
31	1.3		1.8	54		0.18		0.3		0.36	0.15	

retrieved: 2017-03-09 19:42:59 EST (caww01)
Data for the following 1 site(s) are contained in this file
 # USGS 11060400 WARM C NR SAN BERNARDINO CA

Data provided for site 11060400
Data-value qualification codes included in this output:
A Approved data 10/01/15 - 10/04/15
P Provisional data 10/05/15 -09/30/16

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
1	0.02	0	0	0	0.65	0	0	0	0	0	0	0
2	0.01	0.03	0	0	0	0	0	0	0.01	0	0	0
3	0.01	17	0	0	0	0.07	0	0	0	0	0	0
4	6.2	0.06	0	0	0	0	0	0	0	0	0	0
5	2	0	0.03	116	0	0	0.06	0	0	0	0	0
6	0.05	0	0	58	0	16	0	0.73	0	0	0	0
7	0.03	0	0.01	63	0	48	0	1.3	0	0	0	0.01
8	0.04	0	0.17	0.42	0.01	0.47	3.2	0.02	0	0	0	0
9	0.05	0	0.02	0	0	1.4	1.6	0	0.1	0	0	0.02
10	0.04	0	0.15	0.02	0	0.09	2.1	0	0	0	0.06	0
11	0.04	0	7.7	0.11	0.04	8.7	0	0	0	0	0	0
12	0.04	0	0.04	0.44	0.08	0.12	0	0.04	0	0	0	0
13	0.03	0	8.3	0.15	0	0	0	0.08	0	0	0	0
14	0.02	0	0.81	0	0	0.77	0	0.08	0	0.07	0	0
15	17	0	0	0.56	0	0.01	0.01	0.01	0	0	0	0
16	0.07	0.02	0	0	0.02	0.01	0.03	0.04	0.17	0	0	0
17	0.05	0	0	0.61	8.9	0	0.12	0	0	0	0	0
18	0.02	0.02	0	0.68	10	0	0	0	0	0	0	0
19	0.05	0.05	5.9	0.12	0.04	0.01	0	0	0	0	0	0
20	0.01	0	0.41	0.07	0		0	0	0.11	0	0	0.07
21	0.08	0	0	0.04	0.4	0	0.07	0	0.12	0	0	0.5
22	0.03	0	11	0.03	0.02	0.01	0.01	0	0	0	0	0
23	0.01	0	0.2	0.04	0.2	0	0	0	0	0	0	0
24	0	0	0.01	0.01	0.09	0	0	0	0	0	0	0
25	0	3.5	0	0	0.05	0	29	0	0	0.18	0	0
26	0	0.2	0	0.04	0.01	0	0.27	0	0	0.1	0	0
27	0.09	0.17	0	0.4	0.04	0	0	0	0	0	0	0
28	0.01	0	0.11	0.05	0.01	0	0.25	0	0	0	0	0
29	0.03	0	0	0.02	0	15	0	0	0	0	0	0
30	0.01	0	0	0.03		0.27	8.5	0	0	0	0	0
31	0		0	39		0		0		0	0	

retrieved: 2017-03-09 19:51:49 EST (caww01)
Data for the following 1 site(s) are contained in this file
 # USGS 11057500 SAN TIMOTEO C NR LOMA LINDA CA

Data provided for site 11057500
Data-value qualification codes included in this output:
A Approved data 10/01/15 - 06/14/16
P Provisional data 06/15/16 - 09/30/16

Day	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
1	1.5	8.2	11	15	5.8	4.8	13	19	9.5	1	0.22	0.84
2	2.1	13	8.8	14	4.8	6	14	21	8.8	1.5	0.47	1.3
3	2.2	15	7.4	14	6	7.1	15	20	6.8	1.4	0.59	1.6
4	15	14	7.9	14	6.3	3.1	12	22	8.6	1.1	0.53	1.3
5	18	9.2	7.1	71	4.6	1.2	11	22	6.5	1.6	0.49	1.1
6	6.4	7.5	7.7	187	2.9	7	11	26	8.3	3.7	0.44	1.8
7	4.2	8.5	8.3	201	3	26	4.5	34	6.7	2.2	0.76	1.7
8	2.5	9	7.2	59	2.7	25	12	25	4.9	1.7	1.2	1.8
9	1.6	11	7.2	17	2.5	5.4	18	18	6.1	2.8	0.58	1.7
10	1.6	10	9.3	15	3	4.2	16	11	9.2	1.9	0.58	1.6
11	2.2	11	23	14	2.1	8.2	61	8.7	6.6	1.3	0.81	2.4
12	2.6	10	18	10	1.9	13	21	5.5	11	2	1	5.3
13	2.6	8.5	16	9.3	1.8	5.4	13	3.7	11	1.4	0.61	4.1
14	3.9	9.5	20	9.2	2.5	8.2	11	4.9	10	1.1	0.23	1.9
15	17	12	16	8	1.9	6.3	10	8.7	6.5	0.75	0.55	2.7
16	6.7	13	15	8.1	1.6	3.4	7	11	4.5	0.57	0.46	1.8
17	6	9.4	15	9	5	2.6	7.6	5.8	4.2	0.99	0.87	1.5
18	4.2	7.6	14	8.9	6	2.9	7.5	5.9	4.9	1	0.11	3.4
19	7.4	9.3	17	9.4	6.5	3.3	5.2	6	6.3	1.7	0.1	4
20	7.3	9.3	19	7.3	5.7	3.5	4.6	6.1	3.5	0.82	0.31	1.6
21	6.3	9.4	19	6.9	7.6	3.9	5.2	9.8	2.9	0.55	0.9	2
22	7.2	7.6	27	4.4	6.2	3.5	3.9	11	2.7	0.39	0.64	1.8
23	9.5	9.6	19	6.1	6.3	2.8	8.3	11	5.3	0.21	0.35	3.2
24	6.4	12	18	5.2	6.3	3	10	11	2.7	0.42	0.37	2.8
25	7.4	12	22	6.3	5.4	2.2	23	8.9	5	0.58	0.28	2
26	8.3	11	17	4.4	4.5	4	14	9.2	2.8	0.32	0.16	1.9
27	7.8	12	15	2.7	5.4	5.7	11	9.2	2.4	0.42	0.23	2.5
28	7.7	13	17	2.3	7.2	8.4	12	11	2.9	0.35	0.36	2.6
29	7.3	13	15	1.6	6.5	12	14	9.4	2.1	0.28	0.42	4.8
30	8.6	13	13	4.3		14	19	9.7	1.3	0.79	0.24	2.1
31	8.5		15	11		13		11		0.23	0.34	

APPENDIX B

DAILY PRECIPITATION DATA
FOR SAN BERNARDINO

WATER YEAR 2015-16

Table B-1

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

	2015			2016								
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.03	0.00	0.00	1.49	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.64	0.00	0.29	0.00	0.07	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.59	0.00	0.57	0.01	0.03	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.01	0.00	0.00	0.30	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.06	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.32	0.00	0.00	0.19	0.03	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.14	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
15	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.19	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.16	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00
26	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.03	0.00	0.00	0.04	0.07	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.28	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.67		0.00		0.00		0.00	0.00	
Total	0.86	0.55	1.13	3.41	0.32	1.46	0.98	0.13	0.00	0.00	0.00	0.00

Total Rainfall = 8.84 Inches

APPENDIX C

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

WATER YEAR 2015-16

SINCE 1933

ORANGE COUNTY WATER DISTRICT

ORANGE COUNTY'S GROUNDWATER AUTHORITY

March 10, 2017

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

Subject: Review of Fiscal Year 2015-16 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, 2016. 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

SANTA ANA RIVER WATERMASTER

FINANCIAL STATEMENTS

JUNE 30, 2016

SANTA ANA RIVER WATERMASTER

STATEMENT OF ASSETS AND LIABILITIES ARISING FROM CASH TRANSACTIONS

JUNE 30, 2016

ASSETS

Cash in Bank Account	$ 28,039

LIABILITIES AND NET ASSETS

Total Net Assets	$ 28,039

SANTA ANA RIVER WATERMASTER

STATEMENT OF REVENUE AND EXPENSES ARISING FROM CASH TRANSACTIONS

FOR THE PERIOD JULY 1, 2015 - JUNE 30, 2016

	Actual	Budget	Variance - Favorable (Unfavorable)	
REVENUE COLLECTED:				
Water District Contributions				
Orange County Water District	$ 6,400	$ 6,400	0	
Inland Empire Utilities Agency	3,200	3,200	0	
Western Municipal Water District	3,200	3,200	0	
San Bernardino Valley Municipal Water District	3,200	3,200	0	
TOTAL REVENUE COLLECTED	$ 16,000	$ 16,000	$ -	(A)
EXPENSES PAID:				
Professional Engineering Services	$ -	$ 15,000	15,000	(B)
Administrative Expenses:				
Auditing Services				
Reproduction of Annual Report	-	1,000	1,000	(C)
Bank service charges				
	$ -	$ 16,000	$ 16,000	
CHANGE IN NET ASSETS	$ 16,000			
NET ASSETS - BEGINNING OF THE YEAR	$ 12,039			
NET ASSETS - END OF THE YEAR	$ 28,039			

(A) Revenue for the fiscal year 2015-16 was received in May 2016

(B) For engineering service expenditure of WY 2015-16, the payment check was issued in fiscal year 2016-17 to OCWD

(C) For administrative expenes of WY 2015-16, the payment was made in fiscal year 2016-17 to OCWD

SANTA ANA RIVER WATERMASTER

NOTES TO FINANCIAL STATEMENTS

JUNE 30, 2016

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%

The Water master 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, 2016 consisted of the following:

Bank of America:	$28,039

All cash is fully insured by the FDIC.

APPENDIX D

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

WATER YEAR 2015-16

TABLE D-1

NONTRIBUTARY WATER FROM OC-59
MONTHLY TOTALS
WATER YEAR 2015-16
(acre-feet)

Month	Released at OC-59 for OCWD	12-Hour Delay [1]	Evaporative Losses [2]	Calculated Flow at Prado
2015				
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
2016				
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	0	0	0	0
June	4,078	4,015	98	3,917
July	4,226	4,218	135	4,083
August	4,432	4,431	131	4,300
September	44	116	3	113
Total	12,780	12,780	367	12,413

(1) Released nontributary water is delayed 12 hours to reflect the estimated travel time between OC-59 and Prado Dam.

(2) Monthly evaporative losses calculated per the procedures referenced in the Twelfth Annual Watermaster Report, Appendix C and shown in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
October 2015
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
November 2015
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
December 2015
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
January 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
February 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
March 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
April 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
May 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
31	0	0	0
Total (cfs-days)	0	0	0
(AF)	0	0	0

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
June 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	46	23	23
2	78	62	61
3	75	77	75
4	71	73	72
5	71	71	70
6	71	71	69
7	73	72	70
8	73	73	71
9	69	71	69
10	64	66	65
11	62	63	61
12	62	62	61
13	71	66	65
14	72	71	69
15	72	72	70
16	72	72	70
17	71	71	70
18	71	71	69
19	65	68	66
20	65	65	63
21	69	67	65
22	69	69	67
23	69	69	67
24	69	69	67
25	69	69	67
26	68	68	66
27	68	68	66
28	69	69	67
29	70	69	68
30	64	67	65
Total (cfs-days)	2,056	2,024	1,975
(AF)	4,078	4,015	3,917

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
July 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	68	66	63
2	67	67	65
3	67	67	65
4	68	68	65
5	67	67	65
6	65	66	64
7	64	65	63
8	65	65	62
9	67	66	64
10	69	68	66
11	69	69	67
12	67	68	66
13	64	66	63
14	66	65	63
15	67	67	64
16	69	68	66
17	69	69	67
18	67	68	66
19	73	70	68
20	74	73	71
21	74	74	72
22	71	72	70
23	71	71	69
24	70	71	68
25	68	69	67
26	69	69	66
27	69	69	67
28	71	70	68
29	72	72	69
30	71	71	69
31	72	71	69
Total (cfs-days)	2,131	2,126	2,058
(AF)	4,226	4,218	4,083

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
August 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	72	72	70
2	72	72	70
3	72	72	70
4	73	73	71
5	69	71	69
6	67	68	66
7	66	67	65
8	69	68	66
9	71	70	68
10	71	71	69
11	73	72	70
12	73	73	70
13	72	72	70
14	72	72	70
15	72	72	70
16	73	73	70
17	73	73	71
18	72	72	70
19	72	72	70
20	73	72	70
21	73	73	71
22	72	72	70
23	71	71	69
24	72	71	69
25	73	73	71
26	74	74	72
27	75	75	73
28	75	75	73
29	74	74	72
30	74	74	72
31	73	73	71
Total (cfs-days)	2,235	2,234	2,168
(AF)	4,432	4,431	4,300

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-2

NONTRIBUTARY WATER FROM OC-59
September 2016
(cfs)

Day	Released at OC-59 for OCWD	12-Hour Delay	Calculated Flow At Prado Dam [1]
1	22	48	46
2	0	11	11
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	0	0	0
Total (cfs-days)	22	59	57
(AF)	44	116	113

(1) Reflects the monthly evapotrative loss listed in Table D-3.

TABLE D-3
EVAPORATIVE LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2015-16
SUM OF ALL CHANNEL REACHES
(acre-feet)

Month	State Water Released with 12-hour delay	Rialto Pipeline to Los Serranos Road	Los Serranos to Prado Dam w/o vegetation	Los Serranos to Prado Dam w/ vegetation	Total Evaporative Losses	Percent of Monthly Release
2015						
October	0	0	0	0	0	0.0%
November	0	0	0	0	0	0.0%
December	0	0	0	0	0	0.0%
2016						
January	0	0	0	0	0	0.0%
February	0	0	0	0	0	0.0%
March	0	0	0	0	0	0.0%
April	0	0	0	0	0	0.0%
May	0	0	0	0	0	0.0%
June	4,015	39	51	8	98	2.4%
July	4,218	51	65	19	135	3.2%
August	4,431	48	62	21	131	3.0%
September	116	1	2	1	3	2.9%
Total	12,780	139	180	48	367	
				Percent of Annual Releases =		2.9%

TABLE D-3.1
EVAPORATIVE LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2015-16
RIALTO PIPELINE TO LOS SERRANOS ROAD

Month	State Water Released with 12-hour delay (AF)	Days of Evaporation	Historic Pan Evaporation (in) [(a)]	Computed Evaporation Losses[(b)]	
				(AF)	(% of release)
[1]	[2]	[3]	[4]	[5]	[6]
2015					
October	0	0	---	0	---
November	0	0	---	0	---
December	0	0	---	0	---
2016					
January	0	0	---	0	---
February	0	0	---	0	---
March	0	0	---	0	---
April	0	0	---	0	---
May	0	0	---	0	---
June	4,015	30	*8.5*	39	1.0%
July	4,218	31	*10.9*	51	1.2%
August	4,431	31	*10.3*	48	1.1%
September	116	1	*8.0*	1	1.0%

(a) Average from Riverside Citrus Experimental Station from 1956-57 through 1972-73.
(b) Evaporative losses=[3]/(days/month)x[4]x(Pan Factor of 1.0)x(area of 56.1 acres)x(1 foot/12 inches)

TABLE D-3.2
EVAPORATIVE LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2015-16
LOS SERRANOS ROAD TO PRADO DAM (AREA WITHOUT VEGETATION COVER)

Month	State Water Released with 12-hour delay (AF)	Days of Evapotrans-piration[a]	Evaporation (in)[b]	Average Wetted Area (acre)[c]	Computed Evaporation Losses[d]	
					(AF)	(% of release)
[1]	[2]	[3]	[4]	[5]	[6]	[7]
2015						
October	0	0	---	0	0	---
November	0	0	---	0	0	---
December	0	0	---	0	0	---
2016						
January	0	0	---	0	0	---
February	0	0	---	0	0	---
March	0	0	---	0	0	---
April	0	0	---	0	0	---
May	0	0	---	0	0	---
June	4,015	30	8.52	72	51	1.3%
July	4,218	31	10.90	72	65	1.6%
August	4,431	31	10.32	72	62	1.4%
September	116	1	7.95	72	2	1.4%

(a) Period of delivery plus 7 days after stoppage of delivery.
(b) Average from Riverside Citrus Experimental Station from 1956-57 through 1972-73.
(c) Equals 1/2 of 144 acres if the maximum flow rate of the month is less than 200 cfs and 1/2 of 369 acres if the maximum flow rate is greater or equal to 200 cfs.
(d) Evaporative losses=[3]x[4]/(days/month)x[5]x(1 foot/12 inches)

TABLE D-3.3
EVAPORATIVE LOSSES OF STATE PROJECT WATER FROM OC-59
WATER YEAR 2015-16
LOS SERRANOS ROAD TO PRADO DAM (AREA WITH VEGETATION COVER)

Month	State Water Released with 12-hour delay (AF)	Days of Evaporation[a]	Historic Pan Evaporation (in)[b]	Evapotrans-piration (in)[c]	Average Wetted Area (acre)[d]	Computed Evaporative Losses[e]	
						(AF)	(% of release)
[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
2015							
October	0	0	---	---	0	0	---
November	0	0	---	---	0	0	---
December	0	0	---	---	0	0	---
2016							
January	0	0	---	---	0	0	---
February	0	0	---	---	0	0	---
March	0	0	---	---	0	0	---
April	0	0	---	---	0	0	---
May	0	0	---	---	0	0	---
June	4,015	30	8.52	7.20	72	8	0.2%
July	4,218	31	10.90	7.77	72	19	0.4%
August	4,431	31	10.32	6.88	72	21	0.5%
September	116	1	7.95	5.21	72	1	0.5%

(a) Period of delivery plus 7 days after stoppage of delivery.
(b) Average from Riverside Citrus Experimental Station from 1956-57 through 1972-73.
(c) From UCR Station #44
(d) Equals 1/2 of 144 acres if the maximum flow rate of the month is less than 200 cfs and 1/2 of 369 acres if the maximum flow rate is greater or equal to 200 cfs.
(e) Evaporative losses=[3]x([4]-[5])/(days/month)x[6]x(1 foot/12 inches)

TABLE D-4

CALCULATION OF WEIGHTED TDS OF
OC-59 RELEASES

WATER YEAR 2015-16

Month	Released at OC-59 for OCWD (acre-feet)	TDS at Release[1] (mg/L)	Flow X TDS at Release	Calculated OC-59 Flow at Prado (acre-feet)	OC-59 TDS at Prado (mg/L)	Flow at Prado X TDS at Prado
2015						
October	0	---		0	---	
November	0	---		0	---	
December	0	---		0	---	
2016						
January	0	---		0	---	
February	0	---		0	---	
March	0	---		0	---	
April	0	---		0	---	
May	0	---		0	---	
June	4,078	338	1,378,288	3,917	436	1,707,872
July	4,226	305	1,288,985	4,083	381	1,557,295
August	4,432	262	1,161,216	4,300	346	1,487,074
September	44	194	8,492	113	243	27,408
Total	12,780		3,836,982	12,413		4,779,650

At Discharge: $\frac{3,836,982}{12,780}$ = 300 mg/L

At Prado: $\frac{4,779,650}{12,413}$ = 385 mg/L

(1) TDS values from monthly analyses of State Water Project water for Devil Canyon.

TABLE D-5

TDS ADJUSTMENT OF OC-59 DISCHARGE
WATER YEAR 2015-16

As discussed in the Twelfth Annual Report, Appendix C, Section 10, a Watermaster study indicated that salts leach from soils into OC-59 water along the unlined portion of Chino Creek above Prado Dam. The TDS adjustment shown by this table follows a procedure from that report to adjust TDS of State Water Project delivered from OC-59 to OCWD.

2015 - 16

First Step is to get value for q_{bf}

Calculation of SAR Base Flow TDS **Sept 3 - Sept 30, 2016**

Note: Base flow TDS was calculated for the days where there were no purchases of OC-59 water, low interference (storm flow and other purchases), and no storage behind Prado Dam.

$$Q_p * q_p = Q_{bf} * q_{bf}$$

Q_p =	total inflow at Prado [1]	=	1,855	af
q_p =	total flow TDS at Prado [2]	=	692	mg/L
Q_{bf} =	base flow at Prado [1]	=	1,855	af
q_{bf} =	base flow TDS at Prado	=	Unknown	mg/L

$$q_{bf} = Q_p * q_p / Q_{bf}$$

	q_{bf}	=	**692**	mg/L

2015 - 16 **Next step is to solve for q_{59}:**

Using the period of OC-59 flow at Prado

			June	July	August	Sept	
Q_p =	total inflow at Prado [1]	=	8,032	7,130	7,599	409	af
q_p =	total flow TDS at Prado [2]	=	567	514	496	568	mg/L
Q_{bf} =	base flow at Prado [1]	=	4,116	3,047	3,298	296	af
q_{bf} =	base flow TDS at Prado [3]	=	692	692	692	692	mg/L
Q_{sf} =	storm flow at Prado	=	0	0	0	0	af
q_{sf} =	storm flow TDS at Prado	=	275	275	275	275	mg/L
Q_{59} =	OC-59 flow reaching Prado [1]	=	3,917	4,083	4,300	113	af
q_{59} =	OC-59 flow TDS reaching Prado	=	Unknown	Unknown	Unknown	Unknown	mg/L

$$q_{59} = (Q_p * q_p - Q_{bf} * q_{bf} - Q_{sf} * q_{sf}) / Q_{59}$$

	q_{59}	**=**	**436**	**381**	**346**	**243**	mg/L

NOTES:

[1] For given month or specific days in Water Year 2015-16.

[2] Flow-weighted TDS for select days or month during OC-59 flow.

[3] Base flow TDS was calculated above.

[4] Water Years 2004-05 and 2009-10 (where storm flow was the dominant component) were used to obtain representative Storm Flow TDS of 275 at Prado.

APPENDIX E

WATER QUALITY AND DISCHARGE FROM THE SAN JACINTO WATERSHED

WATER YEAR 2015-16

There was no discharge of the San Jacinto Watershed to the Santa Ana River during the 2015-16 water year.

APPENDIX F

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

WATER YEAR 2015-16

TABLE F-1

WATER QUALITY SAMPLES BELOW PRADO DAM
WATER YEAR 2015-16

Date	TDS (mg/L)	EC (um/cm)	TDS/EC Ratio	Source
10/6/2015	491	930	1.89409	USGS
10/23/2015	730	1250	1.71233	USGS
10/26/2015	750	1210	1.61333	USGS
11/10/2015	650	1080	1.66154	USGS
11/10/2015	640	1080	1.68750	USGS
11/23/2015	654	1140	1.74312	USGS
12/7/2015	692	1130	1.63295	USGS
12/10/2015	696	1140	1.63793	USGS
12/22/2015	420	647	1.54048	USGS
1/7/2016	159	265	1.66667	USGS
1/8/2016	199	351	1.76382	USGS
1/21/2016	368	630	1.71196	USGS
1/27/2016	471	762	1.61783	USGS
2/3/2016	523	917	1.75335	USGS
2/4/2016	503	876	1.74155	USGS
2/22/2016	649	1020	1.57165	USGS
2/25/2016	696	1180	1.69540	USGS
3/9/2016	329	NR		USGS
3/9/2016	320	NR		USGS
3/25/2016	702	NR		USGS
4/5/2016	664	1060	1.59639	USGS
4/8/2016	638	1060	1.66144	USGS
4/18/2016	669	993	1.48430	USGS
5/4/2016	675	1110	1.64444	USGS
5/5/2016	650	1110	1.70769	USGS
5/23/2016	667	1080	1.61919	USGS
5/27/2016	712	1160	1.62921	USGS
6/7/2016	564	932	1.65248	USGS
6/7/2016	560	932	1.66429	USGS
6/21/2016	556	941	1.69245	USGS
6/28/2016	563	NR		USGS
7/12/2016	519	NR		USGS
7/14/2016	521	NR		USGS
7/26/2016	497	NR		USGS
8/10/2016	491	851	1.73320	USGS
8/17/2016	462	802	1.73593	USGS
8/24/2016	471	796	1.69002	USGS
9/8/2016	739	1160	1.56969	USGS
9/9/2016	704	1190	1.69034	USGS
9/28/2016	695	1190	1.71223	USGS

NR Not Recorded

TABLE F-2

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

October 2015

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	183	854	514	94,062
2	184	906	545	100,280
3	182	925	556	101,192
4	180	929	559	100,620
5	194	966	581	112,714
6	208	930	559	116,272
7	206	858	516	106,296
8	204	845	508	103,632
9	201	826	497	99,897
10	200	820	493	98,600
11	195	829	498	97,110
12	190	871	524	99,560
13	188	946	569	106,972
14	186	1,020	613	114,018
15	185	1,080	649	120,065
16	184	1,110	667	122,728
17	183	1,110	667	122,061
18	181	1,140	685	123,985
19	213	1,170	704	149,952
20	205	1,210	728	149,240
21	146	1,340	806	117,676
22	121	1,330	800	96,800
23	109	1,250	752	81,968
24	102	1,220	734	74,868
25	93	1,210	728	67,704
26	86	1,210	728	62,608
27	84	1,190	716	60,144
28	84	1,190	716	60,144
29	87	1,180	710	61,770
30	87	1,170	704	61,248
31	84	1,180	710	59,640
Total	4,935			3,043,826

Monthly Flow-weighted TDS = 617 mg/L

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

November 2015

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS (1)	Outflow X TDS
1	82	1,190	716	58,712
2	97	1,160	698	67,706
3	116	1,100	661	76,676
4	161	673	405	65,205
5	170	884	532	90,440
6	167	1,050	631	105,377
7	154	1,130	679	104,566
8	143	1,150	691	98,813
9	133	1,160	698	92,834
10	131	1,080	649	85,019
11	122	1,100	661	80,642
12	117	1,110	667	78,039
13	115	1,140	685	78,775
14	114	1,140	685	78,090
15	114	1,130	679	77,406
16	146	1,080	649	94,754
17	110	1,120	673	74,030
18	113	1,110	667	75,371
19	118	1,120	673	79,414
20	116	1,110	667	77,372
21	112	1,130	679	76,048
22	114	1,150	691	78,774
23	111	1,140	685	76,035
24	116	1,120	673	78,068
25	140	1,070	643	90,020
26	145	1,060	637	92,365
27	136	1,090	655	89,080
28	126	1,110	667	84,042
29	132	1,090	655	86,460
30	124	1,100	661	81,964
Total	3,795			2,472,097

Monthly Flow-weighted TDS = 651 mg/L

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

December 2015

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS (1)	Outflow X TDS
1	121	1,100	661	79,981
2	112	1,130	679	76,048
3	118	1,090	655	77,290
4	113	1,110	667	75,371
5	109	1,130	679	74,011
6	109	1,130	679	74,011
7	110	1,130	679	74,690
8	109	1,140	685	74,665
9	110	1,130	679	74,690
10	102	1,140	685	69,870
11	125	991	596	74,500
12	144	954	574	82,656
13	145	1,010	607	88,015
14	161	781	470	75,670
15	204	821	494	100,776
16	230	998	600	138,000
17	155	1,080	649	100,595
18	109	1,090	655	71,395
19	100	1,090	655	65,500
20	164	838	504	82,656
21	157	981	590	92,630
22	150	647	389	58,350
23	162	502	302	48,924
24	163	602	362	59,006
25	164	747	449	73,636
26	161	840	505	81,305
27	157	891	536	84,152
28	174	988	594	103,356
29	218	1,010	607	132,326
30	195	1,040	625	121,875
31	147	1,060	637	93,639
Total	4,498			2,579,589
		Monthly Flow-weighted TDS =	573	mg/L

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

January 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS (1)	Outflow X TDS
1	143	1,070	643	91,949
2	136	1,080	649	88,264
3	134	1,050	631	84,554
4	139	1,030	619	86,041
5	162	1,010	607	98,334
6	177	437	263	46,551
7	238	265	159	37,842
8	400	351	211	84,400
9	400	375	225	90,000
10	401	452	272	109,072
11	430	462	278	119,540
12	449	458	275	123,475
13	450	478	287	129,150
14	514	479	288	148,032
15	571	463	278	158,738
16	561	470	283	158,763
17	553	479	288	159,264
18	543	481	289	156,927
19	533	541	325	173,225
20	456	612	368	167,808
21	413	630	379	156,527
22	405	644	387	156,735
23	399	631	379	151,221
24	392	654	393	154,056
25	385	728	438	168,630
26	376	778	468	175,968
27	371	762	458	169,918
28	270	827	497	134,190
29	209	894	538	112,442
30	204	952	572	116,688
31	201	989	595	119,595
Total	11,015			3,927,899

Monthly Flow-weighted TDS = 357 mg/L

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

February 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS (1)	Outflow X TDS
1	352	876	527	185,504
2	445	912	548	243,860
3	438	917	551	241,338
4	342	876	527	180,234
5	292	884	532	155,344
6	288	871	524	150,912
7	280	923	555	155,400
8	271	996	599	162,329
9	262	1,090	655	171,610
10	247	1,170	704	173,888
11	298	1,240	746	222,308
12	160	1,190	716	114,560
13	143	1,160	698	99,814
14	143	1,150	691	98,813
15	139	1,120	673	93,547
16	132	1,110	667	88,044
17	121	1,080	649	78,529
18	208	699	420	87,360
19	233	677	407	94,831
20	223	834	501	111,723
21	215	949	571	122,765
22	302	1,020	613	185,126
23	206	1,100	661	136,166
24	132	1,160	698	92,136
25	128	1,180	710	90,880
26	126	1,160	698	87,948
27	130	1,150	691	89,830
28	134	1,160	698	93,532
29	139	1,120	673	93,547
Total	6,529	Monthly Flow-weighted TDS =	598 mg/L	3,901,878

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

March 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	144	1,100	661	95,184
2	138	1,080	649	89,562
3	122	1,080	649	79,178
4	129	1,050	631	81,399
5	138	1,040	625	86,250
6	166	1,010	607	100,762
7	206	456	274	56,444
8	358	481	289	103,462
9	421	-	-	-
10	404	-	-	-
11	281	-	-	-
12	207	-	-	-
13	210	-	-	-
14	310	-	-	-
15	390	-	-	-
16	380	-	-	-
17	378	-	-	-
18	308	-	-	-
19	145	-	-	-
20	135	-	-	-
21	137	-	-	-
22	135	-	-	-
23	126	-	-	-
24	115	-	-	-
25	119	-	-	-
26	120	-	-	-
27	134	-	-	-
28	140	-	-	-
29	133	1,090	655	87,115
30	222	958	576	127,872
31	158	1,060	637	100,646
Total	6,509			1,007,874

1,914 used for TDS calculation on days with EC reading

Monthly Flow-weighted TDS = 527 mg/L

(1) TDS = EC x 0.6013

(2) Equipment Malfunction - EC data missing 3/09/2016 - 3/28/2016. Flow data for period of missing EC is excluded in the Monthly Flow-weighted TDS calculation.

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

April 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS (1)	Outflow X TDS
1	147	1,070	643	94,521
2	145	1,080	649	94,105
3	144	1,090	655	94,320
4	139	1,080	649	90,211
5	132	1,060	637	84,084
6	130	1,040	625	81,250
7	110	1,020	613	67,430
8	120	1,060	637	76,440
9	132	1,010	607	80,124
10	140	897	539	75,460
11	139	957	575	79,925
12	167	1,020	613	102,371
13	182	1,040	625	113,750
14	168	1,080	649	109,032
15	111	1,060	637	70,707
16	105	1,030	619	64,995
17	104	1,010	607	63,128
18	115	993	597	68,655
19	106	973	585	62,010
20	103	978	588	60,564
21	96	1,090	655	62,880
22	100	1,060	637	63,700
23	98	1,020	613	60,074
24	99	1,010	607	60,093
25	105	1,110	667	70,035
26	190	838	504	95,760
27	121	1,000	601	72,721
28	112	1,070	643	72,016
29	97	1,100	661	64,117
30	96	1,110	667	64,032
Total	3,753	Monthly Flow-weighted TDS =	618 mg/L	2,318,510

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

May 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	112	1,040	625	70,000
2	102	1,100	661	67,422
3	92	1,080	649	59,708
4	85	1,110	667	56,695
5	83	1,110	667	55,361
6	140	1,110	667	93,380
7	345	552	332	114,540
8	194	987	593	115,042
9	129	1,070	643	82,947
10	116	1,090	655	75,980
11	109	1,100	661	72,049
12	105	1,120	673	70,665
13	103	1,120	673	69,319
14	97	1,100	661	64,117
15	103	1,120	673	69,319
16	114	1,100	661	75,354
17	104	1,090	655	68,120
18	98	1,100	661	64,778
19	99	1,110	667	66,033
20	104	1,100	661	68,744
21	98	1,080	649	63,602
22	100	1,090	655	65,500
23	97	1,080	649	62,953
24	87	1,080	649	56,463
25	88	1,080	649	57,112
26	90	1,120	673	60,570
27	88	1,160	698	61,424
28	86	1,160	698	60,028
29	81	1,160	698	56,538
30	87	1,140	685	59,595
31	85	1,140	685	58,225
Total	3,421			2,141,583

Monthly Flow-weighted TDS = 626 mg/L

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

June 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	70	1,150	691	48,370
2	128	965	580	74,240
3	149	932	560	83,440
4	141	918	552	77,832
5	135	920	553	74,655
6	134	921	554	74,236
7	141	932	560	78,960
8	146	933	561	81,906
9	141	925	556	78,396
10	137	937	563	77,131
11	136	941	566	76,976
12	140	949	571	79,940
13	142	959	577	81,934
14	149	935	562	83,738
15	151	939	565	85,315
16	148	934	562	83,176
17	147	941	566	83,202
18	136	941	566	76,976
19	136	942	566	76,976
20	126	950	571	71,946
21	129	941	566	73,014
22	124	932	560	69,440
23	133	943	567	75,411
24	131	920	553	72,443
25	133	919	553	73,549
26	133	919	553	73,549
27	137	926	557	76,309
28	139	-	-	-
29	121	-	-	-
30	134	-	-	-
Total	4,047			2,063,060

3,653 used for TDS calculation on days with EC reading

Monthly Flow-weighted TDS = 565 mg/L

(1) TDS = EC x 0.6013

(2) Equipment Malfunction - EC data missing 6/28/2016 - 6/30/2016. Flow data for period of missing EC is excluded in the Monthly Flow-weighted TDS calculation.

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

July 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS (1)	Outflow X TDS
1	126	-	-	-
2	127	-	-	-
3	132	-	-	-
4	125	-	-	-
5	123	-	-	-
6	124	-	-	-
7	122	-	-	-
8	116	-	-	-
9	116	-	-	-
10	117	-	-	-
11	114	-	-	-
12	111	-	-	-
13	109	-	-	-
14	110	-	-	-
15	110	-	-	-
16	108	-	-	-
17	111	-	-	-
18	113	-	-	-
19	113	-	-	-
20	118	-	-	-
21	115	-	-	-
22	112	-	-	-
23	110	-	-	-
24	113	-	-	-
25	118	-	-	-
26	114	-	-	-
27	112	-	-	-
28	111	860	517	57,387
29	111	847	509	56,499
30	113	842	506	57,178
31	121	871	524	63,404
Total	3,595			234,468

456 used for TDS calculation on days with EC reading

Monthly Flow-weighted TDS = 514 mg/L

(1) TDS = EC x 0.6013

(2) Equipment Malfunction - EC data missing 7/01/2016 - 7/27/2016. Flow data for period of missing EC is excluded in the Monthly Flow-weighted TDS calculation.

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

August 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	118	859	517	61,006
2	119	849	511	60,809
3	117	858	516	60,372
4	122	868	522	63,684
5	125	878	528	66,000
6	118	867	521	61,478
7	107	864	520	55,640
8	113	886	533	60,229
9	119	867	521	61,999
10	121	851	512	61,952
11	131	856	515	67,465
12	132	853	513	67,716
13	124	815	490	60,760
14	127	838	504	64,008
15	128	827	497	63,616
16	128	816	491	62,848
17	125	802	482	60,250
18	122	788	474	57,828
19	120	781	470	56,400
20	122	787	473	57,706
21	120	777	467	56,040
22	124	791	476	59,024
23	126	803	483	60,858
24	123	796	479	58,917
25	123	786	473	58,179
26	124	785	472	58,528
27	126	787	473	59,598
28	131	798	480	62,880
29	126	791	476	59,976
30	128	792	476	60,928
31	141	846	509	71,769
Total	3,830			1,898,463
		Monthly Flow-weighted TDS =	496	mg/L

(1) TDS = EC x 0.6013

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2015-16

September 2016

Day	Prado Outflow (cfs)	Daily Median EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	135	828	498	67,230
2	74	1,060	637	47,138
3	67	1,160	698	46,766
4	70	1,160	698	48,860
5	69	1,150	691	47,679
6	70	1,130	679	47,530
7	63	1,150	691	43,533
8	66	1,160	698	46,068
9	67	1,190	716	47,972
10	64	1,190	716	45,824
11	66	1,180	710	46,860
12	67	1,140	685	45,895
13	64	1,120	673	43,072
14	75	1,090	655	49,125
15	76	1,100	661	50,236
16	72	1,110	667	48,024
17	69	1,110	667	46,023
18	68	1,130	679	46,172
19	71	1,180	710	50,410
20	64	1,140	685	43,840
21	71	1,120	673	47,783
22	71	1,160	698	49,558
23	71	1,150	691	49,061
24	67	1,150	691	46,297
25	66	1,180	710	46,860
26	62	1,180	710	44,020
27	61	1,180	710	43,310
28	53	1,190	716	37,948
29	54	1,170	704	38,016
30	51	1,140	685	34,935
Total	2,064			1,396,045

Monthly Flow-weighted TDS = 676 mg/L

(1) TDS = EC x 0.6013

TABLE F-3

ANNUAL SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 2015-16

Month	Monthly Flow [1] (cfs-days)	Monthly Flow-weighted TDS[1] (mg/L)	Monthly Flow x TDS
2015			
October	4,935	617	3,044,895
November	3,795	651	2,470,545
December	4,498	573	2,577,354
2016			
January	11,015	357	3,932,355
February	6,529	598	3,904,342
March	1,914	527	1,007,874
April	3,753	618	2,319,354
May	3,421	626	2,141,546
June	3,653	565	2,063,060
July	456	514	234,468
August	3,830	496	1,899,680
September	2,064	676	1,395,264
Total	49,863 [1]		26,990,737
	Yearly Flow-weighted TDS[1] =	541	

(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 2015-16

PREPARED BY

JOHN V. ROSSI

TABLE G-1

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

WATER YEAR 2015-16

MONTH	Discharge (acre -feet)	TDS (mg/L)	Discharge xTDS
2015			
October	188	912	171,792
November	178	824	146,618
December	183	876	160,360
2016			
January	183	592	108,353
February	171	848	144,955
March	184	862	158,935
April	177	874	154,737
May	183	844	154,036
June	184	972	178,859
		900	165,582
July	184		
August	191	934	178,574
September	176	732	128,810
Total	2,182		1,851,612

Flow-weighted TDS = $\frac{1,851,612}{2,182}$ = 849 mg/L

APPENDIX H

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

WATER YEAR 2015-16

PREPARED BY

JOHN V. ROSSI

TABLE H-1

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2015-16

	Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data		Ratio	Average
2015	10/06/15	930	523	USGS		0.56	
	10/23/15	1250	617	USGS		0.49	*570*
	11/10/15	1080	602	USGS		0.56	
	11/23/15	1140	617	USGS		0.54	*610*
	12/07/15	1130	615	USGS		0.54	
	12/22/15	647	240	USGS	*	0.37	*615*
2016	01/06/16	437	308	USGS	*	0.70	
	01/27/16	762	611	USGS		0.80	*611*
	02/03/16	917	587	USGS		0.64	
	02/25/16	1180	622	USGS		0.53	*605*
	03/09/16	NR	573	USGS	*		
	03/25/16	NR	629	USGS			*629*
	04/07/16	1020	610	USGS		0.60	
	04/25/16	1110	627	USGS	*	0.56	*610*
	05/05/16	1110	621	USGS	*	0.56	
	05/27/16	1160	638	USGS		0.55	*638*
	06/07/16	932	638	USGS		0.68	
	06/28/16	NR	645	USGS			*642*
	07/12/16	NR	629	USGS			
	07/26/16	NR	635	USGS			*632*

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

TABLE H-1 (continued)

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2015-16

	Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data	Ratio	Average
2016	08/10/16	851	645	USGS	0.76	
	08/24/16	796	635	USGS	0.80	*640*
	09/09/16	1190	634	USGS	0.53	
	09/21/16	1120	639	USGS	0.57	*637*

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

TABLE H-2

ANNUAL SUMMARY OF FLOW-WEIGHTED TDS AT RIVERSIDE NARROWS
WATER YEAR 2015-16

	Month	Stream Flow [1] (acre-feet)	Monthly Average TDS [2] (mg/L)	Monthly Flow x TDS
2015	October	2,206	570	1,257,420
	November	2,960	610	1,805,600
	December	1,954	615	1,201,710
2016	January	2,527	611	1,543,997
	February	3,035	605	1,836,175
	March	3,342	629	2,102,118
	April	2,791	610	1,702,510
	May	2,670	638	1,703,460
	June	2,182	642	1,400,844
	July	1,583	632	1,000,456
	August	1,682	640	1,076,480
	September	1,763	637	1,123,031
	Total Stream Flow	28,695		17,753,801

$$\text{Flow-weighted TDS} = \frac{17{,}753{,}801}{28{,}695} = 619 \text{ mg/L}$$

(1) USGS measured flow minus storm flow.
(2) TDS based on water quality data from Table H-1.