How Should Compliance with "Baseflow" Objectives be Determined?

"The dissolved mineral content of the waters of the region, as measured by the total dissolved solids test, shall not exceed the specific objectives listed in Table 4-1 as a result of controllable water quality factors."

Water Quality Control Plan for the Santa Ana River Basin; Feb., 2016; pg. 4-10

Table 4-1 WATER QUALITY OBJECTIVES - Continued

INLAND SURFACE STREAMS	WATER QUALITY OBJECTIVES (mg/L)							Hydrologic Unit	
	Total Dissolved Solids	Hardness	Sodium	Chloride	Total Inorganic Nitrogen	Sulfate	Chemical Oxygen Demand	Primary	Secondary
UPPER SANTA ANA RIVER BASIN									
Santa Ana River									
Reach 3 – Prado Dam to Mission Blvd. in Riverside – Base Flow[2]	700	350	110	140	10[3]	150	30	801.21	801.27, 801.25

Water Quality Control Plan for the Santa Ana River Basin; Feb., 2016; pg. 4-40

"The U.S. Geological Survey (USGS) operates a permanent continuous monitoring station immediately below Prado Dam, and the data collected there are utilized by the Watermaster. Orange County Water District (OCWD) samples the river monthly at the USGS gage and determines the water quality. Compliance with the objectives for reaches 2 and 3 is monitored by the Regional Board, using data and information available from the USGS gage and these sources, plus data from its own specific sampling programs (see Chapter 6). The quality of the Santa Ana River is a function of the quantity and quality of the various component of the flows. The two major components of total flow are storm flow and base flow. Storm flow is the water which results directly from rainfall (surface runoff) in the upper basin; it also includes the stormwater runoff from the San Jacinto Basin which may reach the River via Temescal Creek. Most storms occur during the winter rain season (December through April). Base flow is composed of wastewater discharger, rising groundwater, and nonpoint source discharges. Wastewater discharges are the treated sewage effluents discharged by municipalities to the river and its tributaries. Rising groundwater occurs at a number of locations along the River, including the San Jacinto Fault, Riverside Narrows, and in or near the Prado Flood Control Basin. Nonpoint source discharges include uncontrolled runoff from agricultural and urban areas which is not related to storm flows… As noted earlier, the three components of base flow in the river are wastewater, rising water, and nonpoint source discharges. These three components are present in varying amounts throughout the year, and contributions and quality of each can be affected by the regulatory activities of the Regional Board. The quantity of storm flow is obviously highly variable; programs to control its quality are in their nascent stages. For these reasons, water quality objectives for controllable constituents are set based on the base flow of the river, rather than the total flow."

Water Quality Control Plan for the Santa Ana River Basin; Feb., 2016; pg. 4-28

"In order to determine whether the water quality and quantity objectives for base flow in Reach 3 are being met, the Regional Board will collect a series of grab and composite samples when the influence of storm flows and non-tributary flows is at a minimum. This typically occurs during August and September. At this time of year, there is usually no water impounded behind Prado Dam. The volumes of storm flows, rising water and nonpoint source discharges tend to be low. The major component of base flow at this time is municipal wastewater. The results of this sampling will be compared with the continuous monitoring data collected by USGS and data from other sources. These data will be used to evaluate the efficacy of the Regional Board's regulatory approach, including the TDS and nitrogen wasteload allocations (see Chapter 5).

<u>Water Quality Control Plan for the Santa Ana River Basin; Feb., 2016; pg. 4-29</u>

"Implementation of a surface water monitoring program is needed to determine compliance with the nitrogen and TDS objectives of the Santa Ana River, and thereby, the effectiveness of the wasteload allocation. It is also needed to provide data required to evaluate the effects of surface water discharges on affected groundwater management zones… As discussed in Chapter 4, the Basin Plan specifies baseflow TDS and total nitrogen objectives for Reach 3 of the River… Measurement of baseflow quality, rather than the quality of flows in Reach 2, has long been used to indicate the effects of recharge of Santa Ana River flows on Orange County groundwater."

<u>Water Quality Control Plan for the Santa Ana River Basin; Feb., 2016; pg. 5-38</u>

"The Basin Plan specifies water quality objectives applicable to Reach 3 of the Santa Ana River for TDS, nitrogen, and other constituents which are set on the baseflow of the River (see Chapter 4). To determine compliance with these objectives, the Basin Plan requires that sampling of the River be conducted annually at Prado Dam. As directed by the Basin Plan, Board staff conducts the sampling during August, when the quantity and quality of baseflow is most consistent. Staff then reports the results to the Board. The results of this program are used to determine the effectiveness of the Board's regulatory programs and to determine whether changes, such as revisions to the TDS and nitrogen wasteload allocations, are necessary."

<u>Water Quality Control Plan for the Santa Ana River Basin; Feb., 2016; pg. 6-6</u>

"The quantity and quality of base flow is most consistent during the month of August. At that time of year the influence of storm flows and nontributary flows is at a minimum. There is usually no water impounded behind Prado Dam. The volumes of rising water and nonpoint source discharges tend to be low during that time. The major component of base flow in August, therefore, is municipal wastewater. For these reasons, this period has been selected as the time when base flow will be measured and its quality determined. These data will subsequently allow the evaluation of available assimilative capacity, which serves to verify the accuracy of the waste load allocation. In order to determine whether the water quality and quantity objectives for base flow in Reach 3 are being met, the Regional Board will collect a series of composite samples during August of each year. These data will also be compared with continuous monitoring data collected by USGS and data from other source."

<u>Water Quality Control Plan for the Santa Ana River Basin; 1983; pg. 3-10 & 11</u>

"Prior to 1970, the Regional Board did not have an active water quality planning function. Water quality problems in surface streams and ground water were responded to by setting controls on discharges. Those discharge controls generally consisted of limiting the allowable increases in total filterable residue (TFR) concentrations and certain other parameters. Normally, the only additional requirement specified by the Board was that the discharge could not create a pollution or nuisance. By 1970, the Regional Board was actively involved in the formulation of plans to meet established water quality objectives… Work began in earnest on a complete Water Quality Control Plan, the 1975 Basin Plan, which has been the foundation of the Regional Board's operations since its adoption in 1975. Basin plans were being developed statewide at that time under the direction of the State Water Resources Control Board (SWRCB). In this region, the prime contractor for basin planning was the Santa Ana Watershed Planning Agency (SAWPA), a joint powers agency composed of Orange County Water District, Chino Basin Municipal Water District, Western Municipal Water District, and San Bernardino Valley Municipal Water District. Water quality objectives continued to be based largely on existing water quality, but were confirmed by a set of water quality and quantity computer models, collectively known as the Basin Planning Procedure (BPP) developed by the consulting firm of Water Resources Engineers (WRE, now operating as a division of Camp, Dresser and McKee)."

Water Quality Control Plan for the Santa Ana River Basin; 1983; pg. 1-5

"Chapter 3: Water Quality Objectives… Inland Surface Waters and Groundwaters… Total Filterable Residue (Total Dissolved Solids)…The dissolved mineral content of the waters of the region, as measured by the total filterable residue test, shall not exceed the specific objectives listed in Table 3-1 as a result of controllable water quality factors."

Water Quality Control Plan for the Santa Ana River Basin; 1983; pg. 3-4

Water quality and quantity objectives for Reaches 2 and 3 are shown here.

Santa Ana River	Total Filtrable Residue mg/l	Hardness mg/l	Sodium mg/l	Chloride mg/l	Total Nitrogen (Filtered) mg/l	Sulfate mg/l	Boron mg/l	Filtered BOD mg/l	COD mg/l	Min. Flow (cfs)
Reach 2 - Total Flow (5-year moving average)	650	-	-	-	-	-	-	-	-	-
Reach 3 - Base Flow (determined annually)	700	350	110	140	10	150	0.75	10	30	60

Water Quality Control Plan for the Santa Ana River Basin; 1983; pg. 3-10

"The dividing line between Reaches 2 and 3, and between the Upper and Lower Santa Ana Basins, is Prado Dam, a flood control facility owned and operated by the U.S. Army Corps of Engineers. The dam includes a subsurface ground water barrier, and as a result all ground and surface waters from the upper basin are forced to pass through the dam (or over the spillway). For this reason, it is the ideal place to measure flows and monitor water quality. The Prado Settlement, a stipulated court judgement (Orange County Water District vs. City of Chino, et al.), which requires that a certain minimum amount of water be releases each year from the upper basin, is overseen by the Santa Ana River Watermaster. The U.S. Geological Survey (U.S.G.S.) operates a permanent continuous monitoring station immediately below Prado Dam, and the data collected there are utilized by the Watermaster. The Department of Water Resources (DWR) samples the river monthly at the USGS gage and determines the water quality. Compliance with the objectives for Reaches 2 and 3 is monitored by the Regional Board, using data and information available from the USGS gage and these sources, plus the data from its own specific sampling programs."

<u>Water Quality Control Plan for the Santa Ana River Basin; 1983; pg. 3-8</u>

"Engineering Appendix. The purpose of the Engineering Appendix is to establish the basis for measurements, calculations and determinations required in the operation of the physical solution. In administering the physical solution, it will be necessary to determine the quantity and quality of stream flow and flow in pipelines or other conveyances at several points along the Santa Ana River. Watermaster small make, or obtain from the USGS, flood control districts or other entities, all measurements necessary for making the determinations required by the Judgment… Determination of Flow Components. Since the records available only provide data on the total quantity of surface flow and since storm runoff occurs during and following periods of rainfall, Watermaster must determine what portion of total measured surface flow at Prado and at Riverside Narrows is Storm Flow and what portion is Base Flow."

<u>Settlement Document; Orange County Water District vs. City of Chino, et al. Case No. 117628; Superior Court of the State of California for the County of Orange. Exhibit B, pg. 20</u>

"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 amount of non-storm flow ("Base Flow") at Prado dam, together with the right to all storm flow reaching Prado Dam… 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 ... 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."

<u>Santa Ana River Watermaster for Orange County Water District vs. City of Chino, et al. Case No. 117628 – County of Orange. Forty-fourth Annual Report of the Santa Ana River Watermaster for Water Year October 1, 2013 – September 30, 2014. April 30, 2015; pg. 30.</u>

3.2 Santa Ana River Reach 3

3.2.1 Below Prado Dam

In order to determine whether water quality and quantity objectives for base flow in Reach 3 are being met, the Regional Board collects a series of grab and composite samples at *Below Prado Dam* when the influence of storm flows and nontributary flows is at a minimum. This entails the collection of a series of grab and composite samples during August and September, when the influence of stom flows and nontributary flows is at a minimum. At this time of year there is usually no water impounded behind Prado Dam, the volumes of storm flows, rising water, and nonpoint sources discharges tend to be low, and the major component of base flow is municipal wastewater. Water quality objectives specified for Reach 3 of the SAR by the Basin Plan include TDS, hardness, sodium, chloride, Total Nitrogen (TN), sulfate, Chemical Oxygen Demand (COD) and boron. In 2014, OCWD conducted baseflow monitoring below Prado Dam on behalf of the Regional Board. This monitoring consisted of five sampling events conducted during the months of August and September. The data collected through this program is presented in Table 3-4.

Table 3-4. Results for 2014 Annual Baseflow Monitoring Program for the Santa Ana River at Below Prado Dam

Parameter	Units	Basin Plan Objectives SAR Reach 3	8/5/2014	8/13/2014	8/19/2014	8/26/2014	9/10/2014
Ammonia-Nitrogen	mg/L		<0.1	<0.1	<0.1	0.16	<0.1
Bicarbonate (as CaCO3)	mg/L		160	234	240	234	205
Boron	mg/L	**0.75**	0.24	0.33	0.33	0.31	-na-
Calcium	mg/L		64	87	-na-	90	-na-
Carbonate (as CaCO3)	mg/L		<1	<1	<1	<1	<1
Chemical Oxygen Demand	mg/L	**30**	31	11	12	1	-na-
Chloride	mg/L	**140**	85	144	146	157	133
Electrical Conductivity	umhos/cm		766	1,120	1,120	1,140	1,060
Hydroxide (as CaCO3)	mg/L		<1	<1	<1	<1	<1
Magnesium	mg/L		13	20	-na-	21	-na-
Nitrate-Nitrogen	mg/L		2.6	3.6	3.8	3.8	4.4
Nitrite-Nitrogen	mg/L		0.202	0.038	0.030	0.014	0.053
Organic Nitrogen	mg/L		0.9	0.3	<0.1	0.4	0.2
pH	units		8.0	8.2	8.2	8.2	8.1
Potassium	mg/L		13.3	13.1	-na-	13.6	-na-
Sodium	mg/L	**110**	72	111	-na-	114	-na-
Sulfate	mg/L	**150**	75	122	125	139	115
Total Alkalinity (as CaCO3)	mg/L		160	234	240	234	205
Total Dissolved Solids	mg/L	**700**	476	726	692	684	688
Total Hardness (as CaCO3)	mg/L	**350**	214	300	-na-	310	-na-
Total Inorganic Nitrogen	mg/L		2.8	3.6	3.8	4.0	4.5
Total Kjeldahl Nitrogen	mg/L		0.9	0.4	<0.2	1.0	0.3
Total Nitrogen	mg/L	**10**	3.7	4.0	3.9	4.8	4.8
Total Organic Carbon	mg/L		14.0	5.1	4.9	5.1	6.9
Turbidity	NTU		82	95	22	17	26

Note: na entered where there was no data collected for the constituent

Table 3-2. Monthly Volume-Weighted Moving Average TDS at Below Prado Dam (2014 OCWD, and USGS at Below Prado Dam)

Month	Monthly Flow (cfs-days)	Monthly Volume Weighted TDS (mg/L)	Monthly Flow X TDS
Jan-10*	16,355	295	4,826,467
Feb-10	24,537	363	8,911,038
Mar-10	13,579	448	6,080,724
Apr-10	7,718	580	4,479,897
May-10	5,526	645	3,562,454
Jun-10	4,522	696	3,145,626
Jul-10	3,420	644	2,203,136
Aug-10	2,892	660	1,908,769
Sep-10	3,245	646	2,097,528
Oct-10	4,221	596	2,517,254
Nov-10	4,845	577	2,797,630
Dec-10*	5,690	436	2,482,609
Jan-11*	674	562	378,991
Feb-11*	15,586	497	7,742,234
Mar-11	13,140	424	5,565,684
Apr-11	10,827	467	5,051,565
May-11	7,140	553	3,951,873
Jun-11	8,033	641	5,146,838
Jul-11	5,538	482	2,668,068
Aug-11	5,521	469	2,587,172
Sep-11	3,489	554	1,931,727
Oct-11	5,317	610	3,243,726
Nov-11	6,551	553	3,620,819
Dec-11*	1,981	645	1,276,997
Jan-12	5,693	602	3,424,405
Feb-12	6,369	603	3,837,482
Mar-12*	2,212	625	1,382,629
Apr-12*	4,717	519	2,447,907
May-12	6,523	622	4,055,712
Jun-12	2,704	696	1,883,185
Jul-12	2,386	687	1,640,271
Aug-12	2,273	677	1,539,422
Sep-12	2,914	651	1,896,607
Oct-12	3,492	639	2,230,792
Nov-12	4,703	635	2,984,371
Dec-12*	988	563	556,305
Jan-13*	1,023	543	555,871
Feb-13	6,276	598	3,754,901
Mar-13	5,297	607	3,217,293
Apr-13	3,468	677	2,346,238
May-13	3,484	655	2,280,414
Jun-13	2,333	693	1,616,724
Jul-13	2,183	671	1,465,135
Aug-13	2,000	661	1,322,963
Sep-13	1,970	637	1,254,888
Oct-13	2,721	658	1,791,512
Nov-13	4,207	578	2,433,502
Dec-13	4,446	653	2,903,676
Jan-14	3,312	681	2,255,040
Feb-14	3,627	659	2,390,989
Mar-14	10,811	429	4,635,755
Apr-14	4,329	616	2,664,778
May-14	2,160	698	1,507,815
Jun-14	1,857	702	1,304,490
Jul-14	1,698	711	1,206,771
Aug-14	2,452	635	1,557,234
Sep-14	2,043	672	1,373,065
Oct-14	2,057	720	1,480,137
Nov-14	3,541	613	2,171,523
Dec-14	12,331	327	4,029,366
Total	**314,947**		**167,577,996**
5 - Year Volume Weighted Average: 532 mg/L			

Note: Monthly Flow and Flow weighted TDS includes days with EC readings only

** Denotes monthly results with missing EC readings due to instrumentation issues with USGS equipment*

A summary of all monitoring data collected by the USGS and OCWD at *Below Prado Dam* during 2014 along with Basin Plan objectives for baseflow conditions for SAR Reach 3 water quality are presented in Table 3-6. This included sixteen monitoring events conducted by OCWD at *Below Prado Dam*, including the five monitoring events to support the Regional Board in their annual water quality monitoring of baseflow in the SAR during August and September of 2014. The USGS conducted near bi-monthly monitoring at *Below Prado Dam*, including eighteen sampling events during 2014. A review of this data showed none of the constituents to exceed Basin Plan objectives for baseflow conditions.

Table 3-6. Summary of Annual and Baseflow Water Quality Observations for the Santa Ana River at Below Prado Dam

Constituent	Units	Basin Plan Objectives for Baseflow Conditions Santa Ana River Reach 3	Annual Average	# of Samples	Baseflow Average	# of Samples
Ammonia-Nitrogen	mg/L		<0.1	35	<0.1	8
Bicarbonate (as CaCO3)	mg/L		232	34	234	7
Boron	mg/L	**0.75**	0.26	23	0.31	6
Calcium	mg/L		86	10	81	3
Carbonate (as CaCO3)	mg/L		<1	33	<1	7
Chemical Oxygen Demand	mg/L	**30**	14	4	14	4
Chloride	mg/L	**140**	129	34	137	7
Dissolved Oxygen	mg/L		11.0	18	10.0	2
Electrical Conductivity	umhos/cm		1,029	423	1,087	72
Hydroxide (as CaCO3)	mg/L		<1	16	<1	5
Magnesium	mg/L		20	10	18	3
Nitrate-Nitrogen	mg/L		3.5	35	3.9	8
Nitrite-Nitrogen	mg/L		0.060	35	0.051	8
Organic Nitrogen	mg/L		0.5	17	0.4	6
pH	UNITS		8.0	16	8.1	5
Potassium	mg/L		14.2	10	13.3	3
Sodium	mg/L	**110**	108	10	106	5
Sulfate	mg/L	**150**	109	34	115	7
Total Alkalinity (as CaCO3)	mg/L		209	34	220	7
Total Dissolved Solids	mg/L	**700**	626	58	601	11
Total Hardness (as CaCO3)	mg/L	**350**	296	10	275	3
Total Inorganic Nitrogen	mg/L	**10**	3.6	35	4.0	8
Total Kjeldahl Nitrogen	mg/L		0.6	17	0.6	6
Total Nitrogen	mg/L		4.3	53	4.7	10
Total Organic Carbon	mg/L		7.5	16	7.2	5
Turbidity	NTU		53	33	55	7

Note: Table summarizes monitoring data collected by USGS, and OCWD, at Below Prado Dam during 2014
-na- entered where there was no data collected for the constituent.

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

v. CITY OF CHINO, et al.

CASE NO. 117628 - COUNTY OF ORANGE

FORTY- FOURTH
ANNUAL REPORT
OF THE
SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2013 - SEPTEMBER 30, 2014

APRIL 30, 2015

TABLE 6

COMPONENTS OF FLOW AT PRADO DAM
WATER YEAR 2013-14
(acre-feet)

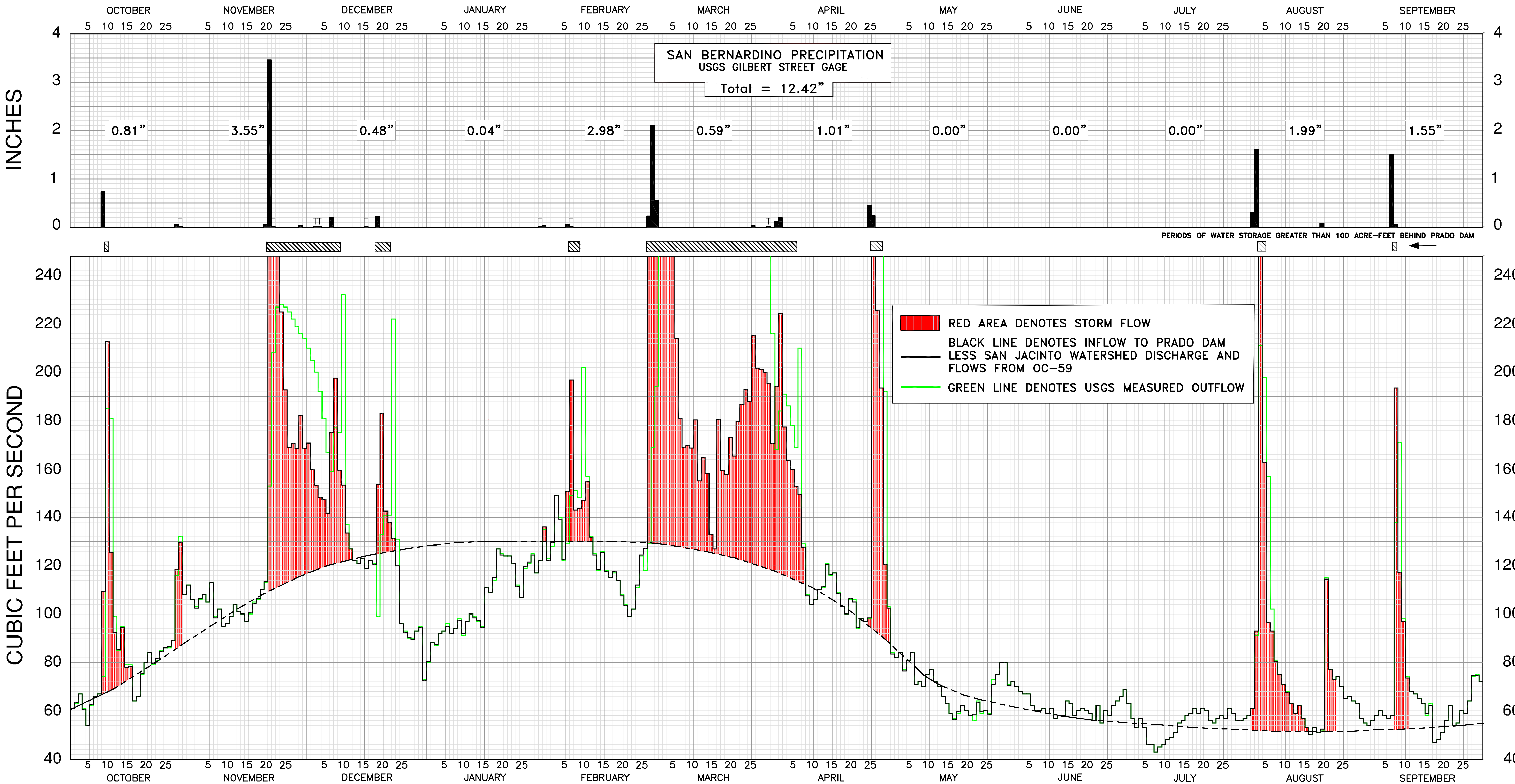
	USGS Measured Outflow	Storage Change (1)	Computed Inflow	San Jacinto Watershed Flow at Prado (2)	WMWD Transfer Water (3)	San Antonio Creek (4)	Storm Flow	Base Flow
<u>2013</u>								
October	5,397	3	5,400	0	0	0	765	4,635
November	8,344	588	8,932	0	0	0	2,591	6,341
December	8,701	(588)	8,113	0	0	0	1,081	7,032
<u>2014</u>								
January	6,569	3	6,572	0	0	0	12	6,560
February	7,194	3,454	10,648	0	0	0	3,828	6,820
March	21,444	(3,326)	18,118	0	0	0	10,476	7,642
April	8,586	(131)	8,455	0	0	0	2,181	6,274
May	4,285	(3)	4,282	0	0	0	0	4,282
June	3,683	0	3,683	0	0	0	0	3,683
July	3,367	0	3,367	0	0	0	0	3,367
August	4,864	0	4,864	0	0	0	1,467	3,397
September	4,052	0	4,052	0	0	0	549	3,503
Total	86,486	0	86,486	0	0	0	22,950	63,536

(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.

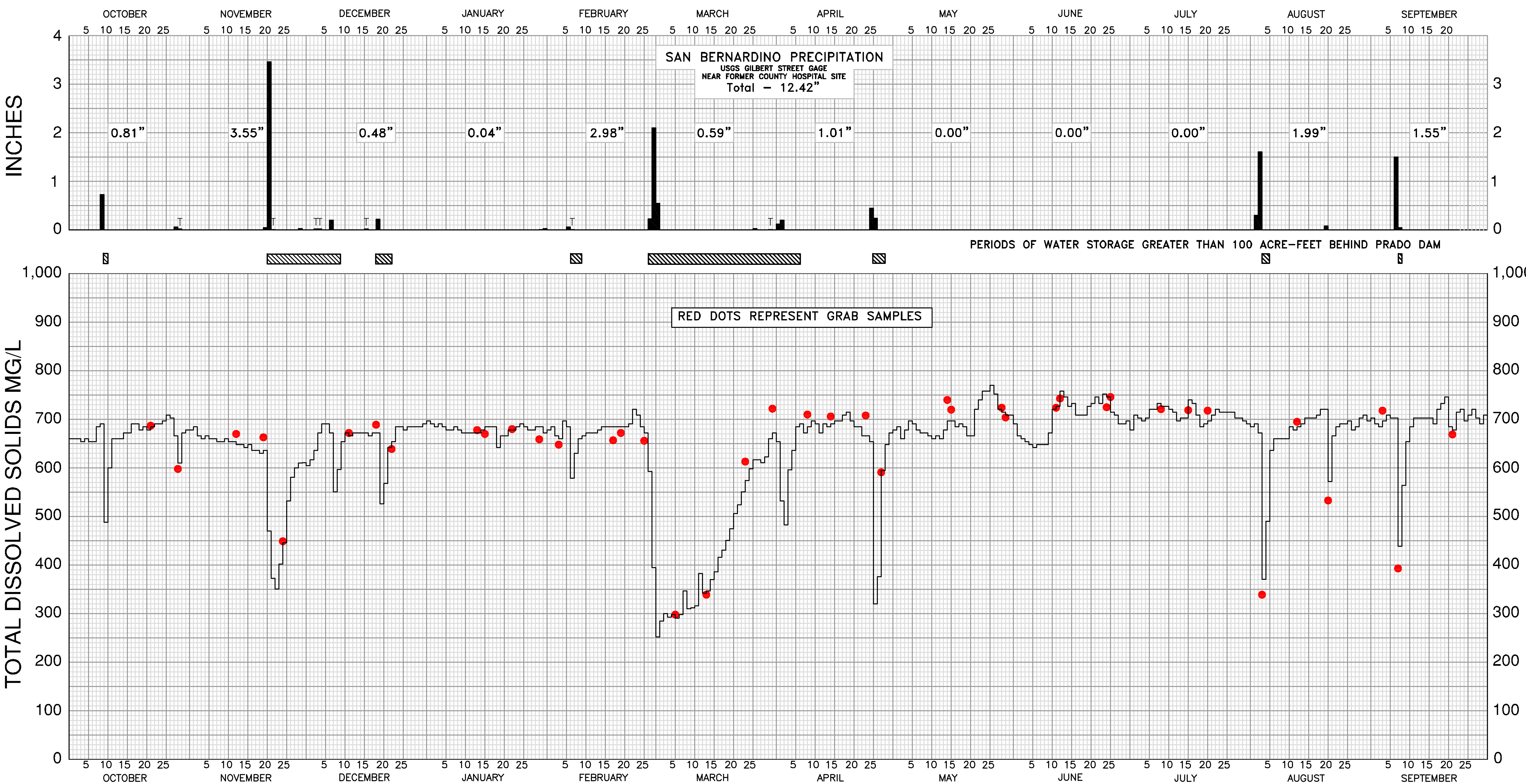
(3) WMWD-OCWD Transfer Program water pumped from the Bunker Hill, Riverside, and Colton basins and discharged to the Santa Ana River above the Riverside Narrows delivered this year.

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



DISCHARGE OF SANTA ANA RIVER AT PRADO DAM & SAN BERNARDINO PRECIPITATION
WATER YEAR 2013-14

Plate 4



DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM
WATER YEAR 2013-14

Water-Data Report 2014

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

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2013-10-01 to 2014-09-30
DAILY MEAN VALUES

Day	Oct 2013	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	Jul 2014	Aug 2014	Sep 2014
1	61	106	210	80	123	194	168	84	72	63	58	54
2	63	103	205	88	128	346	184	82	70	57	61	56
3	67	106	200	87	149	399	191	84	68	53	91	58
4	61	108	192	92	140	394	186	77	67	57	211	60
5	54	105	181	93	122	392	178	81	67	53	198	58
6	62	113	167	96	129	392	169	84	62	46	157	57
7	66	99	159	92	149	386	210	71	60	46	102	58
8	67	102	177	94	151	375	129	72	60	43	81	138
9	74	95	175	98	148	372	108	70	61	45	75	171
10	185	96	232	91	202	383	104	75	59	46	71	98
11	181	99	137	97	157	392	106	77	61	48	68	74
12	99	104	127	100	132	386	110	72	57	49	63	68
13	85	101	122	99	125	383	111	70	58	51	59	67
14	95	100	121	97	118	378	121	66	58	55	62	65
15	79	97	123	95	126	373	116	63	64	56	57	63
16	79	100	119	111	118	367	117	59	63	58	53	58
17	64	105	122	109	115	361	109	57	58	59	50	63
18	66	106	121	114	117	364	103	59	60	61	53	47
19	75	110	99	127	114	360	100	62	61	59	51	48
20	80	113	133	125	108	360	106	60	60	61	52	51
21	84	153	141	124	104	354	106	58	59	60	115	56
22	79	208	141	124	99	350	94	56	56	56	77	62
23	81	227	222	121	102	344	98	64	62	55	73	54
24	85	228	131	112	111	339	97	59	55	57	74	55
25	86	227	96	107	124	331	98	60	60	58	70	60
26	86	225	93	119	118	324	285	59	58	57	65	59
27	89	222	90	121	129	317	280	73	62	61	66	64
28	116	219	90	125	169	306	250	75	64	59	64	74
29	132	216	93	117		295	192	80	66	56	63	75
30	108	214	95	122		278	103	80	69	56	57	72
31	112		73	135		216		71		57	55	
Total	2,721	4,207	4,387	3,312	3,627	10,810	4,329	2,160	1,857	1,698	2,452	2,043
Mean	87.8	140	142	107	130	349	144	69.7	61.9	54.8	79.1	68.1
Max	185	228	232	135	202	399	285	84.0	72.0	63.0	211	171
Min	54.0	95.0	73.0	80.0	99.0	194	94.0	56.0	55.0	43.0	50.0	47.0
Ac-ft	5,397	8,344	8,701	6,569	7,194	21,440	8,586	4,284	3,683	3,368	4,863	4,052

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2014, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	130	151	238	387	438	396	262	189	154	126	108	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)

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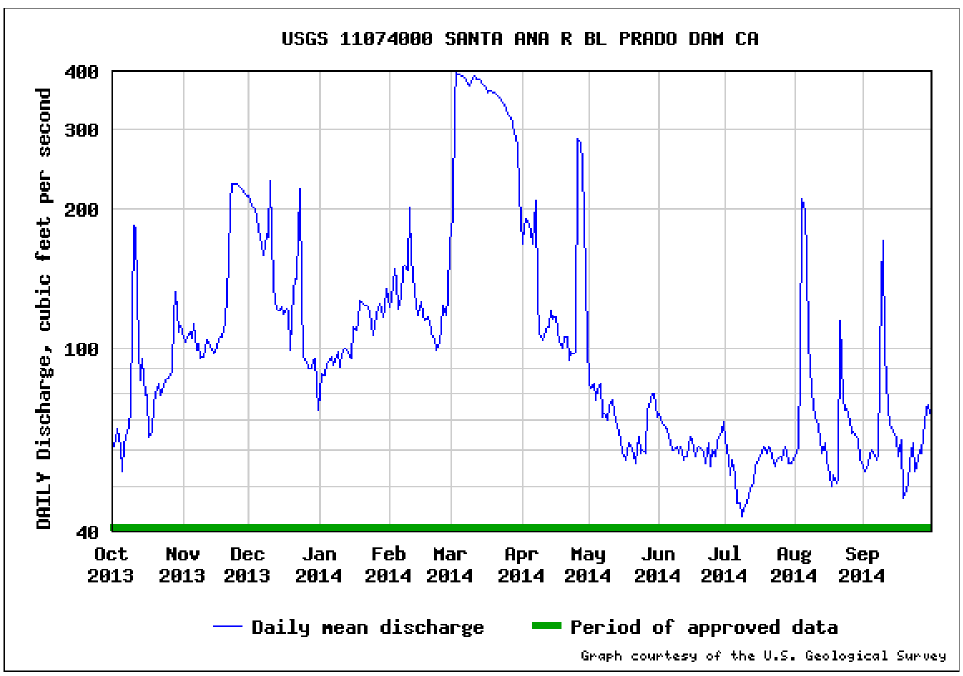
SUMMARY STATISTICS

	Water Year 2014		Water Years 1941 - 2014	
Annual total	43,600			
Annual mean	119.5		222.3	
Highest annual mean			882.1	2005
Lowest annual mean			36.4	1961
Highest daily mean	399.0	Mar 03	11,400	Jan 16, 2005
Lowest daily mean	43.0	Jul 08	2.40	Jul 29, 1978
Annual 7-day minimum	46.1	Jul 06	3.0	Sep 24, 1973
Maximum peak flow			13,200[a]	Jan 15, 2005
Maximum peak stage			8.73	Jan 15, 2005
Annual runoff (cfsm)	0.053		0.098	
Annual runoff (inches)	0.718		1.34	
10 percent exceeds	225.8		383.0	
50 percent exceeds	95.0		138.0	
90 percent exceeds	57.0		42.0	

[a] Discharge affected by Regulation or Diversion



Day	Max	Min	Median	Max	Min	Median
	August			September		
1	1,140	1,100	1,120	1,180	1,100	1,150
2	1,140	1,110	1,130	1,160	1,100	1,130
3	1,150	901	1,100	1,150	1,100	1,120
4	982	547	607	1,170	1,090	1,140
5	947	619	801	1,190	1,130	1,160
6	1,080	945	1,040	1,160	1,130	1,150
7	1,110	1,060	1,080	1,160	1,120	1,150
8	1,090	1,050	1,080	1,150	625	718
9	1,090	1,060	1,080	1,040	775	923
10	1,090	1,060	1,080	1,090	1,040	1,070
11	1,130	1,070	1,120	1,120	1,090	1,120
12	1,130	1,060	1,110	1,160	1,120	1,150
13	1,140	1,080	1,120	1,160	1,130	1,150
14	1,150	1,080	1,130	1,160	1,130	1,150
15	1,160	1,080	1,150	1,170	1,130	1,150
16	1,170	1,110	1,150	1,180	1,120	1,150
17	1,170	1,120	1,150	1,180	1,010	1,130
18	1,200	1,120	1,160	1,200	1,160	1,180
19	1,200	1,160	1,180	1,240	1,170	1,200
20	1,190	1,140	1,180	1,240	1,190	1,220
21	1,220	863	936	1,210	1,090	1,120
22	1,130	961	1,090	1,160	1,060	1,110
23	1,150	1,090	1,120	1,210	1,100	1,170
24	1,150	1,080	1,130	1,210	1,150	1,180
25	1,140	1,110	1,130	1,170	1,100	1,140
26	1,150	1,110	1,140	1,200	1,120	1,160
27	1,140	1,090	1,110	1,200	1,170	1,180
28	1,150	1,090	1,120	1,180	1,140	1,150
29	1,170	1,120	1,150	1,180	1,100	1,130
30	1,180	1,120	1,160	1,180	1,140	1,160
31	1,170	1,120	1,140			
Max	1,220	1,160	1,180	1,240	1,190	1,220
Min	947	547	607	1,040	625	718

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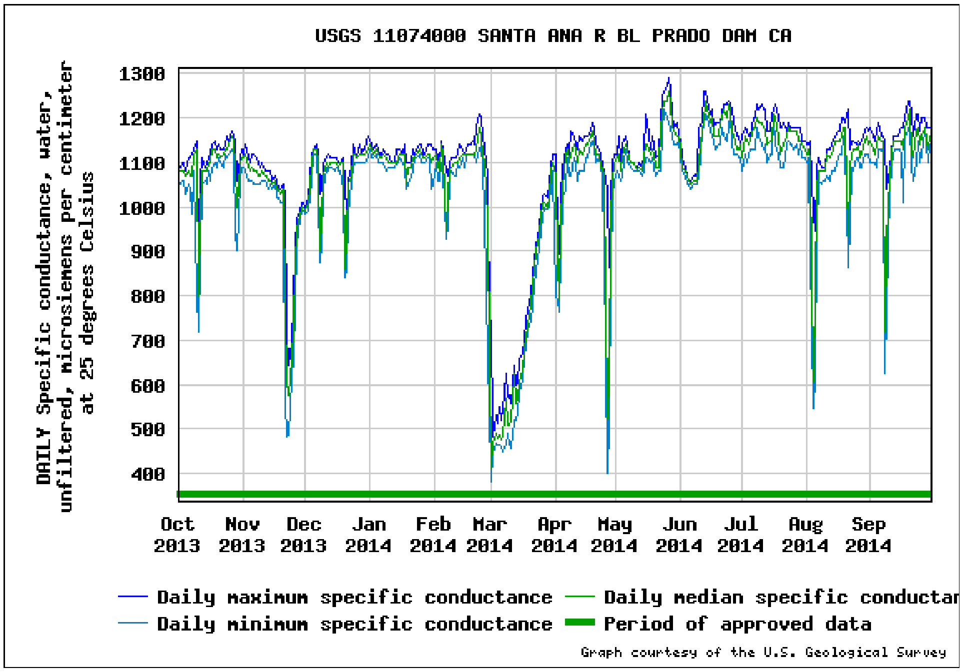

TABLE H-1

WATER QUALITY SAMPLES BELOW PRADO DAM
WATER YEAR 2013-14

Date	EC (microsiemens/cm)	TDS (mg/L)	Source
10/1/2013	1180	730	OCWD
10/22/2013	1130	687	USGS
10/29/2013	1000	598	USGS
11/12/2013	1180	664	OCWD
11/13/2013	1130	670	USGS
11/20/2013	1090	663	USGS
11/25/2013	766	449	USGS
12/3/2013	1040	606	OCWD
12/12/2013	1060	672	USGS
12/19/2013	1100	689	USGS
12/23/2013	1080	639	USGS
1/7/2014	1160	700	OCWD
1/14/2014	1110	678	USGS
1/16/2014	1130	670	USGS
1/23/2014	1100	680	USGS
1/30/2014	1110	659	USGS
2/4/2014	1050	648	USGS
2/4/2014	1060	642	OCWD
2/18/2014	1090	657	USGS
2/20/2014	1120	672	USGS
2/26/2014	1080	656	USGS
3/5/2014	520	322	OCWD
3/6/2014	512	298	USGS
3/12/2014	719	430	OCWD
3/14/2014	605	339	USGS
3/24/2014	1010	613	USGS
3/31/2014	1180	722	USGS
4/9/2014	1160	710	USGS
4/9/2014	1250	692	OCWD
4/15/2014	1140	706	USGS
4/24/2014	1140	708	USGS
4/28/2014	978	591	USGS
5/7/2014	1170	728	OCWD
5/15/2014	1180	740	USGS
5/16/2014	1180	720	USGS
5/29/2014	1180	724	USGS
5/29/2014	1160	704	USGS
6/12/2014	1170	724	USGS
6/12/2014	1180	743	USGS
6/25/2014	1210	746	USGS
7/16/2014	1160	719	USGS
7/16/2014	1160	724	OCWD
8/4/2014	562	339	USGS
8/5/2014	766	476	OCWD
8/13/2014	1120	726	OCWD
8/13/2014	1,140	695	USGS
8/21/2014	888	533	USGS
8/26/2014	1140	684	OCWD
9/4/2014	1160	718	USGS
9/8/2014	633	393	USGS
9/10/2014	1060	688	OCWD
9/22/2014	1100	669	USGS

TABLE H-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2013-14

August 2014

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	58	1,120	685	39,730
2	61	1,130	691	42,151
3	91	1,100	672	61,152
4	211	607	371	78,281
5	198	801	490	97,020
6	157	1,040	636	99,852
7	102	1,080	660	67,320
8	81	1,080	660	53,460
9	75	1,080	660	49,500
10	71	1,080	660	46,860
11	68	1,120	685	46,580
12	63	1,110	678	42,714
13	59	1,120	685	40,415
14	62	1,130	691	42,842
15	57	1,150	703	40,071
16	53	1,150	703	37,259
17	50	1,150	703	35,150
18	53	1,160	709	37,577
19	51	1,180	721	36,771
20	52	1,180	721	37,492
21	115	936	572	65,780
22	77	1,090	666	51,282
23	73	1,120	685	50,005
24	74	1,130	691	51,134
25	70	1,130	691	48,370
26	65	1,140	697	45,305
27	66	1,110	678	44,748
28	64	1,120	685	43,840
29	63	1,150	703	44,289
30	57	1,160	709	40,413
31	55	1,140	697	38,335
Total	2,452			1,555,698
		Monthly Flow-weighted TDS =	634 mg/L	

(1) TDS = EC x 0.611171

TABLE H-3

ANNUAL SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 2013-14

Month	Monthly Flow (cfs-days)	Monthly Flow-weighted TDS (mg/L)	Monthly Flow x TDS
2013			
October	2,721	655	1,782,255
November	4,207	574	2,414,818
December	4,387	546	2,395,302
2014			
January	3,312	678	2,245,536
February	3,627	658	2,386,566
March	10,811	424	4,583,864
April	4,329	612	2,649,348
May	2,160	695	1,501,200
June	1,857	701	1,301,757
July	1,698	709	1,203,882
August	2,452	634	1,554,568
September	2,043	671	1,370,853
Total	43,604		25,389,949
	Yearly Flow-weighted TDS =	582	