WILDERMUTH ENVIRONMENTAL, INC.

December 30, 2014

Santa Ana Watershed Project Authority
Attn: Mark Norton, Water Resources & Planning Manager
11615 Sterling Avenue
Riverside, CA 92503

Subject: ***Investigation and Characterization of the Cause(s) of Recent Exceedances of the TDS Concentration Objective for Reach 3 of the Santa Ana River (Draft)***

Dear Mr. Norton:

Pursuant to the Basin Monitoring Program Task Force's (Task Force) request, Wildermuth Environmental Inc. (WEI) prepared this investigation and characterization of the cause(s) of recent exceedances of the total dissolved solids (TDS) objective for Reach 3 of the Santa Ana River (SAR). The investigation background, methodology, results, and conclusions are provided below.

Background

Figure 1 shows the SAR, its regulatory reaches, and the groundwater management zones (GMZs) as defined in the Water Quality Control Plan for the Santa Ana River Basin[1] (Basin Plan). The Basin Plan contains TDS concentration objectives for the SAR and the GMZs, and a plan to manage TDS concentrations pursuant to those objectives.

Reach 3 of the SAR runs from Mission Blvd in Riverside to Prado Dam. There are three primary components of stream discharge in Reach 3: storm discharge, non-tributary discharge, and base flow discharge. Storm discharge is rainfall runoff. Non-tributary discharge typically originates from outside the watershed, such as imported water, or is an episodic transfer of water within the watershed. Base flow discharge is the remainder and mainly includes tertiary-treated wastewater discharge from POTWs (Publicly-Owned Treatment Works), rising groundwater, and dry-weather runoff.

The Basin Plan contains a TDS concentration objective of 700 milligrams per liter (mg/L) for base flow discharge of the SAR at the USGS gaging station below Prado Dam (SAR below Prado Dam)—the so-called Reach 3 TDS concentration objective. The purpose of the Reach 3 TDS concentration objective is to protect the beneficial uses of the SAR in the Orange County GMZ—the primary use being groundwater recharge.

[1] California Regional Water Quality Control Board, Santa Ana Region. (2011). *Water Quality Control Plan, Santa Ana River Basin (8)*. January 24, 1995 (Updated February 2008 and June 2011).

To measure compliance with the Reach 3 TDS concentration objective, the Regional Board coordinates a program to measure TDS concentrations in SAR grab samples collected at the SAR below Prado Dam during the summertime (August and September) when the influences of storm discharge are typically at a minimum. The Regional Board uses data from this and other monitoring programs to evaluate the efficacy of its current regulatory approach, including the wasteload allocation.

Figure 2 shows the discharge and TDS concentrations of the SAR below Prado Dam during June-September for 2004-2012. The data shown on this figure are representative of base flow and were used in the analysis for this study. The figure demonstrates that average summertime discharge rates decreased from about 168 cubic feet per second (cfs) in 2004 to about 85 cfs in 2012. Over the same time period, the average summertime TDS concentration increased from about 622 mg/L to about 699 mg/L, and in some instances, since 2010, the TDS concentration of individual grab samples exceeded the Reach 3 objective of 700 mg/L. The most recent wasteload allocation investigation, based on projected recycled water discharges to the SAR and its tributaries, did not predict the TDS concentration exceedances.[2] However, when the Wasteload Allocation Model was used to forensically investigate the impacts of Elsinore Valley Municipal Water District discharge on the TDS concentration of the SAR below Prado Dam,[3] it was determined that the TDS concentration was exceeding the Reach 3 TDS concentration objective. This forensic investigation was based on the actual recycled water discharges. For these reasons, the Task Force requested this investigation of the cause(s) of the recent exceedances of the Reach 3 TDS concentration objective.

Methodology

This investigation employed an analysis of mass-balance in Reach 3 of the SAR during the summertime months of 2004-2012. To compute the mass-balance, we compiled a dataset of discharge rates and associated TDS concentrations for the major inflow and outflow terms for Reach 3. The data sources are provided below:

- For the period of 2004-2012, the Chino Basin Watermaster (CBWM) and the Inland Empire Utilities Agency (IEUA) conducted a surface-water monitoring program as part of the Hydraulic Control Monitoring Program (HCMP).[4] The HCMP included bi-weekly discharge and/or TDS concentration measurements at monitoring sites along all major tributaries to Reach 3 and at the USGS gaging stations on Cucamonga Creek, Temescal Creek, the SAR at MWD Crossing, and the SAR below Prado Dam.

- POTW discharges are major components of inflow to Reach 3. POTW discharge rates and TDS concentrations are measured by the POTWs and reported to the Regional Board. The HCMP also included bi-weekly sampling at some POTW discharge outfalls for TDS concentrations.

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[2] Wildermuth Environmental, Inc. (2010). *Addendum to the 2008 Santa Ana River Wasteload Allocation Model Report: Scenario 7*. Prepared for the Basin Monitoring Program Task Force. July 2010.

[3] Wildermuth Environmental, Inc. (2012). *Letter report documenting the application of the Wasteload Allocation Model to characterize the TDS impact on the Santa Ana River from Elsinore Valley Municipal Water District recycled water discharge with TDS concentrations in excess of that allowed in its discharge permit*. Prepared for Elsinore Valley Municipal Water District. July 2012.

[4] Wildermuth Environmental, Inc. (2004). *Final Hydraulic Control Monitoring Program Work Plan for the Optimum Basin Management Program.* Prepared for the Chino Basin Watermaster and the Inland Empire Utilities Agency. May 2004.

- There are other inflows to and outflows from Reach 3 that are not measured, including rising groundwater, streambed recharge, evapotranspiration, dry-weather runoff, and other unknown discharges. These unknown terms were aggregated in a residual term (Residual) and estimated from the mass-balance equation.

Figure 3 shows the Study Area for this investigation, which includes the locations of all monitoring sites used in the mass-balance analysis. Table 1 provides information about each monitoring site.

The combined datasets from the HCMP, USGS, and POTW monitoring programs were used to calculate the discharge and TDS concentration of the Residual by solving the following mass-balance equations:

$$Q_P = Q_{CC} + Q_{CU} + Q_{HL} + Q_X + Q_{TC} + Q_{RIV} + Q_W + Q_{RP1} + Q_{C1B} + R_Q \quad (1)$$

$$Q_P*C_P = (Q_{CC}*C_{CC}) + (Q_{CU}*C_{MC}) + (Q_{HL}*C_{HL})\ (Q_X*C_X) + (Q_{TC}*C_{TC}) + (Q_{RIV}*C_{RIV}) + (Q_W*C_W) + (Q_{RP1}*C_{RP1}) + (Q_{C1B}*C_{C1B}) + (R_Q*R_C) \quad (2)$$

Where:

Q = discharge (cfs)
C = TDS concentration (mg/L)
R_Q = calculated Residual discharge (cfs)
R_C = calculated TDS concentration of the Residual discharge (mg/L)

And, the subscripts refer to the surface-water monitoring sites and POTW discharge locations:

P = Santa Ana River below Prado Dam (USGS station 11074000)
CC = Chino Creek at Pine Avenue
CU = Cucamonga Creek near Mira Loma (USGS station 11073495)[5]
MC = Mill Creek at Chino-Corona[5]
HL = Hole Lake Outlet Channel
X = Santa Ana River at MWD Crossing (USGS station 11066460)
TC = Temescal Creek above Main Street at Corona (USGS station 11072100)
RIV = Riverside Regional Water Quality Control Plant - DP-001
W = Western Riverside County Regional Wastewater Treatment Plant - DP-001
RP1 = IEUA DP-001 - effluent from Regional Water Recycling Plant No. 1
C1B = Corona Wastewater Treatment Plant No. 1 - DP-001

The mass-balance equations were solved for the Residuals during "sampling events." A sampling event is defined as a contiguous two- to four-day period during the summertime months (June to September), during which one pair of discharge and TDS concentration measurements were available at every monitoring site. To augment the number of sampling events, if paired discharge and TDS concentration measurements were not available for just one or two sites in a potential sampling event, the TDS concentration and/or discharge values were estimated for those sites by linear interpolation of the values measured immediately before and after the sampling event.

[5] Discharge data were not collected at the Mill Creek site. Flow measurements collected at the upstream USGS gaging station on Cucamonga Creek were considered representative of discharge at the Mill Creek site.

The data sets were not complete enough in 2005 and 2006 to compute the Residual, and the discharge and TDS concentration data collected in 2011 were influenced by imported water discharged at OC-59 for the Orange County Water District, so these years were excluded from the analysis.

For each sampling event, Equations (1) and (2) were solved to compute the Residual discharge and TDS concentrations. The mass-balance results for all sampling events are shown in Table 2.

Figures 4 through 13 are discharge and TDS concentration time-series charts for all sampling events at each monitoring site (including the computed Residual) for the period 2007-2012. Discharge and TDS concentration data for 2004 were included on the charts as the initial condition.

To identify the inflow terms that were most responsible for the recent TDS concentration increases at the SAR below Prado Dam, the following analyses were performed:

- *Visual inspection of Figures 4 through 13*. Each time-series chart was inspected to identify inflow terms with (i) relatively high discharge rates, (ii) TDS concentrations that differed significantly from those at the SAR below Prado Dam, and/or (iii) discharges or TDS concentrations that changed substantially between 2004 and 2012. An inflow term with one or more of these characteristics could have a significant influence on the TDS concentration of the SAR below Prado Dam.

- *Sensitivity analysis*. Based on the visual inspection, a sensitivity analysis was performed on each inflow term deemed to have a potentially significant influence on the TDS concentration of the SAR below Prado Dam. These sensitivity analyses were performed by resetting the discharge and/or TDS concentration values of the selected inflow terms in the mass-balance equations to 2004 values for all sampling events and recalculating the TDS concentration of the SAR below Prado Dam. Time-series charts were prepared to compare the measured TDS concentrations of the SAR below Prado Dam versus the recalculated values.

Results and Conclusions

Visual inspection of the discharge and TDS concentration time-series charts of all inflow terms indicates that the following inflow terms had the greatest influence on the recently observed decrease in discharge and increase in the TDS concentration of the SAR below Prado Dam:

1. Chino Creek at Pine Avenue (Figure 6). Between 2007 and 2012, the average June-September discharge rate of Chino Creek decreased from 23 cfs to 10 cfs while the average June-September TDS concentration increased from 497 mg/L to 735 mg/L.

2. Cucamonga Creek (Figure 8). Between 2004 and 2012, the average June-September discharge rate of Cucamonga Creek decreased from 52 cfs to 9 cfs while the average June-September TDS concentration remained stable within a range of about 445 to 480 mg/L—much lower than the measured TDS concentrations of the SAR below Prado Dam.

3. IEUA DP-001 (RP-1 Prado) (Figure 11). Between 2004 and 2012, the average June-September discharge rate decreased from 10 cfs to 3 cfs. The average June-September TDS concentration increased slightly from 490 mg/L to 523 mg/L but still remained much lower than the measured TDS concentrations of the SAR below Prado Dam.

The measured decreases in discharge between 2004 and 2012 on Chino and Cucamonga Creeks were primarily the result of decreases in discharge from the IEUA's upstream recycled-water discharge locations: DP-007 (RP-5) and DP-008 (Carbon Canyon) on Chino Creek and DP-002 (RP-1 Cucamonga) on Cucamonga Creek. Figures 14, 15, and 16 are time-series charts of discharge and TDS concentrations measured at these discharge points, respectively. Figure 11 shows that IEUA's discharge rates also decreased at DP-001 (RP-1 Prado), which is located downstream of the Chino Creek monitoring site. Between 2004 and 2012, the IEUA's total discharge of recycled water during June-September decreased from an average of 71 cfs to 17 cfs while the average TDS concentration remained within a range of 445 to 550 mg/L, well below the TDS concentrations of the SAR below Prado Dam.

A sensitivity analysis was performed for IEUA's total discharge rather than each individual inflow term to estimate the TDS concentration of the SAR below Prado Dam had IEUA not reduced its total discharge since 2004. This was done by resetting IEUA discharge in the mass-balance equations from all of its four treatment plants to 2004 values for all sampling events and solving for the discharge and TDS concentration of the SAR below Prado Dam. This sensitivity analysis did not include an adjustment to the TDS concentrations of IEUA discharge. The results of the sensitivity analysis are shown in Table 3.

To reset the discharge, the difference between the discharge rate measured during a sampling event and the 2004 monthly average discharge rate was calculated for each of IEUA's four discharge locations and added to mass-balance equation (1) as new discharge terms. These differences in discharge rate are shown in columns 11-14 of Table 3. The differences in discharge were multiplied by the monthly average TDS concentrations measured at each discharge point during the sampling event year,[6] and added to mass-balance equation (2). These TDS concentrations are shown in columns 27-30 of Table 3. Mass-balance equation (2) was then used to recalculate the TDS concentration of the SAR below Prado Dam had the IEUA's discharge remained at 2004 discharge rates. These recalculated TDS concentrations are shown in column 32 of Table 3.

Figure 17 shows the measured summertime TDS concentrations of the SAR below Prado Dam and a linear trend line that fits these data (blue). The figure also shows the recalculated summertime TDS concentrations of the SAR below Prado Dam with IEUA discharges reset to 2004 values and a linear trend line that fits these data (red). The linear trend line that fits the measured summertime TDS concentrations shows an increasing trend from an average of about 620 mg/L in 2004 to 700 mg/L in 2012. The linear trend line that fits the recalculated summertime TDS concentrations remains horizontal at an average of about 615 mg/L, indicating little change from the 2004 TDS concentrations of the SAR below Prado Dam in this recalculation. This analysis indicates that if IEUA's discharge rates had remained at 2004 levels, the TDS concentration of the SAR below Prado Dam would have remained nearly constant from 2004 to 2012.

In similar sensitivity analyses performed for the other inflow terms, all other terms showed little or no influence on the TDS concentration of the SAR below Prado Dam: discharge rates were relatively low (e.g. Hole Lake Outlet Channel, Temescal Creek above Main Street at Corona), there was little or no change in the discharge rate or TDS concentration (e.g. Corona Wastewater Treatment Plant No. 1, Western Riverside County Regional Wastewater Treatment Plant, the Residual), or the TDS concentrations of the discharge were similar to those of the SAR below Prado Dam (e.g. SAR at MWD Crossing, Riverside Regional Water Quality Control Plant).

[6] For DP-001 (RP-1 Prado), the differences in discharge were multiplied by TDS concentrations measured during each sampling event. These TDS concentrations were used in the original mass-balance equation (2).

Based on this investigation, the primary reason for the summertime increase in TDS concentration of the SAR below Prado Dam from 2004-2012 was the decrease in IEUA's discharge of relatively low-TDS recycled water. This decrease in IEUA's summertime discharge resulted from increased recycled-water reuse and decreased wastewater influent due to the economic recession that began in 2008, and the implementation of indoor water-conservation measures**.**

We appreciate the opportunity to serve the Task Force. Please call if you have any questions.

Very truly yours,

Wildermuth Environmental, Inc.

Mark Wildermuth, PE
President, Principal Engineer

Andy Malone, PG
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Table 1
Surface-Water Monitoring Sites

Site Name	Abbreviated Name	Discharge Type	Discharge			Water Quality		
			Measurement Type	Monitoring Frequency	Monitoring Entity	Sample Type	Monitoring Frequency	Monitoring Entity
Santa Ana River below Prado Dam (USGS station 11074000)	SAR Below Prado Dam	Stream flow	Daily Average	Daily	USGS	Grab	Bi-weekly	CBWM / IEUA
Chino Creek at Pine Avenue	Chino Creek	Stream flow	Instantaneous	Bi-weekly	CBWM / IEUA	Grab	Bi-weekly	CBWM / IEUA
Cucamonga Creek near Mira Loma (USGS station 11073495)[1]	Cucamonga Creek	Stream flow	Daily Average	Daily	USGS	--	--	--
Mill Creek at Chino-Corona[1]	Mill Creek	Stream flow	--	--	--	Grab	Bi-weekly	CBWM / IEUA
Hole Lake Outlet Channel	Hole Lake Outlet Channel	Stream flow	Instantaneous	Bi-weekly	CBWM / IEUA	Grab	Bi-weekly	CBWM / IEUA
Temescal Creek above Main Street at Corona (USGS station 11072100)	Temescal Creek	Stream flow	Daily Average	Daily	USGS	Grab	Bi-weekly	CBWM / IEUA
Santa Ana River at MWD Crossing (USGS station 11066460)	SAR at MWD Xing	Stream flow	Daily Average	Daily	USGS	Grab	Bi-weekly	CBWM / IEUA
Riverside Regional Water Quality Control Plant - DP-001	RWQCP	POTW	Daily Average	Daily	City of Riverside	Grab/24-Hour Composite	Bi-weekly	CBWM / IEUA / Riverside
IEUA DP-001 - effluent from Regional Water Recycling Plant No. 1	RP-1 Prado	POTW	Daily Average	Daily	IEUA	Composite	Bi-weekly	IEUA
Western Riverside County Regional Wastewater Treatment Plant - DP-001	WRCRWTP	POTW	Daily Average	Daily	WRCRWA	Grab/Composite	Bi-weekly	CBWM / IEUA / WRCRWA
Corona Wastewater Treatment Plant No. 1 - DP-001	Corona 1B	POTW	Daily Average	Daily	City of Corona	Grab/Composite	Bi-weekly	CBWM / IEUA / Corona
IEUA DP-002 - effluent from Regional Water Recycling Plants No. 1 and No. 4[2]	RP-1 Cucamonga	POTW	Daily Average	Daily	IEUA	Composite	Bi-weekly	IEUA
IEUA DP-007 - effluent from Regional Water Recycling Plant No. 5[2]	RP-5	POTW	Daily Average	Daily	IEUA	Composite	Bi-weekly	IEUA
IEUA DP-008 - effluent from Carbon Canyon Wastewater Reclamation Facility[2]	Carbon Canyon	POTW	Daily Average	Daily	IEUA	Composite	Bi-weekly	IEUA

[1] Discharge data was not collected at the Mill Creek at Chino-Corona site. Discharge measurements collected at an upstream USGS gaging station (Cucamonga Creek near Mira Loma) are assumed to be representative of discharge at Mill Creek at Chino-Corona. Cucamonga Creek is lined with concrete between these two sites.

[2] These sites were not used as part of the mass-balance equations used to calculate the discharge and TDS concentration of the Residual. Data at these sites were used to assess the influence of IEUA's discharge on the changes in the TDS concentration of the Santa Ana River below Prado Dam.

Table 2
Mass-Balance Computation of the Discharge and TDS Concentration of the Residual

Sampling Event	Discharge (cfs)[1]											TDS (mg/L)[1]										
	(1) SAR at MWD Xing[F]	(2) Hole Lake Outlet Channel	(3) Chino Creek[B]	(4) Temescal Creek[E]	(5) Cuca-monga Creek[C]	(6) RWQCP[G]	(7) Corona 1B[J]	(8) RP-1 Prado[H]	(9) WRC RWTP[I]	(10) Calculated Residual[2]	(11) SAR Below Prado Dam[A]	(12) SAR at MWD Xing[F]	(13) Hole Lake Outlet Channel	(14) Chino Creek[B]	(15) Temescal Creek[E]	(16) Mill Creek[D]	(17) RWQCP[G]	(18) Corona 1B[J]	(19) RP-1 Prado[H]	(20) WRC RWTP[I]	(21) Calculated Residual[2]	(22) SAR Below Prado Dam[A]
6/12/2007 - 6/14/2007	69	3.35	23.3	4.2	38	49.32	6.37	7.86	7.30	-38.70	170.00	700	940	578	1070	456	652	*830*	*487*	*574*	657	628
6/26/2007 - 6/28/2007	64	2.23	9.5	4.2	42	45.84	5.09	7.92	7.43	-24.20	164.00	716	1120	598	886	466	636	*733*	*490*	*558*	533	642
7/10/2007 - 7/12/2007	63	1.98	24.13	4.4	27	48.16	6.08	8.12	7.30	-33.17	157.00	700	1010	556	918	416	*614*	850	492	*553*	543	634
7/24/2007 - 7/26/2007	60	2.57	27.34	7.3	49	48.34	5.04	10.57	7.69	-70.85	147.00	706	1000	626	700	456	618	840	472	548	551	638
8/6/2007 - 8/9/2007	75	2.4	19.99	5.5	30	49.49	6.13	10.16	7.83	-46.50	160.00	696	990	548	802	440	622	826	460	534	643	612
8/21/2007 - 8/23/2007	67	1.91	21.62	7.5	43	48.22	3.96	7.58	7.36	-62.15	146.00	708	1010	584	798	466	616	884	484	558	619	620
9/4/2007 - 9/6/2007	82	1.68	29.68	5.4	50	51.75	5.12	8.09	8.11	-89.82	152.00	624	952	510	868	406	614	876	462	562	464	630
9/18/2007 - 9/20/2007	74	2.14	30.89	6.5	36	47.00	5.15	8.45	7.56	-61.69	156.00	686	894	528	936	438	624	840	464	546	510	648
6/11/2008 - 6/12/2008	76	2.62	33.55	5.5	30	48.42	2.32	7.60	8.65	-47.66	167.00	502	622	548	764	392	622	706	*477*	592	212	626
6/25/2008 - 6/26/2008	48	7.2	33.84	8.2	33	47.06	2.10	7.44	8.26	-48.11	147.00	546	536	556	562	392	642	712	*483*	558	426	584
7/9/2008 - 7/10/2008	52	7.41	30.32	5.9	50	49.09	2.88	8.23	8.52	-73.35	141.00	698	520	360	756	590	672	730	*489*	542	587	608
7/23/2008 - 7/24/2008	51	2.46	31.61	4.4	31	47.59	5.21	7.60	8.57	-63.44	126.00	672	606	556	734	418	620	550	*490*	736	557	608
8/6/2008 - 8/7/2008	53	15.6	32.85	4.5	33	45.82	5.11	6.67	8.45	-66.99	138.00	692	484	532	754	420	648	778	*488*	566	540	612
8/19/2008 - 8/21/2008	57	2.93	44.47	6.8	30	47.23	5.45	6.51	8.14	-78.53	130.00	562	796	560	646	450	628	764	488	564	423	658
9/3/2008 - 9/4/2008	56	7.88	30.75	6.8	25	49.89	4.83	8.38	8.25	-78.78	119.00	692	624	570	722	476	710	746	*503*	608	600	664
9/16/2008 - 9/18/2008	69	7.21	27.57	2.9	31	49.04	3.26	6.51	9.05	-64.55	141.00	526	820	562	738	586	624	740	516	*656*	462	642
6/10/2009 - 6/11/2009	59	4.16	30.15	5.6	26	47.12	5.93	7.92	7.56	-49.44	144.00	650	870	550	860	450	690	740	*505*	550	566	640
6/24/2009 - 6/25/2009	61	4.28	26.29	3.7	20	46.92	3.14	6.67	8.42	-56.42	124.00	670	700	550	990	460	650	740	*508*	520	575	640
7/8/2009 - 7/9/2009	55	2.28	25.79	6.4	13	44.89	3.03	6.36	7.44	-67.19	97.00	630	840	550	710	510	660	710	*506*	540	578	640
7/21/2009 - 7/23/2009	47	2.04	18.41	8.4	6.7	46.86	2.57	5.89	8.39	-57.26	89.00	700	820	570	870	490	640	750	504	550	667	640
8/4/2009 - 8/6/2009	47	1.72	20.12	3.1	9.1	44.86	3.33	2.97	8.32	-41.52	99.00	670	940	550	820	500	660	770	478	570	608	650
8/18/2009 - 8/19/2009	47	1.62	26.51	3.7	14	46.62	4.44	5.74	9.95	-51.58	108.00	670	910	540	850	480	610	690	492	570	585	620
9/2/2009	40	1.86	35.43	3.1	6.3	47.48	0.99	5.58	9.73	-69.47	81.00	690	690	600	800	430	600	700	*493*	560	542	680
9/14/2009 - 9/17/2009	40	1.58	27.42	6.8	21	47.53	4.64	6.71	10.88	-54.57	112.00	680	850	540	800	470	640	740	494	550	614	610
9/29/2009 - 9/30/2009	44	2.05	17.65	4.3	19	47.77	0.00	11.32	9.93	-49.03	107.00	680	810	570	850	520	620	720	*498*	550	581	630
6/23/2010 - 6/24/2010	55	1.52	19.6	3.9	5.6	44.38	0.88	5.97	6.98	-35.84	108.00	700	900	640	800	520	560	710	*481*	570	484	680
7/6/2010 - 7/8/2010	54	11.21	27.71	3.2	5.9	45.64	0.17	5.41	8.68	-50.92	111.00	720	740	570	870	520	600	740	492	550	556	680
7/21/2010 - 7/22/2010	63	1.74	23.96	3.8	7.9	47.21	0.00	4.64	8.55	-75.81	85.00	650	730	610	900	490	580	750	*472*	530	511	700
8/3/2010 - 8/5/2010	52	2.83	13.5	2.6	5.6	44.00	0.14	4.64	8.93	-48.24	86.00	680	770	650	760	480	600	700	502	550	562	670
8/17/2010 - 8/19/2010	50	6.24	7.65	2.7	15	46.89	5.20	4.64	11.21	-53.53	96.00	670	760	660	900	320	620	750	532	560	575	640
9/1/2010 - 9/2/2010	55	8.88	12.78	3.2	12	45.37	5.79	6.19	9.35	-46.56	112.00	680	740	720	690	530	580	740	*517*	550	575	660
9/15/2010 - 9/16/2010	56	7.08	13.27	2.2	13	44.38	7.26	5.41	8.50	-45.10	112.00	680	760	620	930	470	600	700	*504*	560	582	650
9/29/2010 - 9/30/2010	56	3.9	15.45	1.8	9.5	48.22	5.23	6.19	8.59	-49.88	105.00	680	800	600	800	480	570	710	*508*	530	544	650
6/6/2012 - 6/7/2012	40	12.6	1.56	10	3.9	44.38	4.80	1.39	8.57	-40.20	87.00	710	1000	800	900	470	490	720	526	570	507	730
6/20/2012 - 6/21/2012	41	2.76	10.4	2.3	8.5	41.97	4.97	3.25	9.44	-41.58	83.00	630	860	750	920	480	630	730	512	540	463	720
7/3/2012 - 7/6/2012	36	1.74	9.775	2.6	9.1	41.21	4.29	1.69	8.23	-33.63	81.00	710	970	730	820	440	640	760	518	530	459	740
7/18/2012 - 7/19/2012	37	10.56	8.54	2.4	10	41.92	4.59	4.67	8.73	-49.42	79.00	750	630	810	930	390	660	770	524	540	650	680
7/31/2012 - 8/2/2012	38	4.5	*9.13*	2.1	6.3	42.73	4.24	1.69	8.32	-44.01	73.00	710	930	760	780	430	640	760	508	550	605	710
8/14/2012 - 8/16/2012	35	*3.81*	*9.73*	1.9	7.1	41.32	3.25	2.92	8.55	-39.58	74.00	680	950	640	900	530	680	730	*500*	540	584	710
8/28/2012 - 8/30/2012	44	*3.11*	*10.32*	1.2	9.5	43.56	4.53	2.38	8.04	-39.65	87.00	670	930	750	770	450	650	690	*509*	500	642	650
9/10/2012 - 9/13/2012	75	2.42	10.91	1.8	8.9	45.11	3.45	5.40	8.66	-60.65	101.00	620	860	840	850	450	650	700	542	530	542	690
9/24/2012 - 9/26/2012	61	3.08	15.27	4.4	17	46.77	2.37	3.31	8.82	-62.01	100.00	660	730	640	770	440	620	730	542	530	538	670

[1] Italicized values are not measured data. When no measured data were available within a given sampling event, an estimated value was linearly interpolated between data values measured before and after the sampling event. These estimated values are shown in italics.

[2] The discharge and TDS concentrations of the Residual were calculated using the data measured at surface water sites shown in this table and the mass balance equations described in the letter report. These equations are shown below using the column numbers corresponding to each term.

(11) = (1) + (2) + (3) + (4) + (5) + (6) + (7) + (8) + (9) + (10)

(11)*(22) = [(1)*(12)] + [(2)*(13)] + [(3)*(14)] + [(4)*(15)] + [(5)*(16)] + [(6)*(17)] + [(7)*(18)] + [(8)*(19)] + [(9)*(20)] + [(10)*(21)]

[3] For monitoring sites with abbreviated names in the table above, full site names are listed below:

A - Santa Ana River below Prado Dam (USGS station 11074000)
B - Chino Creek at Pine Avenue
C - Cucamonga Creek near Mira Loma (USGS station 11073495) - flow only
D - Mill Creek at Chino-Corona - water quality only
E - Temescal Creek above Main Street at Corona (USGS station 11072100)
F - Santa Ana River at MWD Crossing (USGS station 11066460)
G - Riverside Regional Water Quality Control Plant - DP-001
H - IEUA DP-001 - effluent from Regional Water Recycling Plant No. 1
I - Western Riverside County Regional Wastewater Treatment Plant - DP-001
J - Corona Wastewater Treatment Plant No. 1 - DP-001

Table 3

Mass-Balance Analysis that Characterizes the Impact of IEUA Discharge on the TDS Concentration of the Santa Ana River below Prado Dam

Sampling Event	Discharge (cfs)[1]															
	Original	Original	Original	Original	Original	Original	Original	Original	Original	Calculated	Adjusted[3]	Adjusted[3]	Adjusted[3]	Adjusted[3]	Original	Recalculated[5]
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	SAR at MWD Xing[F]	Hole Lake Outlet Channel	Chino Creek[B]	Temescal Creek[E]	Cucamonga Creek[C]	RWQCP[G]	Corona 1B[J]	RP-1 Prado[H]	WRC RWTP[I]	Residual[2]	RP-1 Prado[H]	RP-1 Cucamonga[K]	RP-5[L]	Carbon Canyon[M, 3]	SAR at Below Prado Dam[A]	SAR at Below Prado Dam[A]
6/12/2007 - 6/14/2007	69	3.35	23.3	4.2	38	49.32	6.37	7.86	7.30	-38.70	3.34	10.83	-5.62	0.41	170	**179**
6/26/2007 - 6/28/2007	64	2.23	9.5	4.2	42	45.84	5.09	7.92	7.43	-24.20	3.28	9.66	-3.58	0.82	164	**174**
7/10/2007 - 7/12/2007	63	1.98	24.13	4.4	27	48.16	6.08	8.12	7.30	-33.17	1.67	7.71	-3.66	3.24	157	**166**
7/24/2007 - 7/26/2007	60	2.57	27.34	7.3	49	48.34	5.04	10.57	7.69	-70.85	-0.77	9.02	-4.03	2.96	147	**154**
8/6/2007 - 8/9/2007	75	2.4	19.99	5.5	30	49.49	6.13	10.16	7.83	-46.50	0.22	13.60	-6.22	2.94	160	**171**
8/21/2007 - 8/23/2007	67	1.91	21.62	7.5	43	48.22	3.96	7.58	7.36	-62.15	2.80	11.14	-3.53	0.74	146	**157**
9/4/2007 - 9/6/2007	82	1.68	29.68	5.4	50	51.75	5.12	8.09	8.11	-89.82	2.25	6.87	-4.26	1.31	152	**158**
9/18/2007 - 9/20/2007	74	2.14	30.89	6.5	36	47.00	5.15	8.45	7.56	-61.69	1.89	10.69	-4.10	-0.49	156	**164**
6/11/2008 - 6/12/2008	76	2.62	33.55	5.5	30	48.42	2.32	7.60	8.65	-47.66	3.60	21.71	-6.70	3.10	167	**189**
6/25/2008 - 6/26/2008	48	7.2	33.84	8.2	33	47.06	2.10	7.44	8.26	-48.11	3.75	20.13	-5.43	2.97	147	**168**
7/9/2008 - 7/10/2008	52	7.41	30.32	5.9	50	49.09	2.88	8.23	8.52	-73.35	1.56	10.80	-0.52	1.35	141	**154**
7/23/2008 - 7/24/2008	51	2.46	31.61	4.4	31	47.59	5.21	7.60	8.57	-63.44	2.20	12.12	-1.07	4.17	126	**143**
8/6/2008 - 8/7/2008	53	15.6	32.85	4.5	33	45.82	5.11	6.67	8.45	-66.99	3.71	17.17	-3.33	3.34	138	**159**
8/19/2008 - 8/21/2008	57	2.93	44.47	6.8	30	47.23	5.45	6.51	8.14	-78.53	3.87	19.48	-3.45	2.10	130	**152**
9/3/2008 - 9/4/2008	56	7.88	30.75	6.8	25	49.89	4.83	8.38	8.25	-78.78	1.95	23.76	-5.87	5.79	119	**145**
9/16/2008 - 9/18/2008	69	7.21	27.57	2.9	31	49.04	3.26	6.51	9.05	-64.55	3.82	22.74	-3.87	4.09	141	**168**
6/10/2009 - 6/11/2009	59	4.16	30.15	5.6	26	47.12	5.93	7.92	7.56	-49.44	3.28	16.15	-2.85	-1.54	144	**159**
6/24/2009 - 6/25/2009	61	4.28	26.29	3.7	20	46.92	3.14	6.67	8.42	-56.42	4.53	29.62	-4.10	5.08	124	**159**
7/8/2009 - 7/9/2009	55	2.28	25.79	6.4	13	44.89	3.03	6.36	7.44	-67.19	3.44	19.42	-0.73	3.10	97	**122**
7/21/2009 - 7/23/2009	47	2.04	18.41	8.4	6.7	46.86	2.57	5.89	8.39	-57.26	3.90	24.42	-0.89	5.93	89	**122**
8/4/2009 - 8/6/2009	47	1.72	20.12	3.1	9.1	44.86	3.33	2.97	8.32	-41.52	7.41	24.55	-3.87	5.20	99	**132**
8/18/2009 - 8/19/2009	47	1.62	26.51	3.7	14	46.62	4.44	5.74	9.95	-51.58	4.64	28.03	-1.38	2.49	108	**142**
9/2/2009	40	1.86	35.43	3.1	6.3	47.48	0.99	5.58	9.73	-69.47	4.75	25.85	3.57	7.06	81	**122**
9/14/2009 - 9/17/2009	40	1.58	27.42	6.8	21	47.53	4.64	6.71	10.88	-54.57	3.62	22.59	-0.78	2.86	112	**140**
9/29/2009 - 9/30/2009	44	2.05	17.65	4.3	19	47.77	0.00	11.32	9.93	-49.03	-0.99	19.72	0.63	2.45	107	**129**
6/23/2010 - 6/24/2010	55	1.52	19.6	3.9	5.6	44.38	0.88	5.97	6.98	-35.84	5.22	33.99	-1.56	5.17	108	**151**
7/6/2010 - 7/8/2010	54	11.21	27.71	3.2	5.9	45.64	0.17	5.41	8.68	-50.92	4.38	37.69	-2.08	5.71	111	**157**
7/21/2010 - 7/22/2010	63	1.74	23.96	3.8	7.9	47.21	0.00	4.64	8.55	-75.81	5.15	33.67	-1.62	4.17	85	**126**
8/3/2010 - 8/5/2010	52	2.83	13.5	2.6	5.6	44.00	0.14	4.64	8.93	-48.24	5.74	37.43	6.28	6.90	86	**142**
8/17/2010 - 8/19/2010	50	6.24	7.65	2.7	15	46.89	5.20	4.64	11.21	-53.53	5.74	30.31	12.16	2.41	96	**147**
9/1/2010 - 9/2/2010	55	8.88	12.78	3.2	12	45.37	5.79	6.19	9.35	-46.56	4.15	32.24	12.55	3.32	112	**164**
9/15/2010 - 9/16/2010	56	7.08	13.27	2.2	13	44.38	7.26	5.41	8.50	-45.10	4.92	32.24	12.55	4.09	112	**166**
9/29/2010 - 9/30/2010	56	3.9	15.45	1.8	9.5	48.22	5.23	6.19	8.59	-49.88	4.15	34.25	12.55	5.79	105	**162**
6/6/2012 - 6/7/2012	40	12.6	1.56	10	3.9	44.38	4.80	1.39	8.57	-40.20	9.80	37.66	10.83	4.04	87	**149**
6/20/2012 - 6/21/2012	41	2.76	10.4	2.3	8.5	41.97	4.97	3.25	9.44	-41.58	7.95	33.02	10.83	4.04	83	**139**
7/3/2012 - 7/6/2012	36	1.74	9.775	2.6	9.1	41.21	4.29	1.69	8.23	-33.63	8.11	34.09	8.32	4.86	81	**136**
7/18/2012 - 7/19/2012	37	10.56	8.54	2.4	10	41.92	4.59	4.67	8.73	-49.42	5.12	27.88	12.15	4.85	79	**129**
7/31/2012 - 8/2/2012	38	4.5	*9.13*	2.1	6.3	42.73	4.24	1.69	8.32	-44.01	8.11	33.49	12.15	4.12	73	**131**
8/14/2012 - 8/16/2012	35	*3.81*	*9.73*	1.9	7.1	41.32	3.25	2.92	8.55	-39.58	7.46	32.92	11.37	7.25	74	**133**
8/28/2012 - 8/30/2012	44	*3.11*	*10.32*	1.2	9.5	43.56	4.53	2.38	8.04	-39.65	8.00	30.56	12.16	7.11	87	**145**
9/10/2012 - 9/13/2012	75	2.42	10.91	1.8	8.9	45.11	3.45	5.40	8.66	-60.65	4.94	28.90	12.55	8.29	101	**156**
9/24/2012 - 9/26/2012	61	3.08	15.27	4.4	17	46.77	2.37	3.31	8.82	-62.01	7.03	20.61	7.78	6.52	100	**142**

Sampling Event	TDS (mg/L)[1]															
	Original	Original	Original	Original	Original	Original	Original	Original	Original	Calcuated	Adjusted[4]	Adjusted[4]	Adjusted[4]	Adjusted[4]	Original	Recalculated[5]
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
	SAR at MWD Xing[F]	Hole Lake Outlet Channel	Chino Creek[B]	Temescal Creek[E]	Mill Creek[D]	RWQCP[G]	Corona 1B[J]	RP-1 Prado[H]	WRC RWTP[I]	Residual[2]	RP-1 Prado[H]	RP-1 Cucamonga[K]	RP-5[L]	Carbon Canyon[M]	SAR below Prado Dam[A]	SAR below Prado Dam[A]
6/12/2007 - 6/14/2007	700	940	578	1070	456	652	*830*	*487*	*574*	657	*487*	486	534	512	628	**619**
6/26/2007 - 6/28/2007	716	1120	598	886	466	636	*733*	*490*	*558*	533	*490*	486	534	512	642	**632**
7/10/2007 - 7/12/2007	700	1010	556	918	416	*614*	850	492	*553*	543	492	482	532	508	634	**625**
7/24/2007 - 7/26/2007	706	1000	626	700	456	618	840	472	548	551	472	482	532	508	638	**630**
8/6/2007 - 8/9/2007	696	990	548	802	440	622	826	460	534	643	460	472	521	489	612	**602**
8/21/2007 - 8/23/2007	708	1010	584	798	466	616	884	484	558	619	484	472	521	489	620	**609**
9/4/2007 - 9/6/2007	624	952	510	868	406	614	876	462	562	464	462	463	505	490	630	**623**
9/18/2007 - 9/20/2007	686	894	528	936	438	624	840	464	546	510	464	463	505	490	648	**638**
6/11/2008 - 6/12/2008	502	622	548	764	392	622	706	*477*	592	212	*477*	477	537	495	626	**607**
6/25/2008 - 6/26/2008	546	536	556	562	392	642	712	*483*	558	426	*483*	477	537	495	584	**569**
7/9/2008 - 7/10/2008	698	520	360	756	590	672	730	*489*	542	587	*489*	490	559	513	608	**598**
7/23/2008 - 7/24/2008	672	606	556	734	418	620	550	*490*	736	557	*490*	490	559	513	608	**594**
8/6/2008 - 8/7/2008	692	484	532	754	420	648	778	*488*	566	540	*488*	488	540	504	612	**595**
8/19/2008 - 8/21/2008	562	796	560	646	450	628	764	488	564	423	488	488	540	504	658	**632**
9/3/2008 - 9/4/2008	692	624	570	722	476	710	746	*503*	608	600	*503*	516	547	518	664	**636**
9/16/2008 - 9/18/2008	526	820	562	738	586	624	740	516	*656*	462	516	516	547	518	642	**621**
6/10/2009 - 6/11/2009	650	870	550	860	450	690	740	*505*	550	566	*505*	510	534	504	640	**627**
6/24/2009 - 6/25/2009	670	700	550	990	460	650	740	*508*	520	575	*508*	510	534	504	640	**610**
7/8/2009 - 7/9/2009	630	840	550	710	510	660	710	*506*	540	578	*506*	504	563	505	640	**612**
7/21/2009 - 7/23/2009	700	820	570	870	490	640	750	504	550	667	504	504	563	505	640	**603**
8/4/2009 - 8/6/2009	670	940	550	820	500	660	770	478	570	608	478	487	553	509	650	**607**
8/18/2009 - 8/19/2009	670	910	540	850	480	610	690	492	570	585	492	487	553	509	620	**588**
9/2/2009	690	690	600	800	430	600	700	*493*	560	542	*493*	494	544	501	680	**619**
9/14/2009 - 9/17/2009	680	850	540	800	470	640	740	494	550	614	494	494	544	501	610	**586**
9/29/2009 - 9/30/2009	680	810	570	850	520	620	720	*498*	550	581	*498*	494	544	501	630	**607**
6/23/2010 - 6/24/2010	700	900	640	800	520	560	710	*481*	570	484	*481*	462	523	525	680	**620**
7/6/2010 - 7/8/2010	720	740	570	870	520	600	740	492	550	556	492	481	510	513	680	**623**
7/21/2010 - 7/22/2010	650	730	610	900	490	580	750	*472*	530	511	*472*	481	510	513	700	**629**
8/3/2010 - 8/5/2010	680	770	650	760	480	600	700	502	550	562	502	517	504	528	670	**609**
8/17/2010 - 8/19/2010	670	760	660	900	320	620	750	532	560	575	532	517	504	528	640	**597**
9/1/2010 - 9/2/2010	680	740	720	690	530	580	740	*517*	550	575	*517*	505	494	*528*	660	**611**
9/15/2010 - 9/16/2010	680	760	620	930	470	600	700	*504*	560	582	*504*	505	494	*528*	650	**603**
9/29/2010 - 9/30/2010	680	800	600	800	480	570	710	*508*	530	544	*508*	505	494	*528*	650	**599**
6/6/2012 - 6/7/2012	710	1000	800	900	470	490	720	526	570	507	526	519	512	546	730	**643**
6/20/2012 - 6/21/2012	630	860	750	920	480	630	730	512	540	463	512	519	512	546	720	**639**
7/3/2012 - 7/6/2012	710	970	730	820	440	640	760	518	530	459	518	517	528	556	740	**651**
7/18/2012 - 7/19/2012	750	630	810	930	390	660	770	524	540	650	524	517	528	556	680	**620**
7/31/2012 - 8/2/2012	710	930	760	780	430	640	760	508	550	605	508	517	528	556	710	**626**
8/14/2012 - 8/16/2012	680	950	640	900	530	680	730	*500*	540	584	*500*	505	518	535	710	**622**
8/28/2012 - 8/30/2012	670	930	750	770	450	650	690	*509*	500	642	*509*	505	518	535	650	**595**
9/10/2012 - 9/13/2012	620	860	840	850	450	650	700	542	530	542	542	542	521	*535*	690	**636**
9/24/2012 - 9/26/2012	660	730	640	770	440	620	730	542	530	538	542	542	521	*535*	670	**631**

[1] Italicized values are not measured data. When no measured data were available within a given sampling event, an estimated value was linearly interpolated between data values measured before and after the sampling event. These estimated values are shown in italics.

[2] The discharge and TDS concentrations of the Residual were calculated using the data measured at surface water sites shown in this table and the mass balance equations described in the letter report. These equations are shown below using the column numbers corresponding to each term.

(15) = (1) + (2) + (3) + (4) + (5) + (6) + (7) + (8) + (9) + (10)

(15)*(31) = [(1)*(17)] + [(2)*(18)] + [(3)*(19)] + [(4)*(20)] + [(5)*(21)] + [(6)*(22)] + [(7)*(23)] + [(8)*(24)] + [(9)*(25)] + [(10)*(26)]

[3] To reset IEUA discharges to 2004 discharge rates, at each discharge location the difference between the discharge rate measured during an event window and the 2004 monthly average discharge rate was added into the mass balance equation as a new term. From 2007-2012, actual discharge from RP-1 Cucamonga is captured at the Cucamonga Creek site, and actual discharge from RP-5 and Carbon Canyon is captured at the Chino Creek site.

[4] The TDS concentrations of the adjusted flows were calculated as the monthly average TDS concentration at the given discharge point during the sampling event year. At RP-1 Prado, the TDS concentration of the adjusted flows were either measured or interpolated during event windows and match values originally used in the mass-balance (column 24**).** This sensitivity analysis only assessed the impact of changes in IEUA discharge on the SAR below Prado Dam and did not include adjustments to the TDS concentrations of the IEUA's discharge.

[5] The discharge and TDS concentrations of the SAR below Prado Dam were recalculated using the original inflow monitoring site data, calculated Residual and adjusted flows. The modified mass-balance equations are shown below using the column numbers corresponding with each surface water station term.

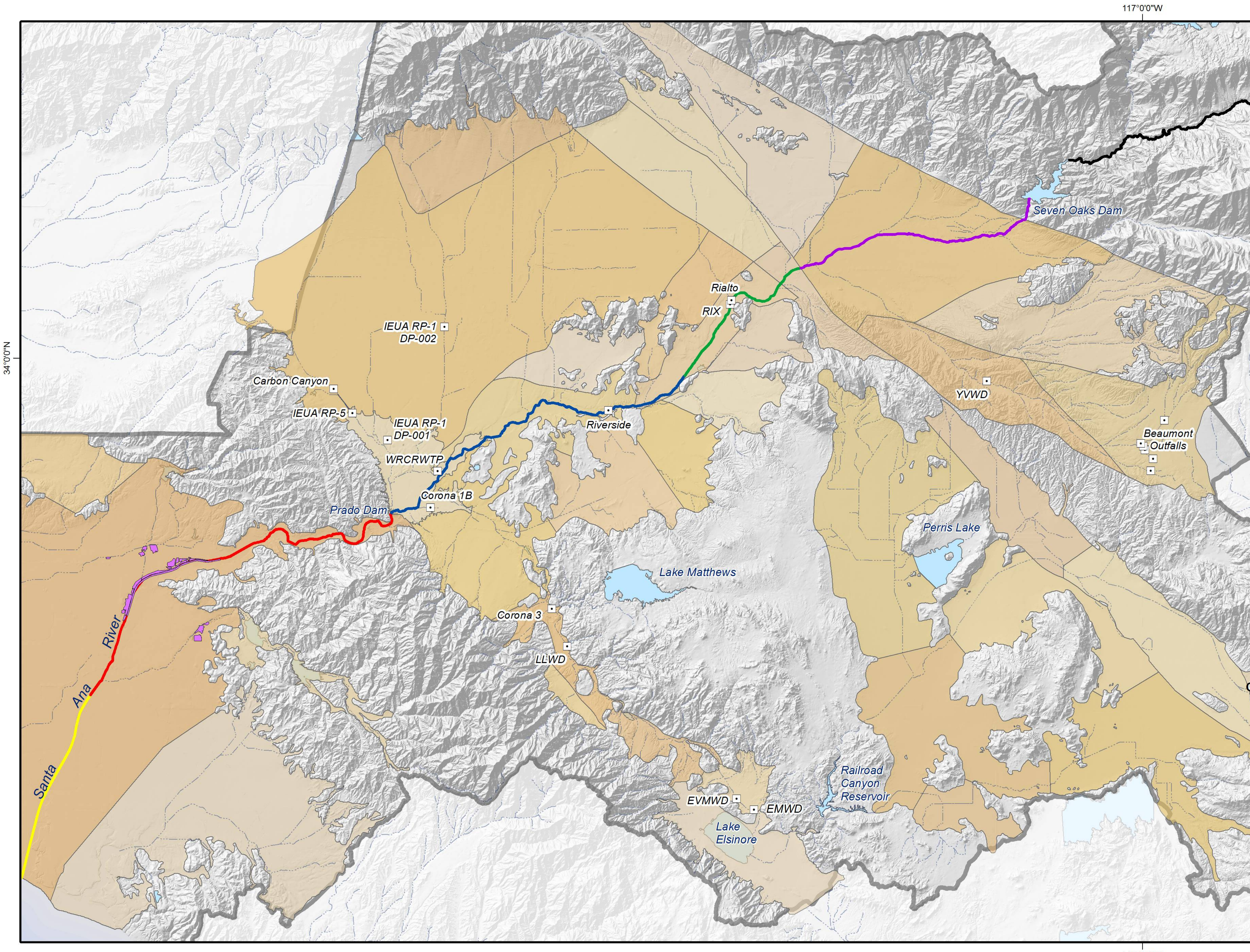
(16) = (1) + (2) + (3) + (4) + (5) + (6) + (7) + (8) + (9) + (10) + (11) + (12) + (13) + (14)

(16)*(32) =[(1)*(17)] + [(2)*(18)] + [(3)*(19)] + [(4)*(20)] + [(5)*(21)] + [(6)*(22)] + [(7)*(23)] + [(8)*(24)] + [(9)*(25)] + [(10)*(26)]+[(11)*(27)] + [(12)*(28)] + [(13)*(29)] + [(14)*(30)]

For monitoring sites with abbreviated names in the table above, full site names are listed below:

A - Santa Ana River below Prado Dam (USGS station 11074000)
B - Chino Creek at Pine Avenue
C - Cucamonga Creek near Mira Loma (USGS station 11073495) - flow only
D - Mill Creek at Chino-Corona - water quality only
E - Temescal Creek above Main Street at Corona (USGS station 11072100)
F - Santa Ana River at MWD Crossing (USGS station 11066460)
G - Riverside Regional Water Quality Control Plant - DP-001
H - IEUA DP-001 - effluent from Regional Water Recycling Plant No. 1
I - Western Riverside County Regional Wastewater Treatment Plant - DP-001
J - Corona Wastewater Treatment Plant No. 1 - DP-001
K - IEUA DP-002 - effluent from Regional Water Recycling Plants No. 1 and No. 4
L - IEUA DP-007 - effluent from Regional Water Recycling Plant No. 5
M - IEUA DP-008 - effluent from Carbon Canyon Wastewater Reclamation Facility

Text

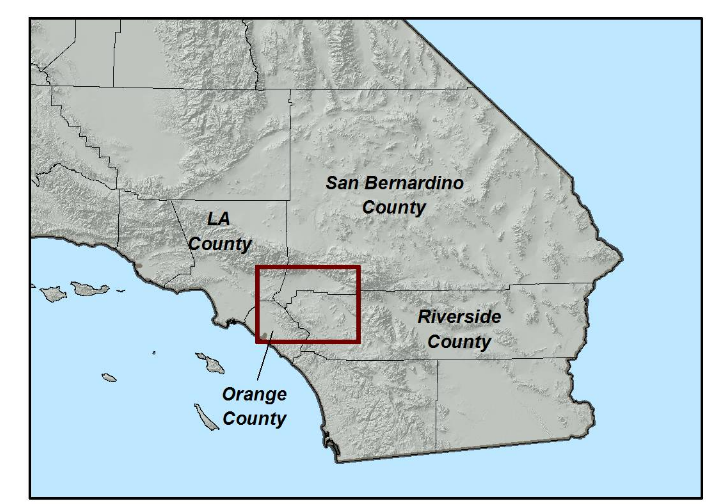


Santa Ana River Reaches

Reach 1 Reach 2
Reach 3 Reach 4
Reach 5 Reach 6

Other Features

Recycled Water Discharge Location
Santa Ana Regional Water Quality Control Board Boundary
Rivers, Creeks, and Flood Control Channels
OCWD Recharge Facilities
Lakes & Reservoirs



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File: Figure_1.mxd

0 5 10 15 Miles
0 5 10 15 20 25 KM

Investigation and Characterization of the Causes of Recent Exceedances of the TDS Concentration Objective for Reach 3 of the Santa Ana River

SAWPA

Santa Ana River Reaches and POTW Discharge Locations

Santa Ana River Watershed

Figure 1

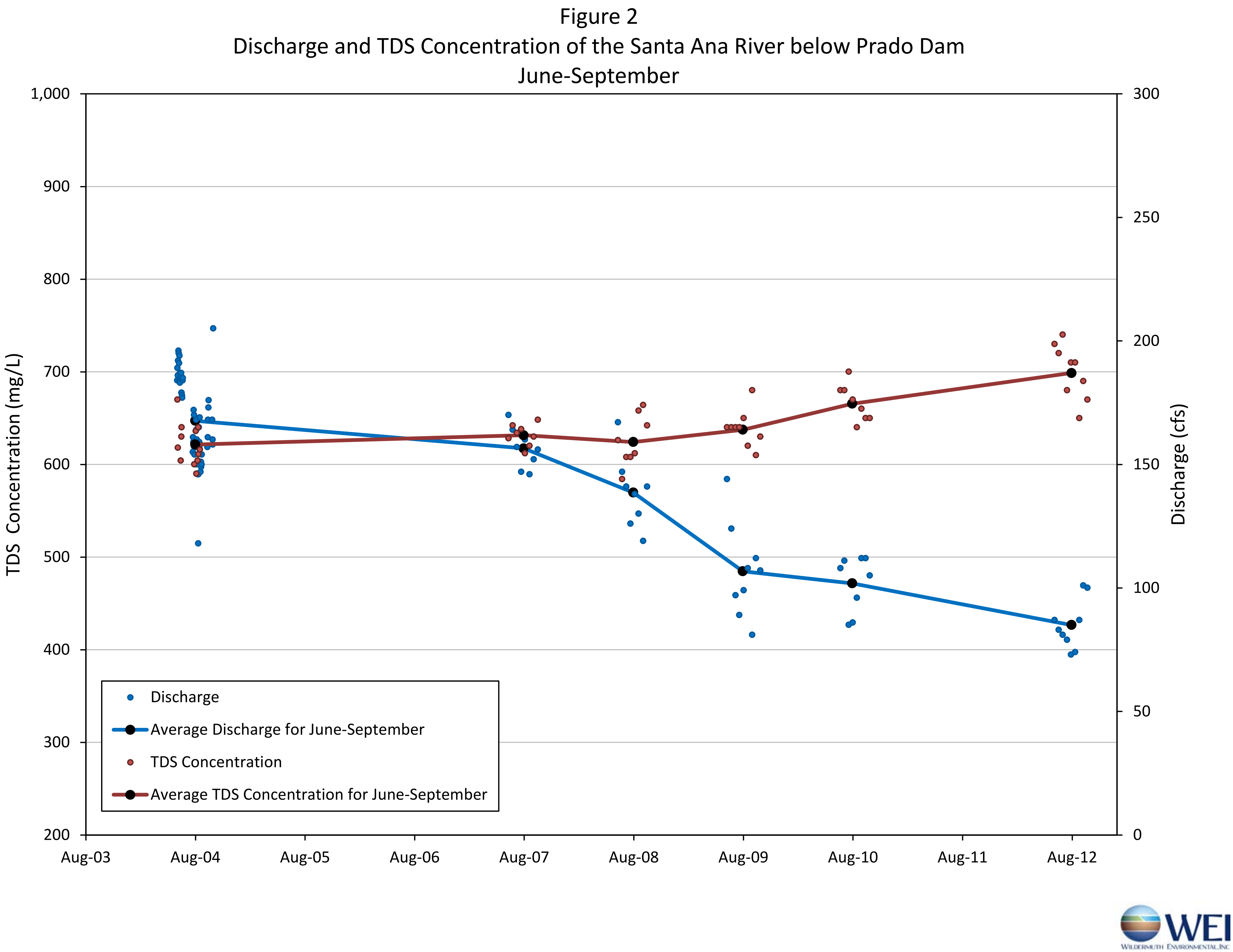
Figure 2
Discharge and TDS Concentration of the Santa Ana River below Prado Dam
June-September
TDS Concentration (mg/L)
Discharge (cfs)
1,000
900
800
700
600
500
400
300
200
300
250
200
150
100
50
0
Aug-03
Aug-04
Aug-05
Aug-06
Aug-07
Aug-08
Aug-09
Aug-10
Aug-11
Aug-12
Discharge
Average Discharge for June-September
TDS Concentration
Average TDS Concentration for June-September
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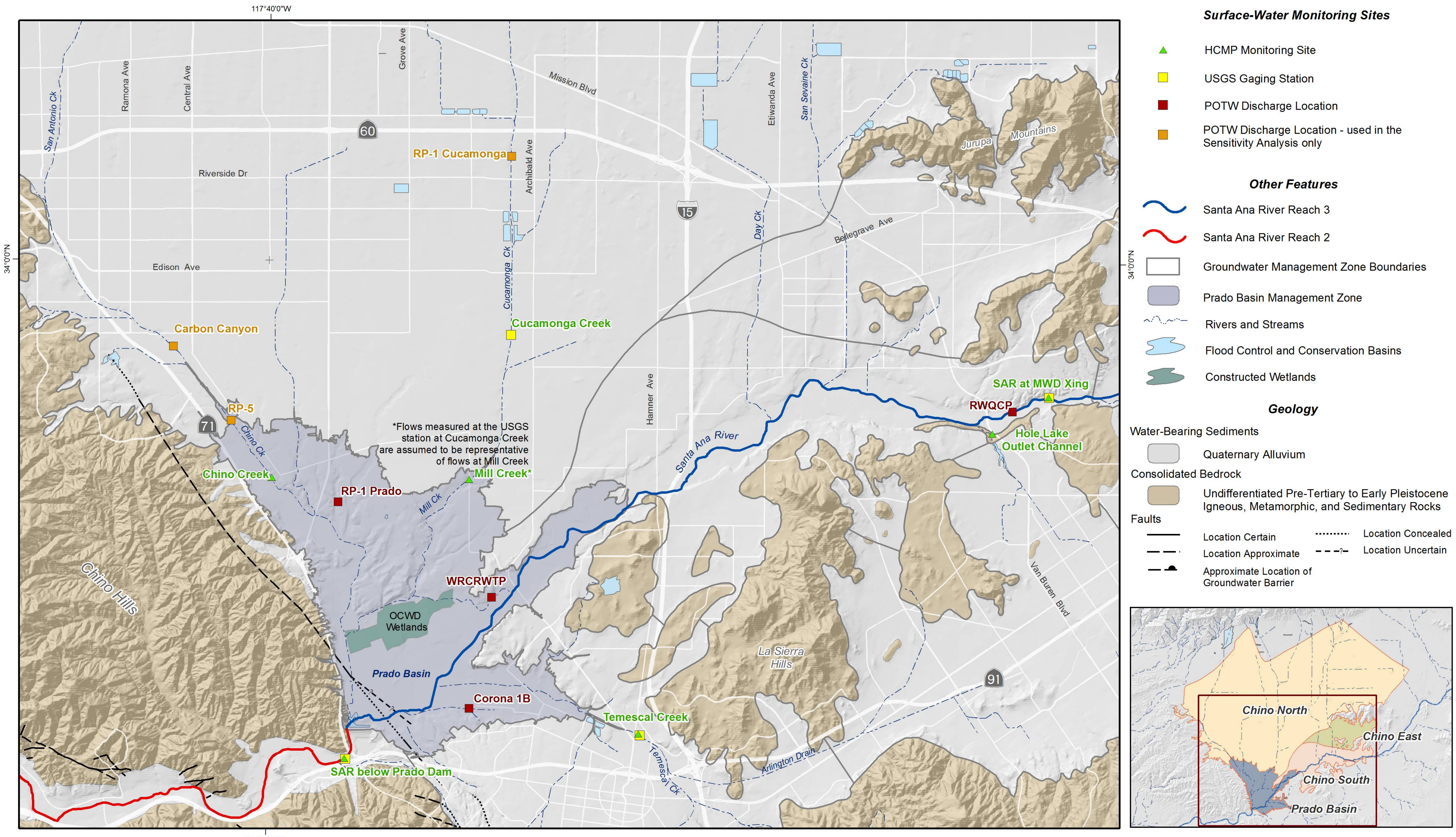

Prepared by:

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Author: JMS
Date: 20141203
File: Figure 3.mxd

Investigation and Characterization of the Causes of Recent Exceedances of the TDS Concentration Objective for Reach 3 of the Santa Ana River

SAWPA

Surface-Water Monitoring Sites within the Study Area

Figure 3

Figure 4
Discharge and TDS Concentration of the Santa Ana River at MWD Crossing
June-September

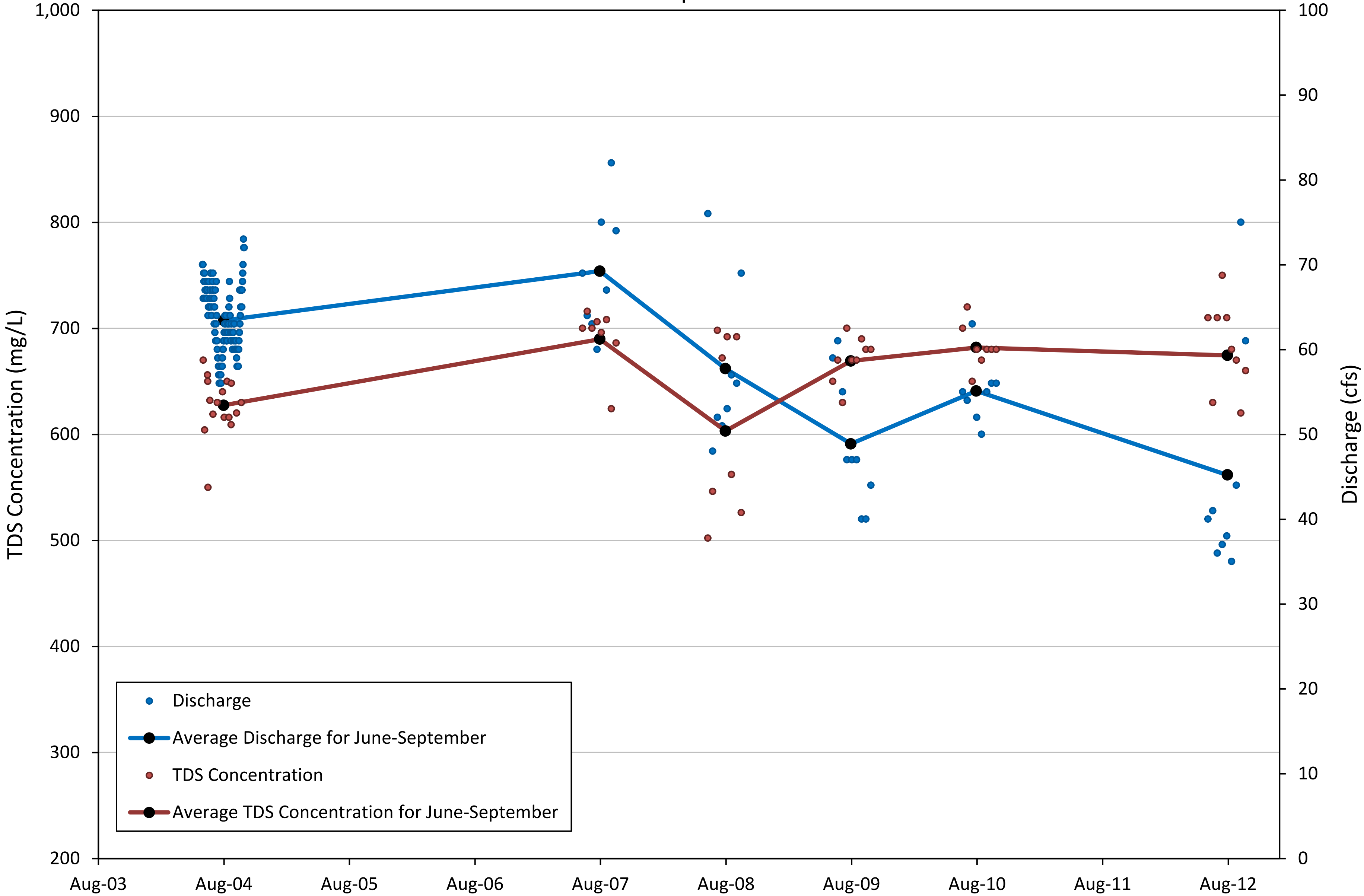

Figure 5
Discharge and TDS Concentration at the Hole Lake Outlet Channel
June-September

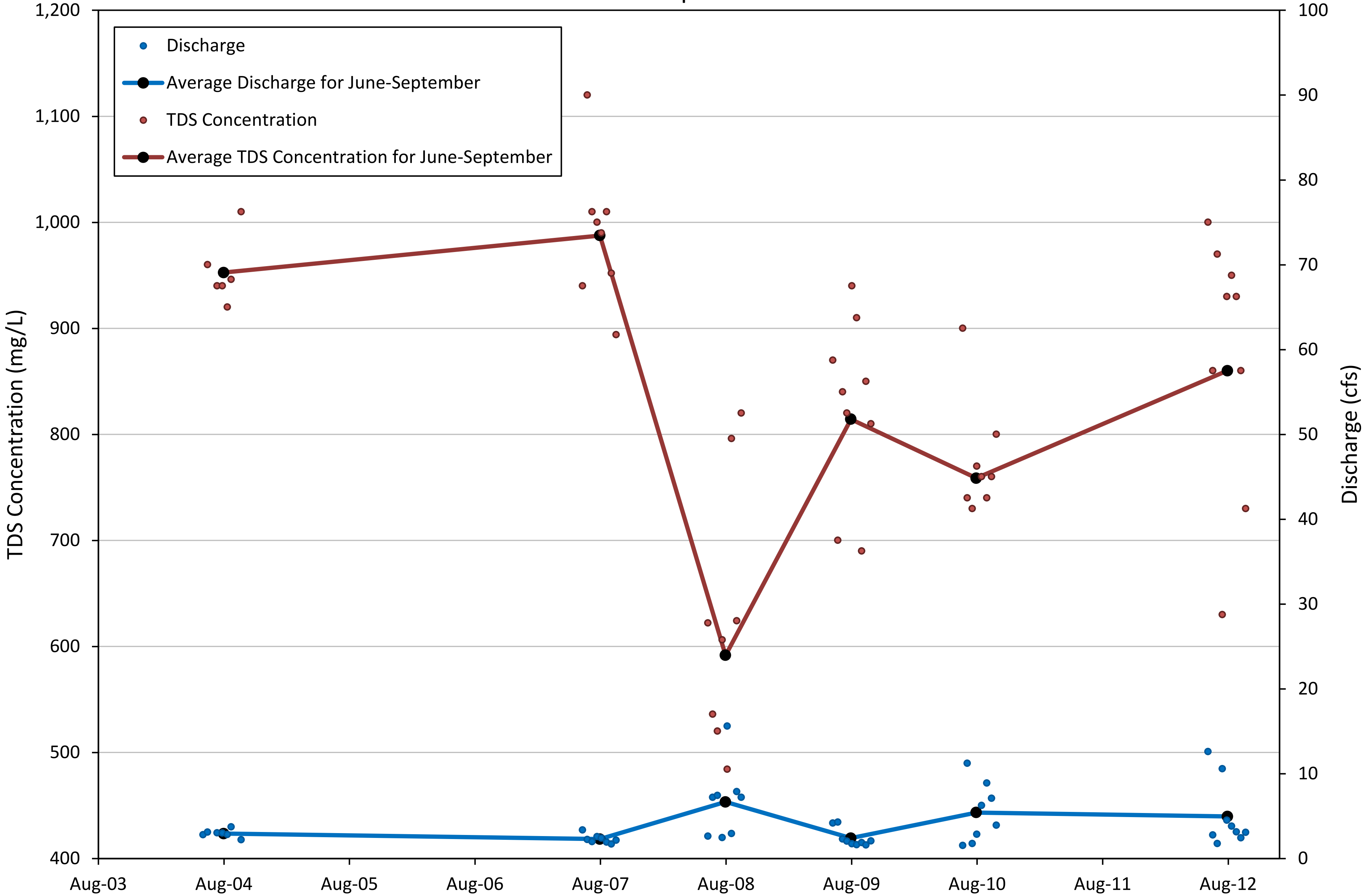

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Figure 6
Discharge and TDS Concentration of Chino Creek at Pine Avenue
June-September

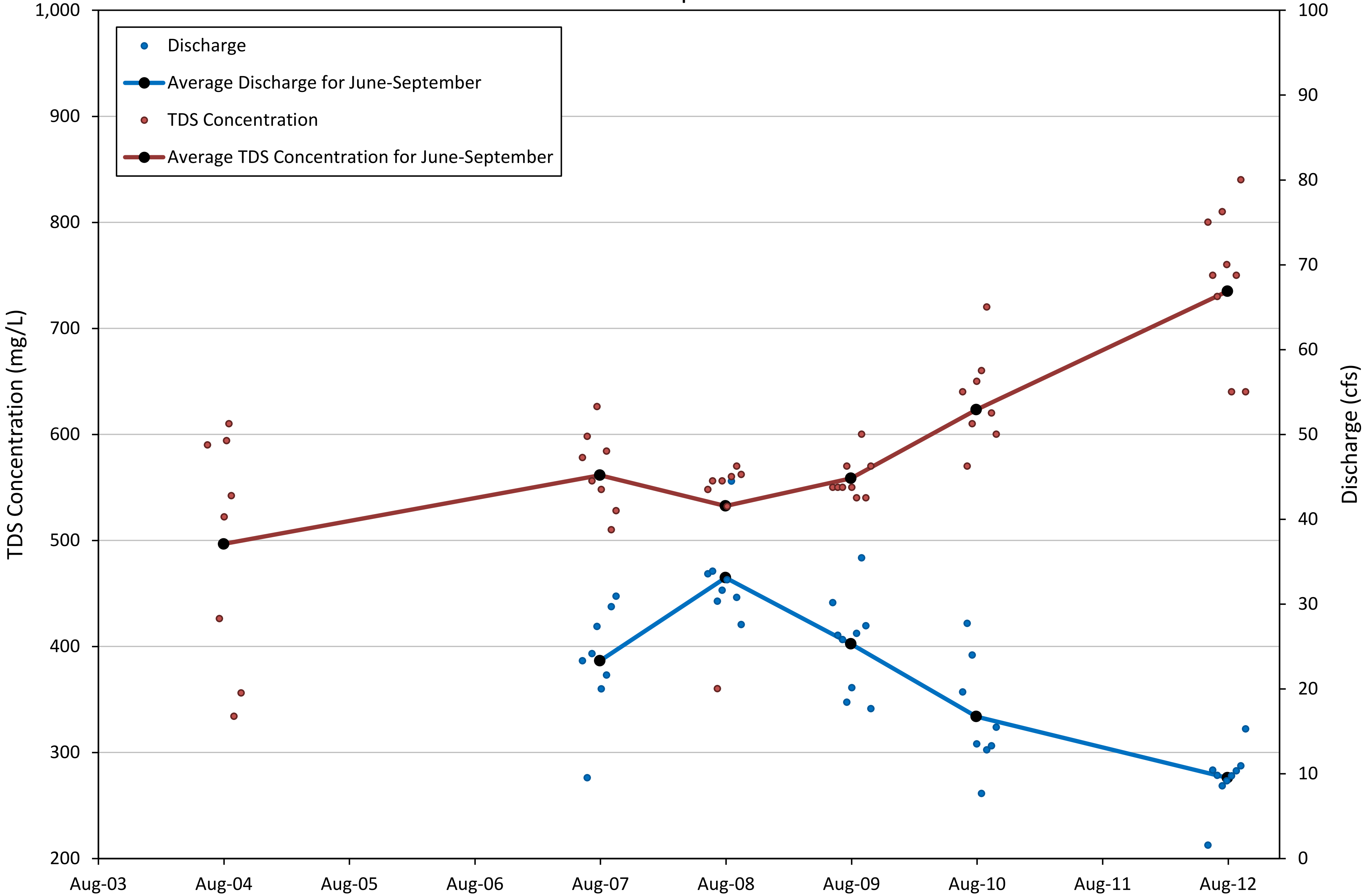

Figure 7
Discharge and TDS Concentration of Temescal Creek above Main Street at Corona
June-September

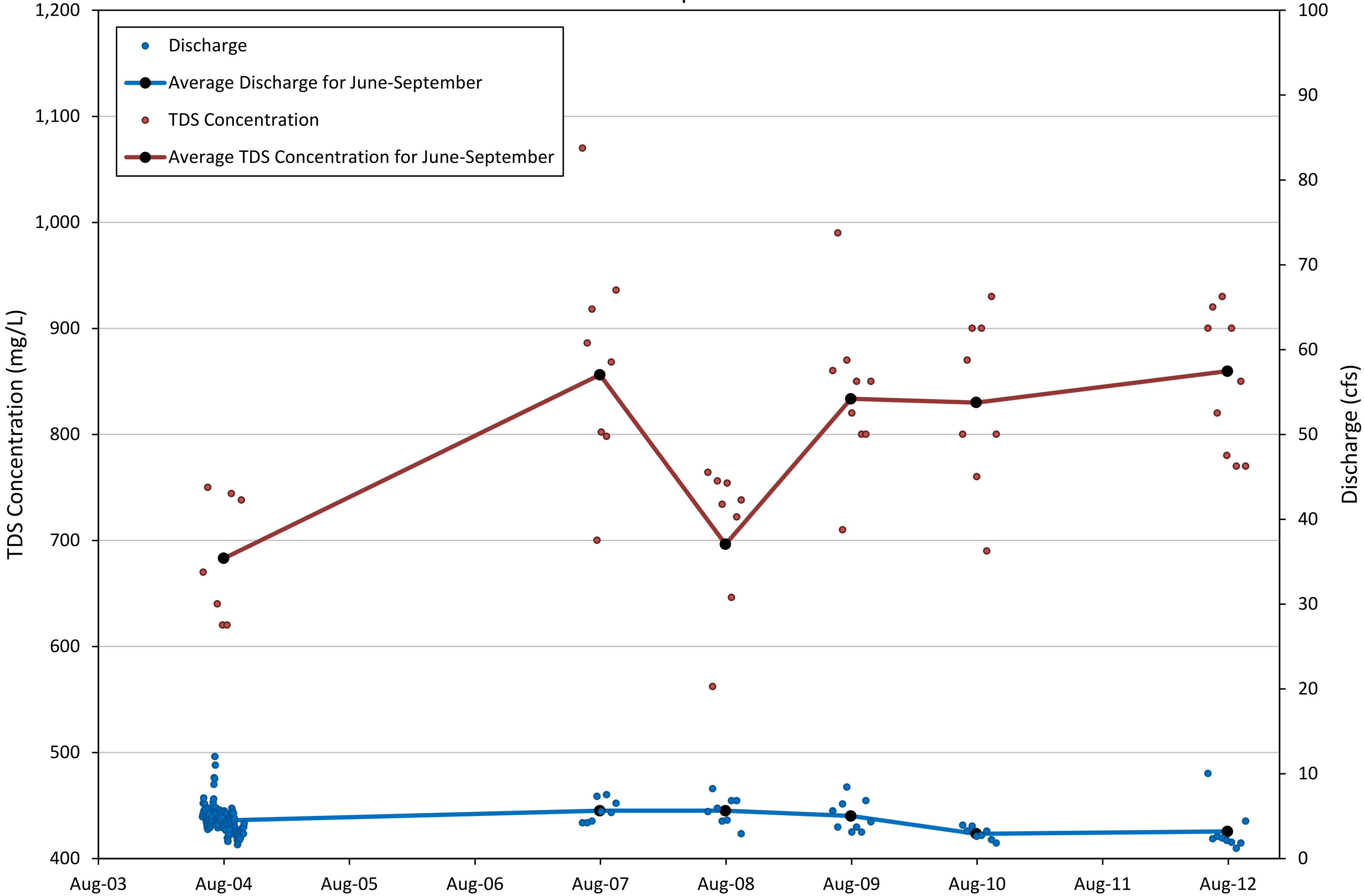

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Figure 8
Discharge and TDS Concentration of Cucamonga Creek
June-September

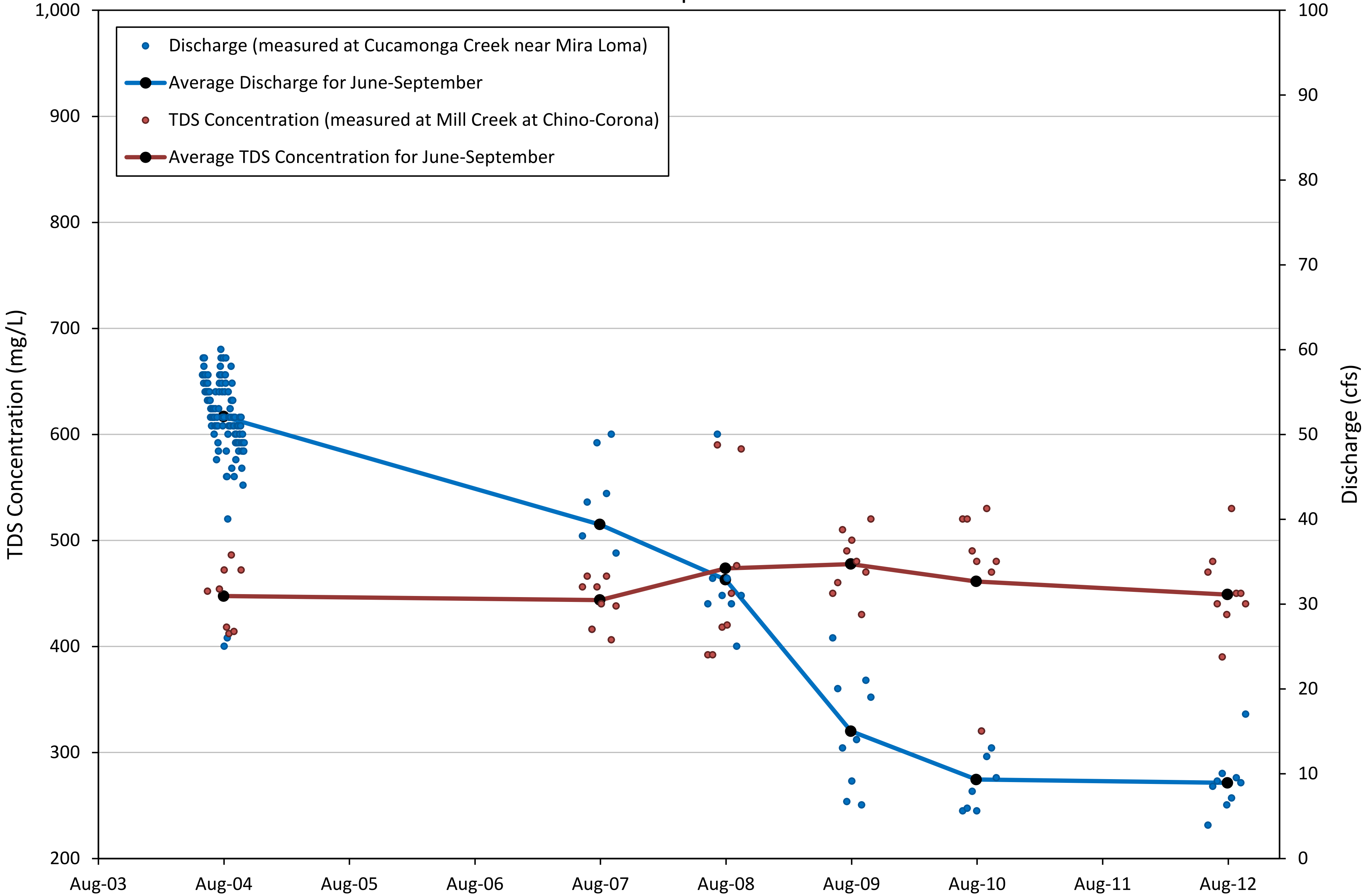

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Figure 9
Discharge and TDS Concentration of Discharge from the Riverside Regional Water Quality Control Plant
June-September

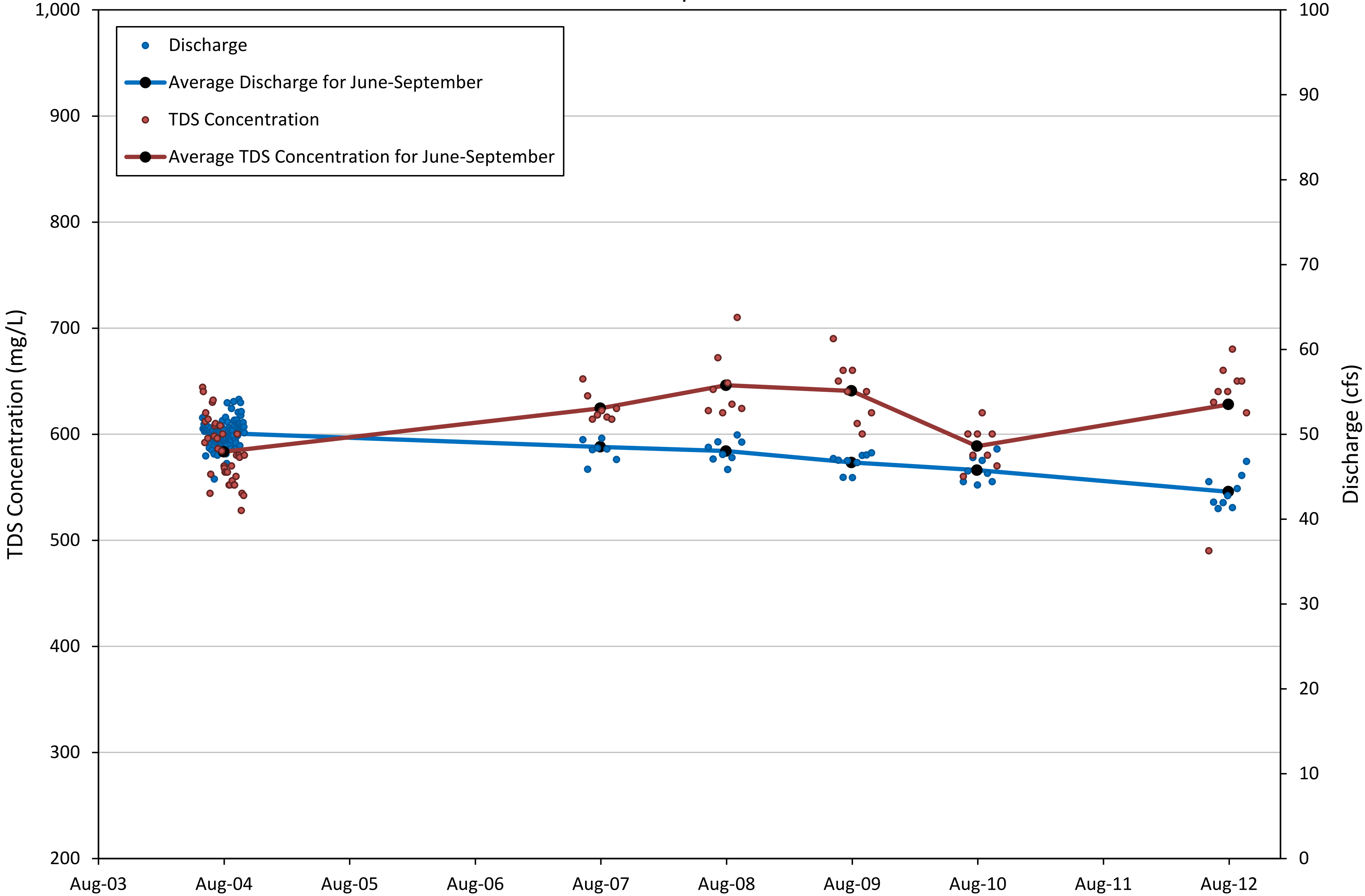

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Figure 10
Discharge and TDS Concentration of Effluent from Corona Wastewater Treatment Plant No. 1
June-September

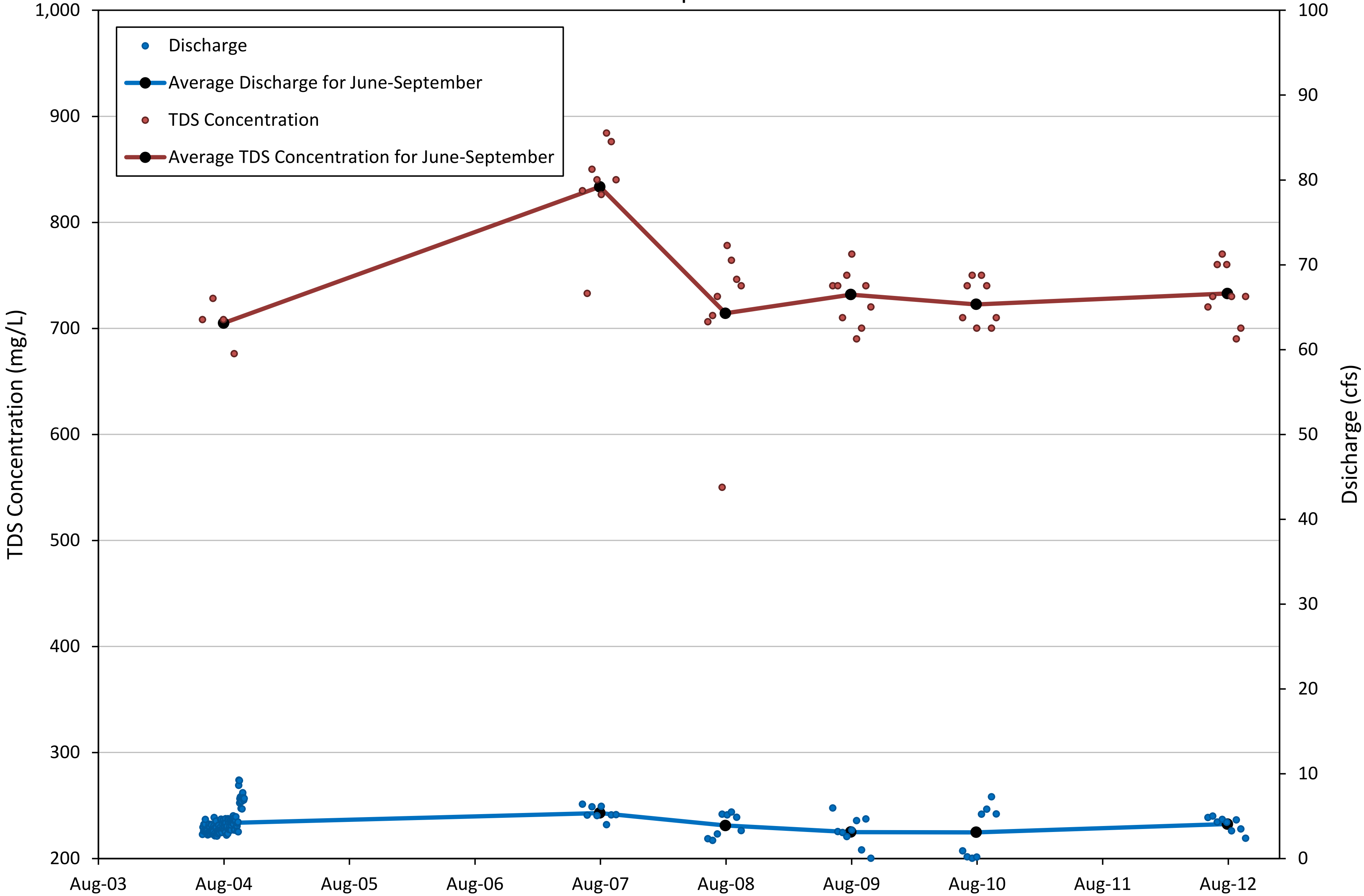

Figure 11
Discharge and TDS Concentration of Effluent from IEUA DP-001 (RP-1 Prado)
June-September

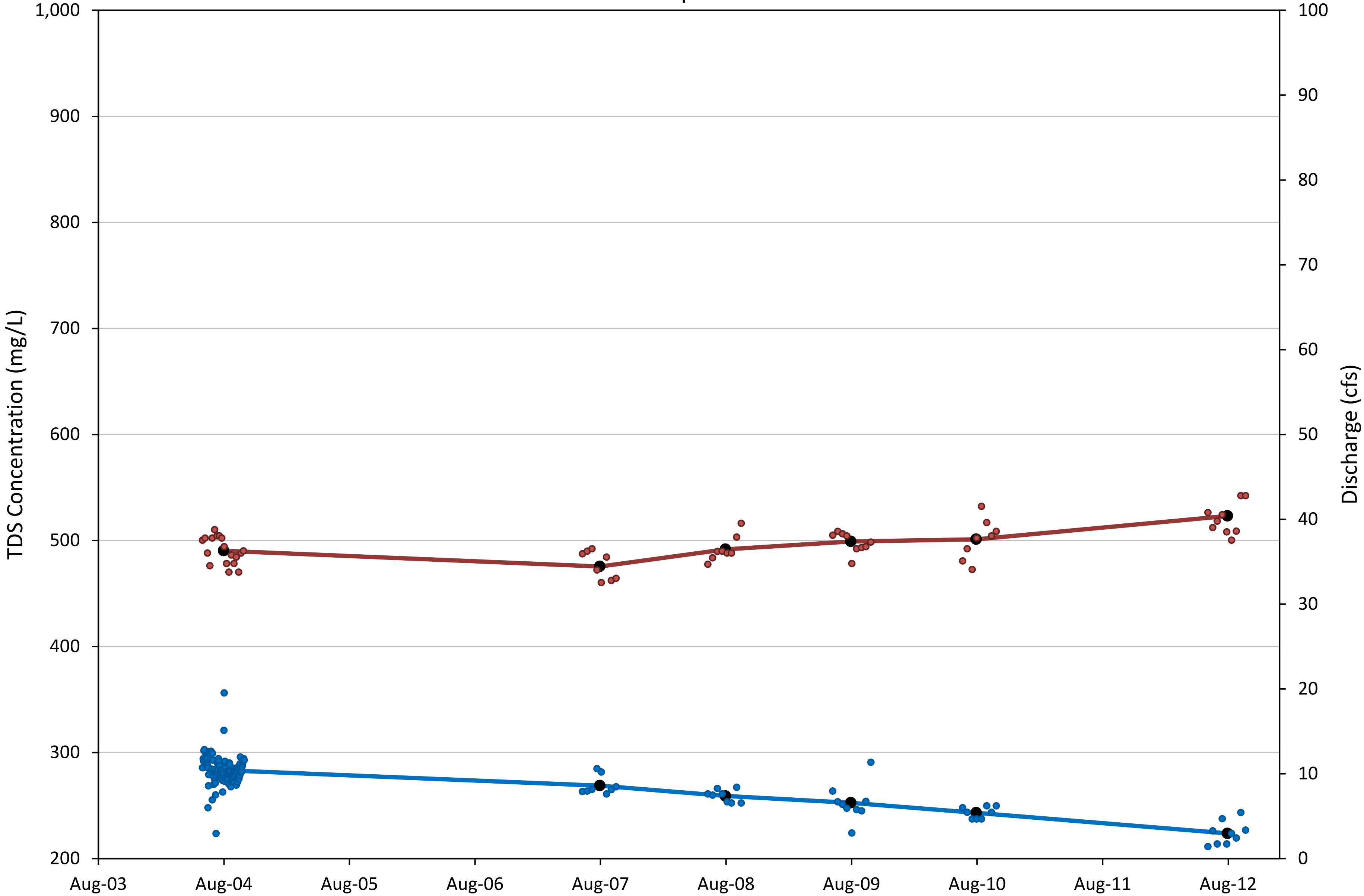

Figure 12
Discharge and TDS Concentration of Effluent from the Western Riverside County Regional WTP
June-September

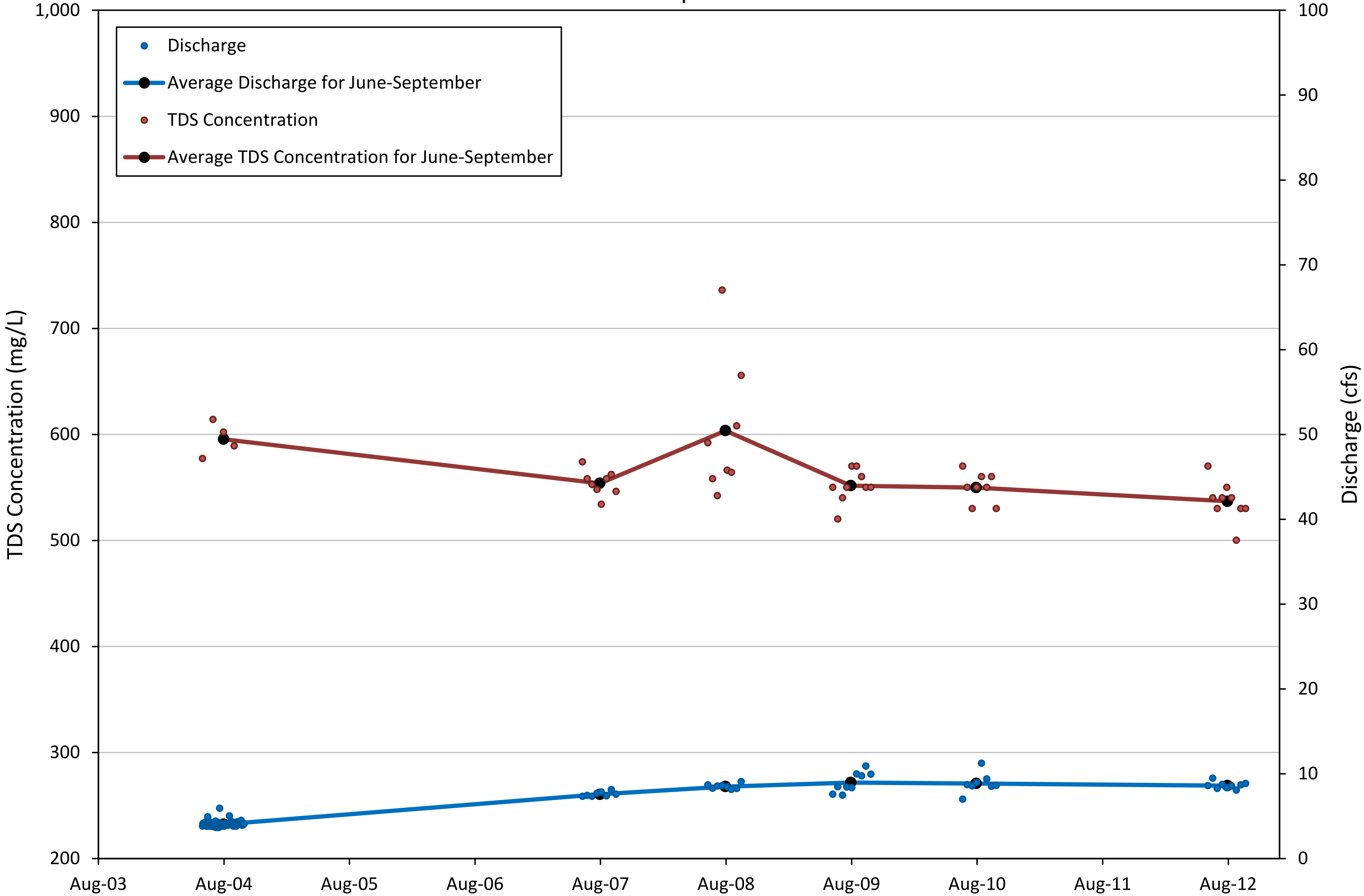

Figure 13
Discharge and TDS Concentration of the Residual
June-September

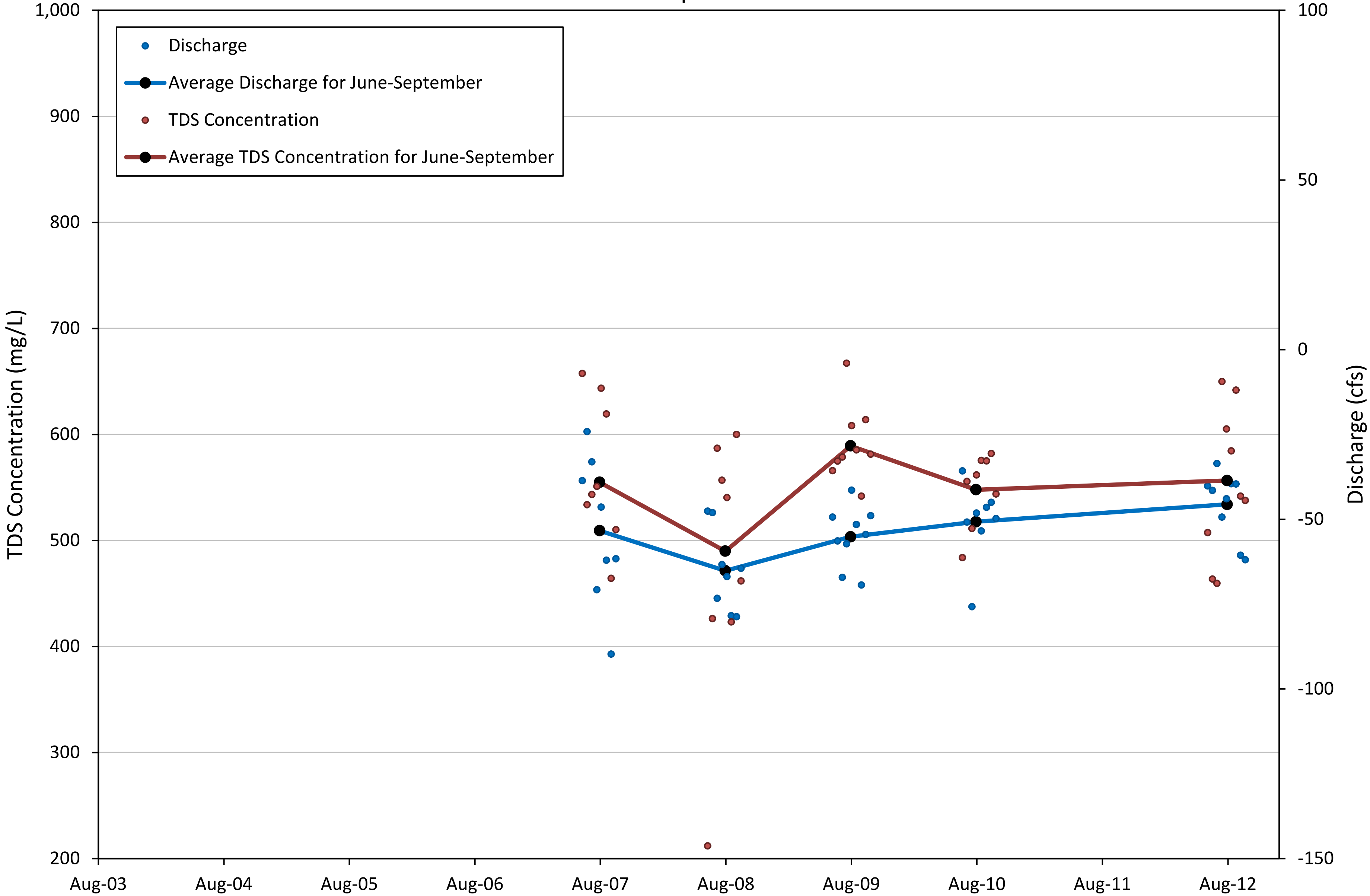

Figure 14
Flow and TDS Concentration of Discharge from IEUA DP-007 (RP-5)
June-September

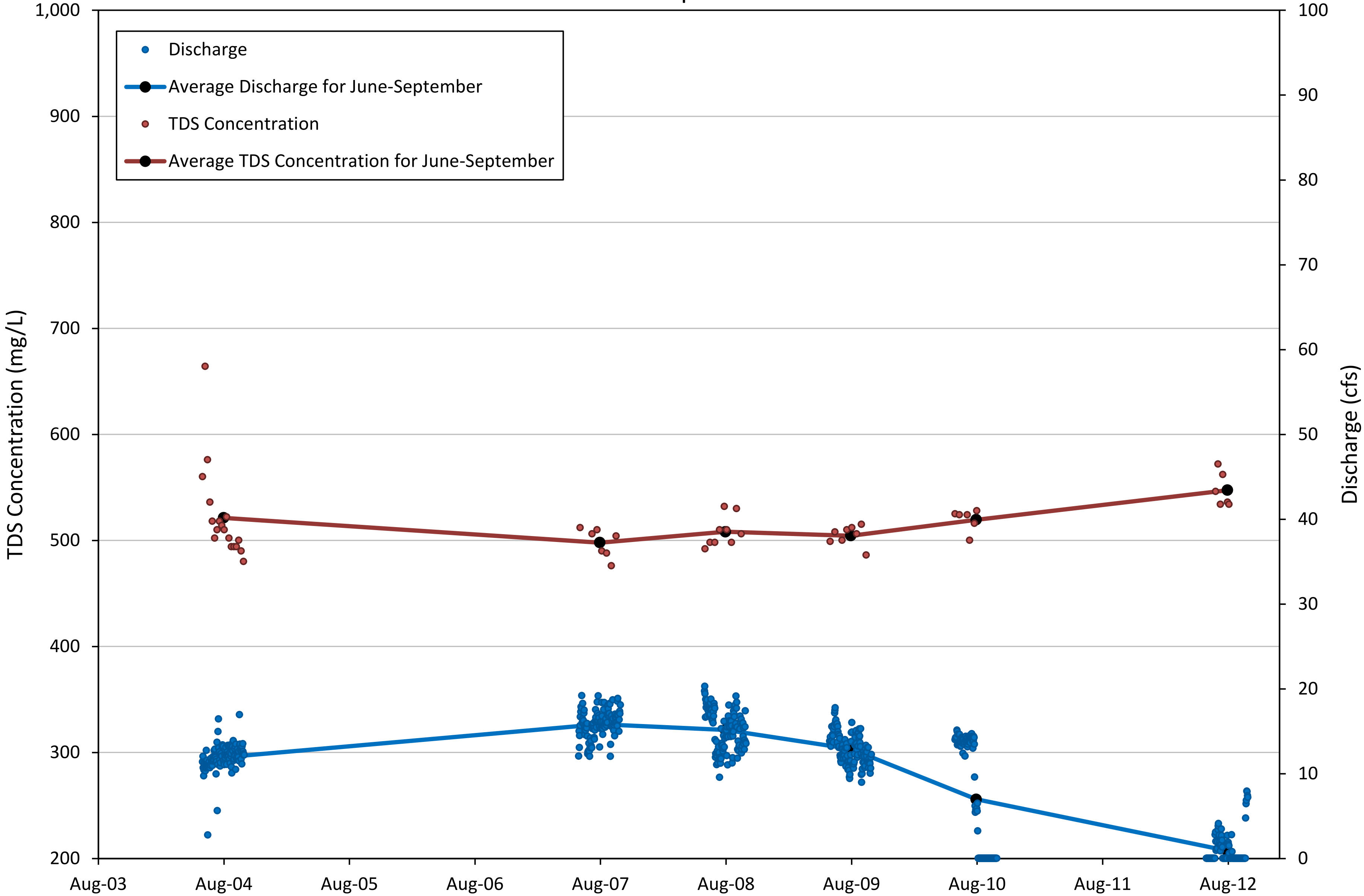

Figure 15
Flow and TDS Concentration of Discharge from IEUA DP-008 (Carbon Canyon)
June-September

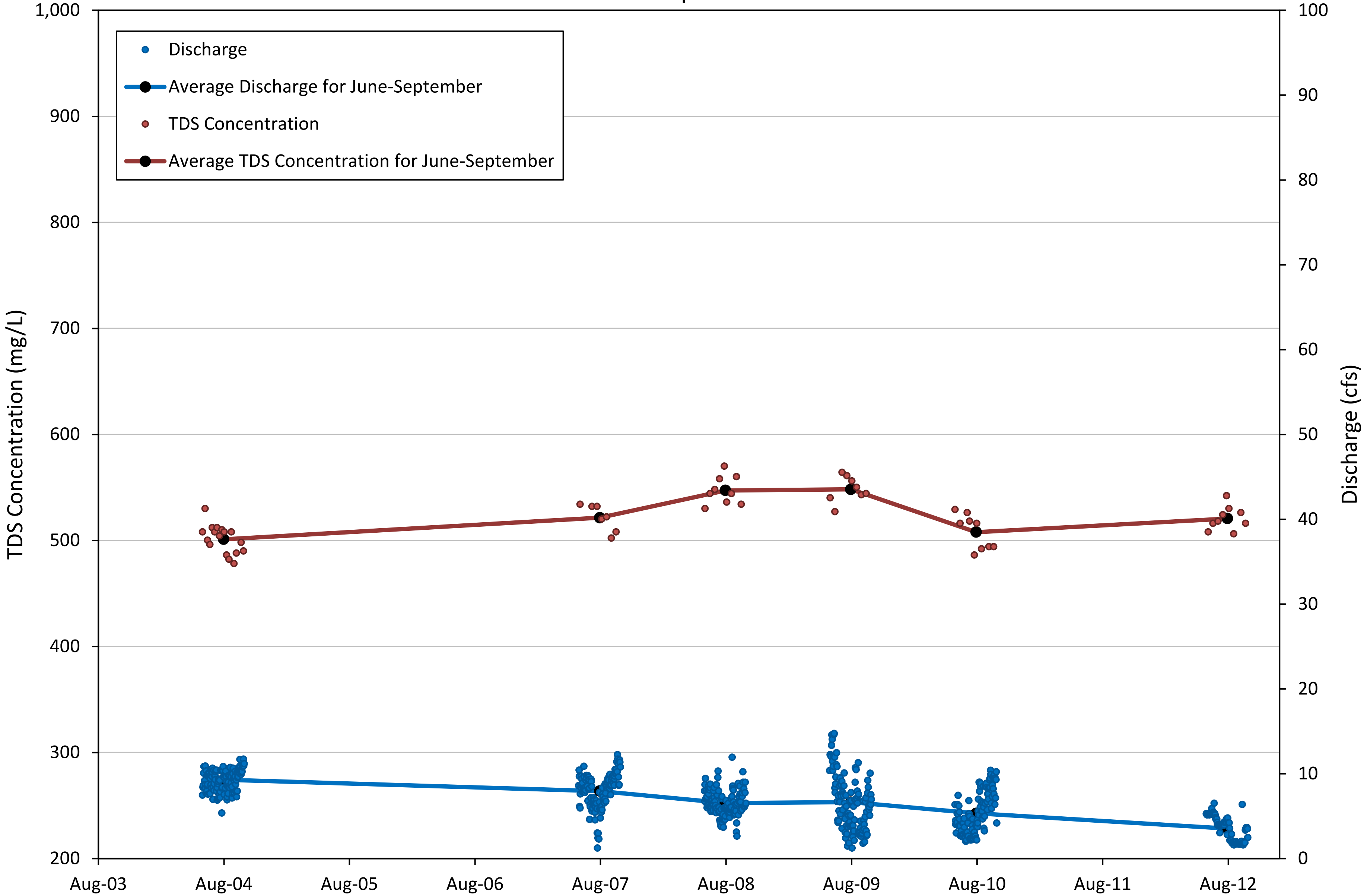

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Figure 16
Flow and TDS Concentration of Discharge from IEUA DP-002 (RP-1 Cucamonga)
June-September

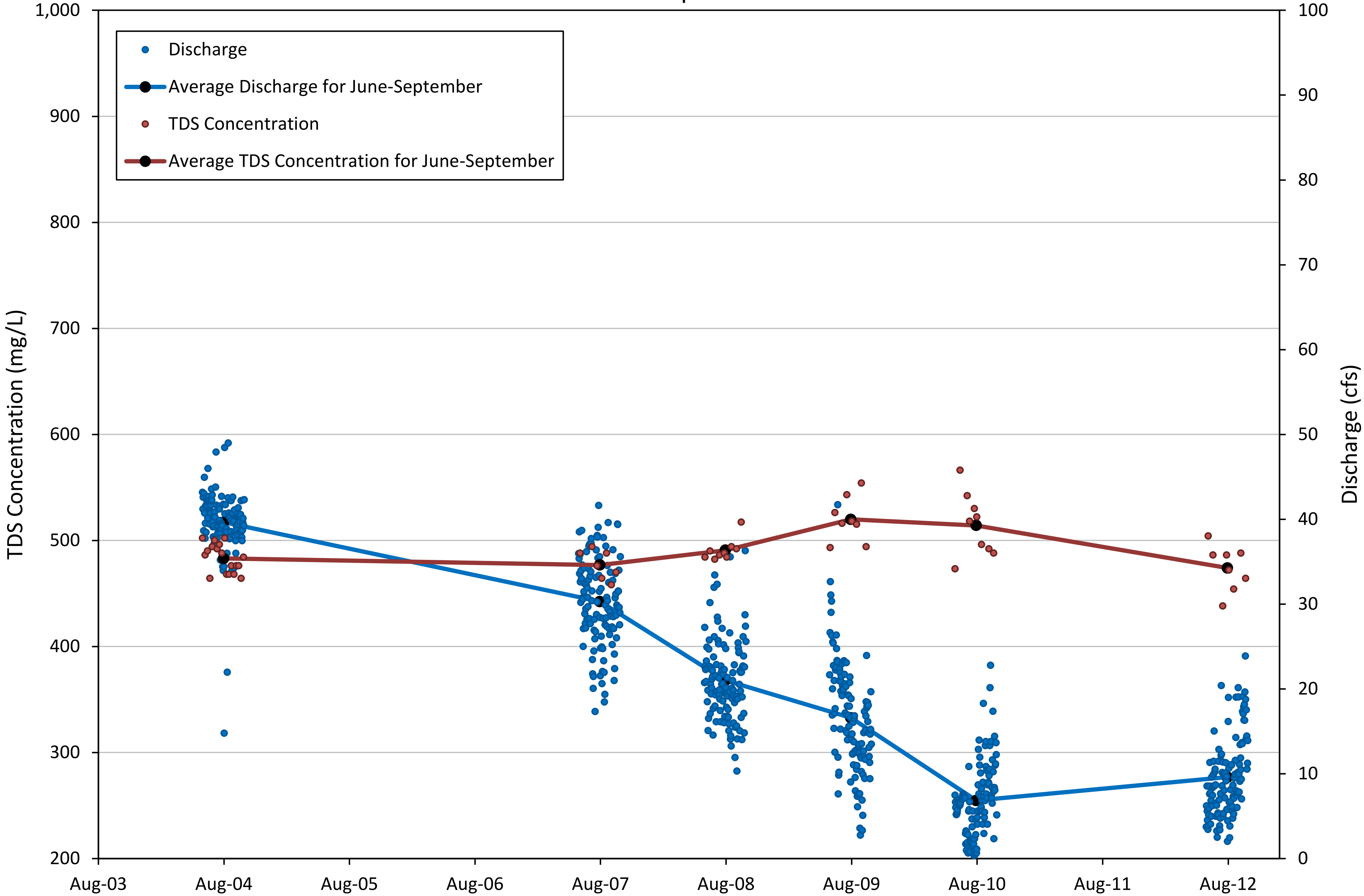

Figure 17
Influence of IEUA Discharge on the TDS Concentration of the Santa Ana River below Prado Dam