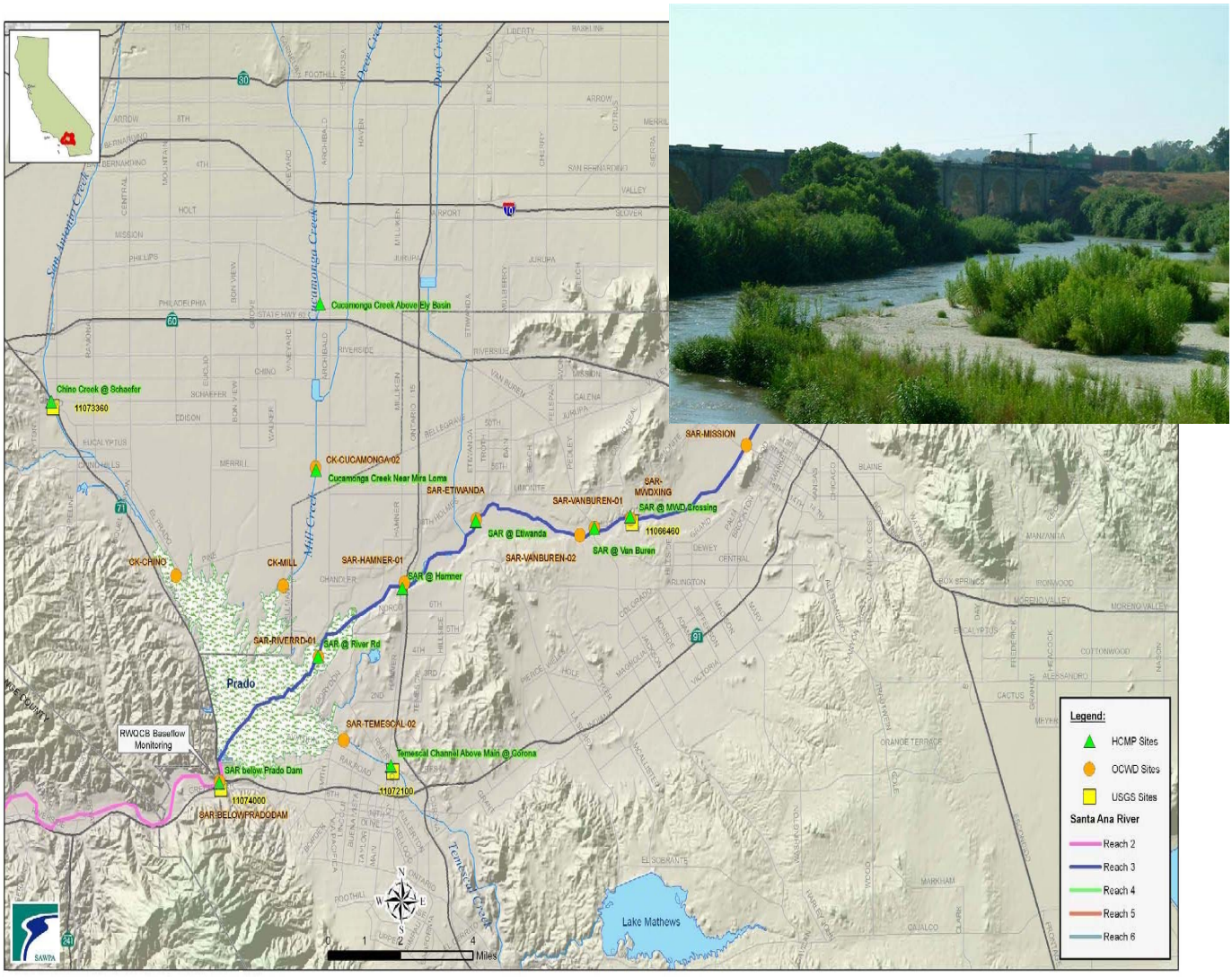
2007 ANNUAL REPORT

OF SANTA ANA RIVER WATER QUALITY

Final Report



Prepared by:

SANTA ANA WATERSHED PROJECT AUTHORITY

September 2008

TABLE OF CONTENTS

1 Introduction 1-1

2 Data Collection 2-1

3 Analysis of Monitoring Data 3-1

3.1 Santa Ana River Reach 2 3-1

3.2 Santa Ana River Reach 3 3-5

3.2.1 Below Prado Dam 3-5

3.2.2 Santa Ana River Mainstem between Riverside Narrows and Prado Wetlands 3-24

3.2.3 Tributaries to Reach 3 of the Santa Ana River 3-30

3.2.3.1 Chino Creek 3-30

3.2.3.2 Cucamonga Creek 3-34

3.2.3.3 Temescal Creek 3-36

3.3 Santa Ana River Reach 4 3-39

3.4 Santa Ana River Reach 5 3-41

4 Summary 4-1

APPENDICES

Appendix A ALL 2007 WATER QUALITY AND FLOW DATA (INCLUDED ON ENCLOSED CD) A-1

LIST OF TABLES

Table 2-1. OCWD's Santa Ana Water Quality Monitoring Locations 2-4
Table 2-2. USGS Stream Gauge Stations 2-5
Table 2-3. Hydraulic Control Monitoring Program (HCMP) Monitoring Sites 2-6
Table 2-4. Non-Tributary Discharges 2-7
Table 3-1. Monthly Volume-Weighted Moving Average TDS at Below Prado Dam 3-2
Table 3-2. Five Year Volume Weighted Moving Average TDS at Below Prado Dam 3-4
Table 3-3. Results of RWQCB 2007 Annual Baseflow Monitoring Program for the Santa Ana River at Below Prado Dam 3-5
Table 3-4. Historical Results of RWQCB Annual Baseflow Monitoring Program for the Santa Ana River at Below Prado Dam 1983-2007 3-7
Table 3-5. Summary of All Water Quality Observations for the SAR at Below Prado Dam 3-8
Table 3-6. Summary of Water Quality Observations for the Santa Ana River between Riverside Narrows and Prado Wetlands 3-25
Table 3-7. Baseflow Water Quality Observations for the SAR between Riverside Narrows and Prado Wetlands (August - September 2007) 3-27
Table 3-8. Annual Recycled Water Discharge to Santa Ana River Reach 3 and Associated Average Water Quality for Parameters of Interest 3-29
Table 3-9. Summary of Water Quality and Flow Observations for Chino Creek, Reach 1B 3-31
Table 3- 10. Annual Discharges of Flow and Average Water Quality to Chino Creek, Reach 1B 3-32
Table 3-11. Summary of Water Quality and Flow Observations for Chino Creek, Reach 2 3-33
Table 3-12. Annual Discharges of Flow and Average Water Quality to Chino Creek, Reach 2 3-34
Table 3-13. Summary of Water Quality and Flow Observations for Cucamonga Creek 3-35
Table 3-14. Annual Discharges of Flow and Average Water Quality to Cucamonga Creek 3-36
Table 3-15. Summary of Water Quality and Flow Observations for Temescal Creek 3-37
Table 3-16. Annual Discharges of Flow and Average Water Quality to Temescal Creek 3-38
Table 3-17. Summary of Water Quality and Flow Observations for Santa Ana River Reach 4 3-39
Table 3-18. Annual Discharges of Flow and Average Water Quality to Santa Ana River Reach 4 3-40
Table 3-19. Annual Discharges of Flow and Average Water Quality to San Timoteo Wash 3-42

LIST OF FIGURES

Figure 2-1a. Surface Water Monitoring Locations 2-2
Figure 2-1b. Non Tributary Dischargers 2-3
Figure 3-1. Total Dissolved Solids (TDS) at below Prado Dam 3-3
Figure 3-2. Total Nitrogen (TN) Below Prado Dam 3-9
Figure 3-3. Boron (B) Below Prado Dam 3-10
Figure 3-4. Chloride (Cl) Below Prado Dam 3-11
Figure 3-5. Chemical Oxygen Demand (COD) Below Prado Dam 3-12
Figure 3-6. Sodium (Na) Below Prado Dam 3-13
Figure 3-7. Sulfate (SO4) Below Prado Dam 3-14
Figure 3-8. Total Hardness Below Prado Dam 3-15
Figure 3-9. Total Dissolved Solids (TDS) MWD Crossing 3-16
Figure 3-10. Total Nitrogen (TN) MWD Crossing 3-17
Figure 3-11. Boron (B) MWD Crossing 3-18
Figure 3-12. Chloride (Cl) MWD Crossing 3-19
Figure 3-13. Chemical Oxygen Demand (COD) MWD Crossing 3-20
Figure 3-14. Sodium (Na) MWD Crossing 3-21
Figure 3-15. Sulfate (SO4) MWD Crossing 3-22
Figure 3-16. Total Hardness MWD Crossing 3-23
Figure 4-1. Annual Average Water Quality and Volume Discharged to Santa Ana River and Tributaries in 2007 4-2

Acronym and Abbreviations List

Acre-ft/yr	acre-feet per year
AF	acre-feet
CBWM	Chino Basin Watermaster
CCWRF	Carbon Canyon Water Reclamation Facility
COD	chemical oxygen demand
CDPH	California Department of Public Health
EC	electrical conductivity
EMWD	Eastern Municipal Water District
EPA	Environmental Protection Agency
EVMWD	Elsinore Valley Municipal Water District
HCMP	Hydraulic Control Monitoring Program
IEUA	Inland Empire Utilities Agency
JCSD	Jurupa Community Services District
LLWD	Lee Lake Water District
MG	million gallons
ug/L	micrograms per liter
mg/L	milligrams per liter
umho/cm	micromhos per centimeter
MWD	Metropolitan Water District of Southern California
NTU	nephelometric turbidity units
OCWD	Orange County Water District
RIX	Rapid Infiltration and Extraction Facility
RWQCB	Regional Water Quality Control Board, Santa Ana Region
RWQCP	Regional Water Quality Control Plant
RWWRF	Regional Wastewater Reclamation Facility
SAR	Santa Ana River
SAWPA	Santa Ana Watershed Project Authority
SWP	State Project Water

Acronym and Abbreviations List

TDS	total dissolved solids
TKN	total Kjeldahl nitrogen
TIN	total inorganic nitrogen
TN	total nitrogen
TOC	total organic carbon
TSS	total suspended solids
USGS	U.S. Geological Survey
WMWD	Western Municipal Water District
WRCRWTP	Western Riverside County Regional Wastewater Treatment Plant
WRF	Water Reclamation Facility
WRP	Water Reclamation Plant
WWTF	Wastewater Treatment Facility
WWTP	Wastewater Treatment Plant
YVWD	Yucaipa Valley Water District

1 Introduction

In 1996, the Nitrogen and Total Dissolved Solids (N/TDS) Task Force was formed to conduct scientific investigations regarding the then existing nitrogen and TDS water quality objectives of the 1995 Water Quality Control Plan for the Santa Ana River (SAR) Basin (Region 8). This Task Force, administered by the Santa Ana Watershed Project Authority (SAWPA) was comprised of 22 water supply and wastewater agencies. The work performed by the Task Force was broken out into a number of phases. In 2003, the Final Technical Memorandum was completed which reported the results of this scientific investigation, *The TIN/TDS Study – Phase 2B of the Santa Ana Watershed Wasteload Allocation Investigation*.

As a result of this work, the Regional Water Quality Control Board staff amended the Santa Ana Watershed Water Quality Control Plan (Basin Plan). The Basin Plan Amendment (hereafter the 2004 Basin Plan Amendment) was adopted by the Regional Board in January 2004, approved by the State Water Resources Control Board in September 2004, and approved by the Office of Administrative Law in December 2004.

Pursuant to the 2004 Basin Plan Amendment, certain participants in the N/TDS Task Force are required to conduct the following investigations:

- Re-computation of the triennial Ambient Water Quality over a 20 year period ; and
- Preparation of an Annual Report of Santa Ana River Water Quality.

This report fulfills the second requirement listed above – *Preparation of an Annual Report of Santa Ana River Water Quality*. Contained within this report are water quality data required to implement the surface water monitoring program necessary to determine compliance with the nitrogen and TDS objectives of the SAR and, thereby, the effectiveness of the wasteload allocations.

In Chapter 4 of the Basin Plan, the baseflow TDS, and total nitrogen objectives for Reach 3 of the River are specified. For Reach 2, a TDS objective based on a five-year, volume-weighted, moving average of the annual TDS concentration is also defined. The use of this moving average allows the effects of wet and dry years to be integrated over the five-year period and reflects the long-term quality of water recharged by Orange County Water District (OCWD) downstream of Prado Dam.

The Basin Plan specifies a monitoring program to determine compliance with the Reach 3 baseflow objectives at Prado Dam (see Chapter 4 of the Basin Plan). Regional Board staff conducts this program on an annual basis. The measurement of baseflow quality, rather than the quality of flows in Reach 2, has long been used to indicate the effects of recharge of SAR flows on Orange County groundwater. The efficacy of this approach was evaluated as part of the 2004 Basin Plan Amendment for the TDS/nitrogen management plan in the Basin Plan. As discussed in the 2004 Basin Plan Amendment, Reach 3 baseflow objectives are considered protective of the Orange County Groundwater Basin and the existing monitoring program designed to measure compliance is sufficient.

In addition to the baseflow sampling program and the surface water monitoring commitments associated with certain agencies' "maximum benefit" programs, the comprehensive monitoring program implemented by the Task Force members must include an evaluation of compliance with the TDS and nitrogen objectives for Reaches 2, 4, and 5 of the SAR. Compliance with the Reach 2 TDS objective can be determined by the evaluation of data collected by the Santa Ana River Watermaster, OCWD, the United States Geological Survey (USGS), and others. Compliance with Basin Plan objectives for Reach 4 and 5 of the SAR can be determined in the same manner.

A description of the data collected for this report is discussed in Section 2. Section 3 presents the analysis of the monitoring data collected. Results are presented by Reach of the SAR, followed by non-tributary discharges to the River. Water quality and flow data were also collected from tributaries to the SAR and, where appropriate, were compared to Basin Plan Objectives to determine compliance. Section 4 provides a summary of the report. The complete set of 2007 surface water quality and POTW discharge data is included as Appendix A on the enclosed CD.

2 Data Collection

Water quality and discharge data used to prepare the 2007 Annual Report of Santa Ana Water Quality were collected from a number of regional efforts to monitor surface water quality along the SAR and its tributaries including in-stream gauges employed by USGS. Additional sources of data included non-tributary discharges from water recycling facilities and imported water releases to the SAR and its tributaries. Surface water quality monitoring locations including USGS flow gauging stations are shown in Figure 2-1a, and other non-tributary discharge points are shown in Figure 2-1b.

A detailed description of each of these monitoring efforts follows:

The Santa Ana Regional Water Quality Control Board (RWQCB) staff conducts annual water quality monitoring of baseflow in the SAR exiting Reach 3, below Prado Dam. Monitoring extends over a four- to eight-week period during the months of August and September. Monitoring results are used to determine compliance with Reach 3 baseflow objectives. In 2007, baseflow monitoring consisted of three sampling events from September 7 through September 29. The complete set of 2007 baseflow water quality data collected exiting Reach 3 below Prado Dam by the RWQCB is included in Appendix A on the enclosed CD.

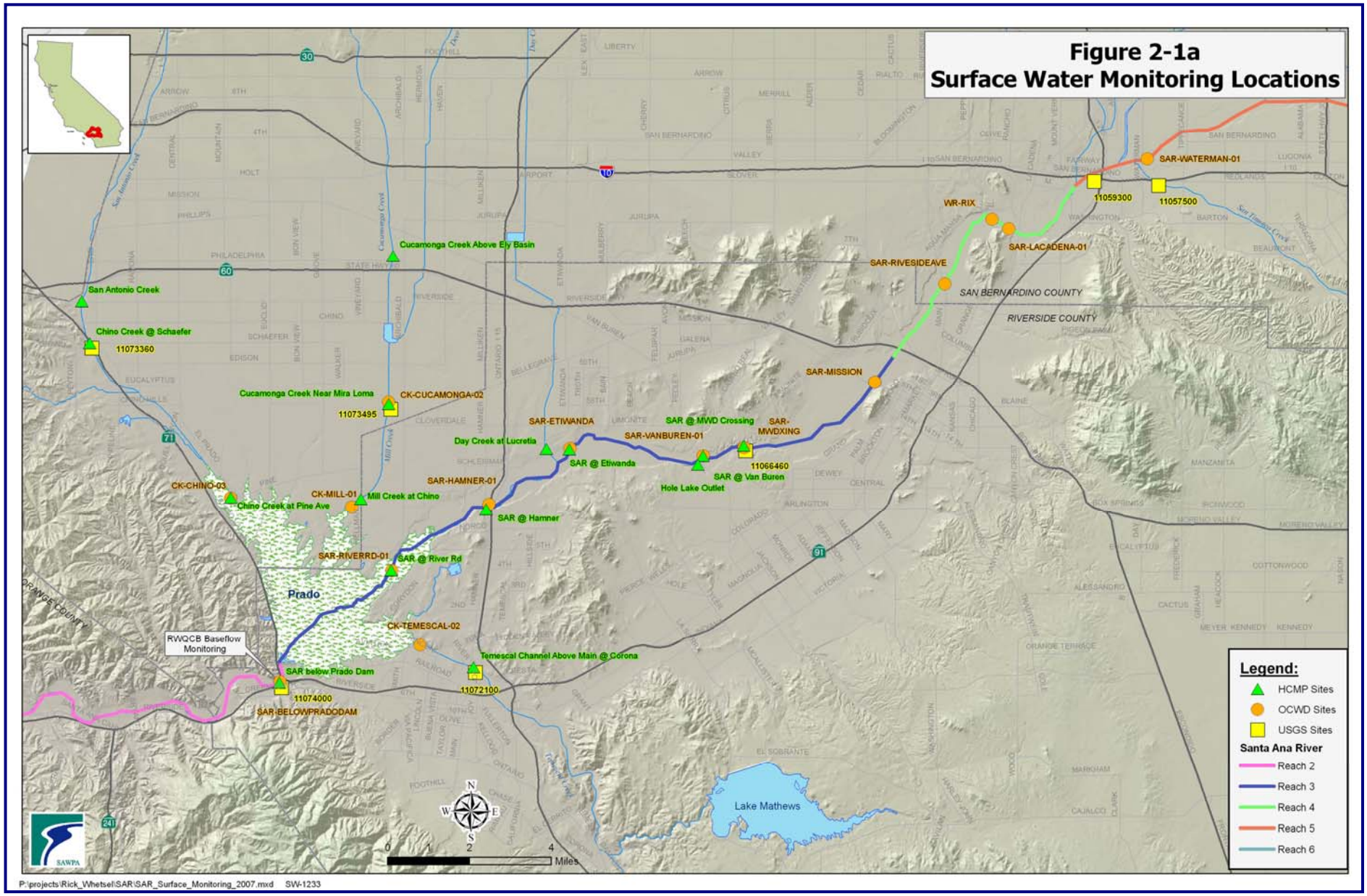


Figure 2-1a
Surface Water Monitoring Locations
SAR-WATERMAN-01
11059300
11057500
WR-RIX
SAR-LACADENA-01
SAR-RIVESIDEAVE
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
SAR-MISSION
Cucamonga Creek Above Ely Basin
San Antonio Creek
Chino Creek @ Schaefer
11073360
Cucamonga Creek Near Mira Loma
CK-CUCAMONGA-02
11073495
SAR-ETIWANDA
SAR @ MWD Crossing
SAR-MWDXING
SAR-VANBUREN-01
Day Creek at Lucretia
SAR @ Etiwanda
11066460
SAR @ Van Buren
Hole Lake Outlet
SAR-HAMNER-01
CK-CHINO-03
CK-MILL-01
Mill Creek at Chino
Chino Creek at Pine Ave
SAR @ Hamner
SAR-RIVERRD-01
SAR @ River Rd
Prado
CK-TEMESCAL-02
RWQCB Baseflow Monitoring
Temescal Channel Above Main @ Corona
SAR below Prado Dam
11072100
11074000
SAR-BELOWPRADODAM
Lake Mathews
Legend:
HCMP Sites
OCWD Sites
USGS Sites
Santa Ana River
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Miles
P:\projects\Rick_Whetsel\SAR\SAR_Surface_Monitoring_2007.mxd SW-1233

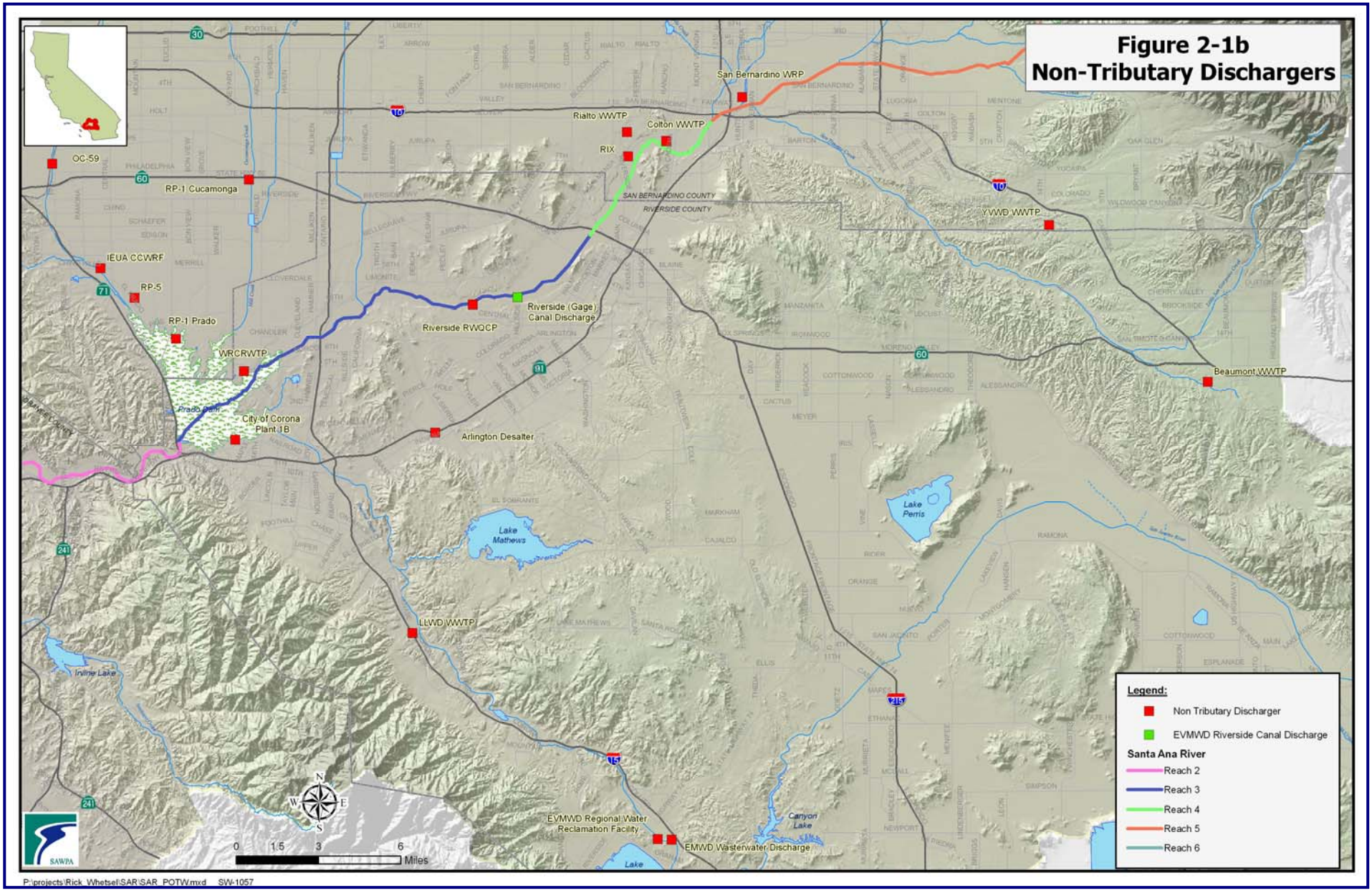


Figure 2-1b
Non-Tributary Dischargers
San Bernardino WRP
Rialto WWTP
Colton WWTP
RIX
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
YVWD WWTP
OC-59
RP-1 Cucamonga
IEUA CCWRF
RP-5
RP-1 Prado
WRCRWTP
Prado Dam
City of Corona Plant 1B
Riverside RWQCP
Riverside (Gage) Canal Discharge
Arlington Desalter
Beaumont WWTP
Lake Perris
Lake Mathews
LLWD WWTP
Irvine Lake
EVMWD Regional Water Reclamation Facility
EMWD Wasterwater Discharge
Canyon Lake
Legend:
Non Tributary Discharger
EVMWD Riverside Canal Discharge
Santa Ana River
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
0 1.5 3 6
Miles
P:\projects\Rick_Whetsel\SAR\SAR_POTW.mxd SW-1057

OCWD conducts a monitoring program for the SAR to assess the quality of the SAR water recharged into the Orange County Groundwater Basin. OCWD collects monthly and quarterly samples from the SAR at Imperial Highway in Anaheim and other locations along the SAR below Prado Dam and its tributaries. During the month of August, monitoring is performed with a greater sampling frequency to capture base flow conditions within the watershed. Above Prado Dam OCWD collects samples from a single monitoring event in August. These data are used in this report to evaluate water quality for Reaches 2, 3, and 4 of the SAR and Reach 1B of Chino Creek during low flow conditions. OCWD monitoring locations used in this report are presented in Table 2-1. In later tables and figures, OCWD stations are referred to by their map location. The complete set of 2007 SAR water quality data collected by the OCWD is included in Appendix A on the enclosed CD.

Table 2-1. OCWD's Santa Ana Water Quality Monitoring Locations

Station ID	Station Name	Tributary
8105	SAR-BELOWDAM-01	Santa Ana River Reach 2
8096	SAR-RIVERRD-01	Santa Ana River Reach 3
8111	SAR-HAMNER-01	Santa Ana River Reach 3
9672	SAR-ETIWANDA-01	Santa Ana River Reach 3
8112	SAR-VANBUREN-01	Santa Ana River Reach 3
8113	SAR-MWDXING-01	Santa Ana River Reach 3
8094	CK-CHINO-03	Chino Creek
8090	CK-MILL-01	Cucamonga Creek
17576	CK-CUCAMONGA-02	Cucamonga Creek
8107	CK-TEMESCAL-02	Temescal Creek
8114	SAR-MISSION-01	Santa Ana River Reach 4
8115	SAR-RIVERSIDEAVE-01	Santa Ana River Reach 4
14655	WR-RIX-01	Santa Ana River Reach 4
	SAR-LACADENA-01	Santa Ana River Reach 4
8117	SAR-WATERMAN-01	Santa Ana River Reach 5

The USGS maintains seven active gauging stations to monitor flow and water quality along the SAR and several of its tributaries. Long-term stream flow and water quality data are available for gauging stations 11074000, *located at Below Prado Dam*, and gauging station 11066460, *located at MWD Crossing*. Data available from the other gauging stations, however, includes only stream flow and are used only to provide information on annual stream flow at various locations throughout the watershed. The complete list of USGS gauging stations used in this report is presented in Table 2-2. The complete set of 2007 flow and water quality data available from the USGS is included in Appendix A on the enclosed CD.

Table 2-2. USGS Stream Gauge Stations

USGS ID	Station Name	2007 Flow (AFY)	Tributary
11074000	Santa Ana River Below Prado Dam	162,657	Santa Ana River Reach 2
11073360	Chino Creek at Schaefer Avenue near Chino	2,755	Chino Creek
11072100	Temescal Creek above Main St at Corona	14,325	Temescal Creek
11073495	Cucamonga Creek nr Mira Loma	37,892	Cucamonga Creek
11066460	Santa Ana River at MWD Crossing	63,421	Santa Ana River Reach 3
11059300	Santa Ana River at E St near San Bernardino	9,235	Santa Ana River Reach 5
11057500	San Timoteo Creek near Loma Linda	4,135	San Timoteo Creek

The Chino Basin Hydraulic Control Monitoring Program (HCMP) is conducted jointly by the Chino Basin Watermaster (CBWM) and Inland Empire Utility Agency (IEUA) as part of their Maximum Benefit monitoring commitment. Water quality data collected through this program is used in this report to evaluate compliance with Basin Plan objectives for Reaches 2 and 3 of the SAR. The HCMP program collects monthly and bi-monthly samples from locations along the SAR (both above and below Prado Dam) and its tributaries. HCMP monitoring locations used in this report are presented in Table 2-3. The complete set of 2007 water quality data collected through the HCMP is included in Appendix A on the enclosed CD.

Table 2-3. Chino Basin Hydraulic Control Monitoring Program (HCMP) Monitoring Sites

Station ID	Site Name	Tributary
1207122	Santa Ana River Below Prado Dam	Santa Ana River Reach 2
1207120	Santa Ana River at River Road	Santa Ana River Reach 3
1207119	Santa Ana River at Hamner	Santa Ana River Reach 3
1207118	Santa Ana River at Etiwanda	Santa Ana River Reach 3
1208412	Day Creek at Lucretia	Tributary to Santa Ana River Reach 3
1207117	Hole Lake Outlet	Tributary to Santa Ana River Reach 3
1207121	Santa Ana River at Van Buren	Santa Ana River Reach 3
1207098	Santa Ana River at MWD Xing	Santa Ana River Reach 3
1208388	Chino Creek at Pine Ave	Chino Creek
1207114	Chino Creek at Schaefer	Chino Creek
1207124	San Antonio Creek	Chino Creek
1208306	Mill Creek at Chino	Cucamonga Creek
1207116	Cucamonga Creek Near Mira Loma	Cucamonga Creek
1207115	Cucamonga Creek Above Ely Basin	Cucamonga Creek
1207123	Temescal Channel above Main at Corona	Temescal Creek

Data for non-tributary discharges were compiled from individual communications with facility operators and from data made available from the SAR Watermaster. This includes discharge monitoring report data from sixteen facilities producing recycled water and the Arlington desalter, which may also discharge to the system. Additionally included under this category are records maintained by OCWD of imported water released at OC-59 located on San Antonio Creek. Non-tributary discharges are listed in Table 2-4. The complete set of 2007 discharge water quality data compiled for this report is included in Appendix A on the enclosed CD.

Table 2-4. Non-Tributary Discharges

Agency	Facility	Receiving Water
City of Riverside Public Works Department	City of Riverside Regional Water Quality Control Plant	Santa Ana River Reach 3
City of Riverside Public Works Department	Gage Canal Discharge	Santa Ana River Reach 3
Western Riverside County Regional Wastewater Authority	Western Riverside County Regional Wastewater Treatment Plant	Santa Ana River Reach 3
Inland Empire Utilities Agency	IEUA RP-1 Cucamonga	Cucamonga Creek
Orange County Water District	OCWD-OC-59 turn out *	San Antonio Creek
Inland Empire Utilities Agency	IEUA RP-1 El Prado	Chino Creek
Inland Empire Utilities Agency	IEUA RP-5	Chino Creek
Inland Empire Utilities Agency	IEUA Carbon Canyon Water Reclamation Facility	Chino Creek
Western Municipal Water District	WMWD Arlington Desalter	Temescal Creek
Lee Lake Water District	LLWD Wastewater Treatment Plant	Temescal Creek
City of Corona Public Works Department	City of Corona Wastewater Treatment Plant 1B	Temescal Creek
Eastern Municipal Water District	EMWD Wastewater Treatment Plant	Temescal Creek
Elsinore Valley Municipal Water District	EVMWD Regional Water Reclamation Facility	Temescal Creek
City of San Bernardino Water Department	City of San Bernardino Rapid Infiltration Facility (RIX)	Santa Ana River Reach 4
City of Rialto Public Works Department	City of Rialto Wastewater Treatment Plant	Santa Ana River Reach 4
City of Colton Public Works Department	City of Colton Waste Water Treatment Facility *	Santa Ana River Reach 4
City of San Bernardino Water Department	City of San Bernardino Water Reclamation Plant	Santa Ana River Reach 5
Yucaipa Valley Water District	YVWD Wastewater Reclamation Facility	San Timoteo Creek
City of Beaumont Public Works Department	City of Beaumont Wastewater Treatment Plant No.1	San Timoteo Creek

** Note: In 2007, there were no discharges from OCWD – OC-59 turn out, or from the City of Colton WWTF.*

3 Analysis of Monitoring Data

3.1 Santa Ana River Reach 2

Water quality objectives specified for Reach 2 of the SAR by the Basin Plan include only a TDS objective of 650 mg/L. No other water quality objectives are specified for Reach 2. The TDS objective of 650 mg/L is based on a five-year, volume-weighted, moving average. Annual flow-weighted TDS averages are reported in the Annual Reports of the SAR Watermaster. Using the same method as the Santa Ana River Watermaster, data collected from OCWD, USGS, and for the HCMP were plotted and a five-year, volume-weighted moving average was calculated to determine compliance with this objective.

During the 2007 calendar year, sixty-five samples were collected for TDS at *Below Prado Dam*. These included grab samples collected by the RWQCB, USGS, OCWD, and by CBWM/IEUA for the HCMP. From the results of these samples, electrical conductivity (EC) and TDS were graphically plotted. A linear regression of TDS versus EC yielded the following equation:

$$TDS = (EC \times 0.5534) + 68.702$$

The coefficient of determination of the linear regression was 0.73, which indicates a strong correlation between TDS and EC; that is, about 73 percent of the variability in TDS is explained by this equation. Using the above equation and daily EC data from a continuous monitoring device operated by USGS, daily TDS values were calculated for the all of 2007. Daily streamflow values at *Below Prado Dam* were multiplied by the computed TDS values and summed for each month. This total was divided by the total monthly flow in order to yield a volume-weighted average for each month. These results are shown in Table 3-1. The 5-year volume-weighted TDS average for the period January 2003 thru December 2007 was 455 mg/L. This represents an increase of 7 mg/L from last year's 5-year volume-weighted TDS average of 448 mg/L. A five-year, volume-weighted, moving average was calculated using these values in addition to historic flow-weighted TDS averages calculated by the SAR Watermaster. Figure 3-1 shows the time history for TDS observations (1967 to the present), the volume-weighted average TDS concentrations at *Below Prado Dam* (1974 to the present), the five-year moving average TDS concentration (1972 to the present), and the five-year, volume-weighted, moving average TDS concentration (1978 to the present).

The five-year, volume-weighted, moving average for TDS is the compliance metric for Reach 2. This statistic has never exceeded the Basin Plan objective of 650 mg/L for the period shown. The five-year, volume-weighted moving average TDS concentration has decreased over time from the mid 1980s until about 2000 when TDS concentration were observed to slightly increase. This upward trend continued until about 2004 when TDS concentrations again began to decrease through to the present.

During wet periods, not all of the water flowing from Prado Dam is captured for recharge in Orange County. Therefore, a volume-weighted average may not be representative of the quality of water actually recharged. For comparison, the five-year moving average TDS, based on discrete samples collected by OCWD, RWQCB, USGS, and by CBWM/IEUA for the HCMP, is plotted on Figure 3-1 and shown in Table 3-2 as well. The volume-weighted and non-volume-weighted moving averages are quite similar. However, the five-year moving average exceeded 650 mg/L before 1976 and between 1984 and 1988. After the mid-1980s, TDS concentrations decrease monotonically until about 2000; wherein, a slight increase in TDS concentration is observed. The non-volume-weighted moving average also began to decrease around 2004, but not as significantly.

Table 3-1. Monthly Volume-Weighted Moving Average TDS at Below Prado Dam

Month	Monthly Flow	Monthly Volume Weighted TDS	Monthly Flow X TDS
	(cfs-days)	(mg/L)	
Jan-03	10,428	576	6,006,528
Feb-03	19,430	318	6,178,740
Mar-03	18,355	350	6,424,250
Apr-03	14,631	396	5,793,876
May-03	11,653	531	6,187,743
Jun-03	9,170	611	5,602,870
Jul-03	6,489	587	3,809,043
Aug-03	6,105	567	3,461,535
Sep-03	6,276	548	3,439,248
Oct-03	7,187	531	3,816,096
Nov-03	8,088	552	4,463,324
Dec-03	7,729	551	4,261,015
Jan-04	11,738	538	6,316,149
Feb-04	20,503	352	7,220,108
Mar-04	11,983	415	4,978,063
Apr-04	10,118	590	5,972,242
May-04	8,358	592	4,944,367
Jun-04	5,947	579	3,445,582
Jul-04	5,691	584	3,322,480
Aug-04	4,938	593	2,926,626
Sep-04	5,663	560	3,169,760
Oct-04	28,203	317	8,954,315
Nov-04	9,491	480	4,553,368
Dec-04	16,765	490	8,218,969
Jan-05	104,306	246	25,673,765
Feb-05	54,879	317	17,371,844
Mar-05	29,605	426	12,598,107
Apr-05	21,433	413	8,850,577
May-05	14,246	483	6,882,591
Jun-05	12,328	508	6,257,422
Jul-05	10,557	584	6,165,791
Aug-05	12,477	535	6,670,158
Sep-05	7,627	580	4,425,838
Oct-05	8,892	507	4,507,431
Nov-05	8,753	616	5,395,727
Dec-05	9,442	594	5,609,985
Jan-06	10,582	537	5,679,875
Feb-06	9,045	624	5,644,711
Mar-06	14,902	420	6,260,662
Apr-06	23,460	363	8,521,994
May-06	13,680	494	6,760,821
Jun-06	9,107	583	5,305,597
Jul-06	7,057	621	4,382,420
Aug-06	5,455	632	3,445,292
Sep-06	5,317	632	3,358,636
Oct-06	5,918	572	3,384,215
Nov-06	6,562	561	3,683,925
Dec-06	8,336	582	4,854,590
Jan-07	8,647	631	5,459,258
Feb-07	8,514	600	5,112,068
Mar-07	7,951	624	4,963,395
Apr-07	7,225	609	4,402,060
May-07	6,204	624	3,874,264
Jun-07	5,093	638	3,247,941
Jul-07	4,725	630	2,977,831
Aug-07	4,711	625	2,944,281
Sep-07	4,937	597	2,945,965
Oct-07	5,488	637	3,497,357
Nov-07	5,469	634	3,467,037
Dec-07	13,042	603	7,869,518
Total	**760,911**		**345,919,245**
5 - Year Volume Weighted Average: 455 mg/L			

Figure 3-1. Total Dissolved Solids (TDS) at below Prado Dam

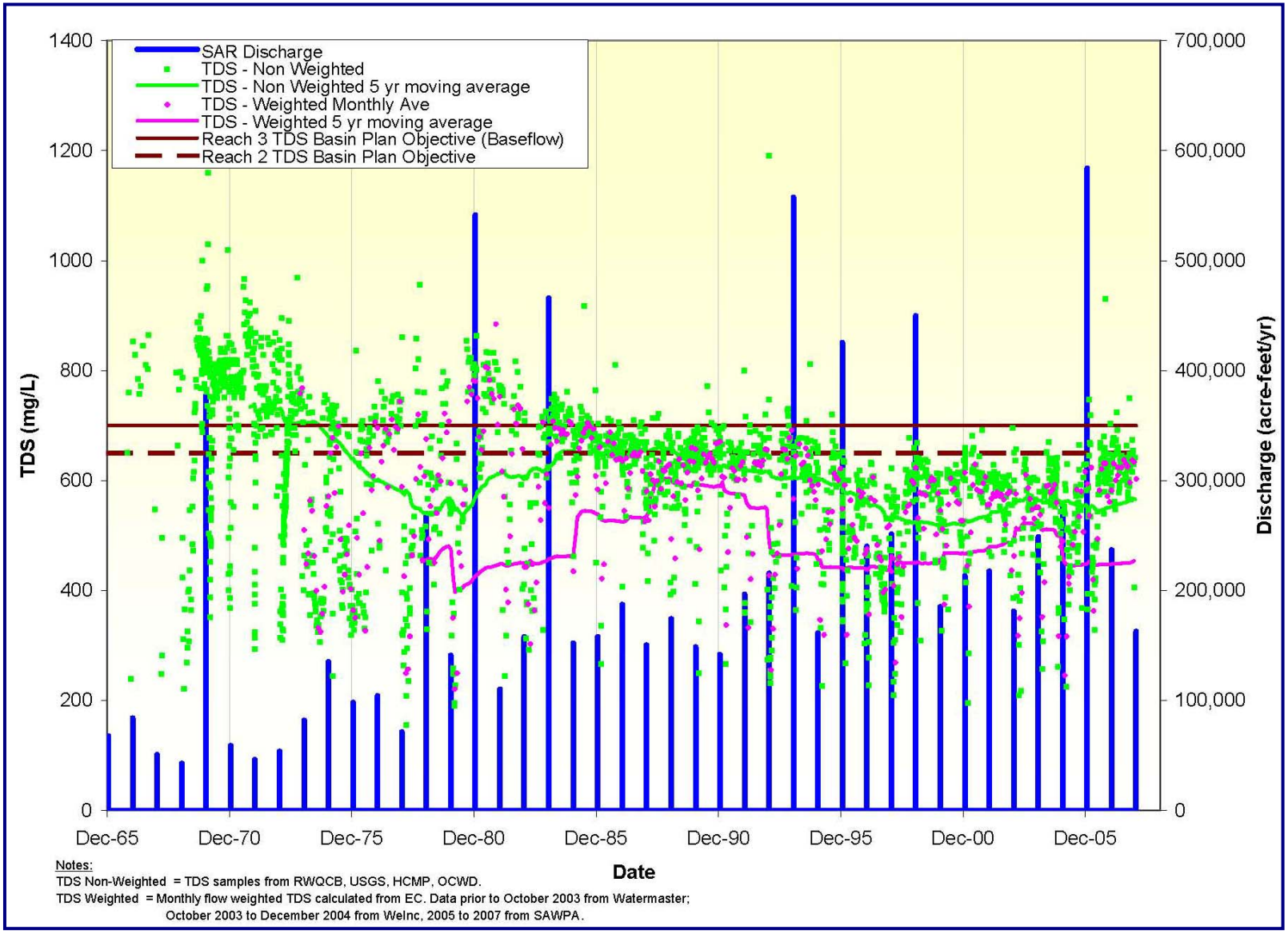


Table 3-2. Five Year Volume Weighted Moving Average TDS at Below Prado Dam

5 Year Intervals	5 Year Volume Weighted Moving Average
	(mg/L)
1974-1978	454.5
1975-1979	480.9
1976-1980	422.4
1977-1981	446.8
1978-1982	450.0
1979-1983	454.1
1980-1984	461.5
1981-1985	539.9
1982-1986	525.9
1983-1987	533.0
1984-1988	603.9
1985-1989	596.6
1986-1990	590.7
1987-1991	574.6
1988-1992	547.8
1989-1993	465.3
1990-1994	465.9
1991-1995	441.7
1992-1996	440.1
1993-1997	437.3
1994-1998	451.0
1995-1999	449.8
1996-2000	468.1
1997-2001	474.6
1998-2002	487.3
1999-2003	520.1
2000-2004	498.4
2001-2005	447.7
2002-2006	447.5
2003-2007	454.6

3.2 Santa Ana River Reach 3

3.2.1 Below Prado Dam

Compliance with water quality objectives for Reach 3 is determined using data collected by the RWQCB at *Below Prado Dam* through their annual baseflow monitoring program. 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 2007 baseflow monitoring consisted of four sampling events conducted during September. The data collected through this program is presented in Table 3-3.

Table 3-3. Results of RWQCB 2007 Annual Baseflow Monitoring Program for the Santa Ana River at Below Prado Dam

Parameter	Units	Basin Plan Objectives SAR Reach 3	9/7/2007	9/13/2007	9/20/2007	9/27/2007
Ammonia-Nitrogen	mg/L		0.08	0.06	0.07	0.10
Bicarbonate (as CaCO3)	mg/L		-na-	-na-	250	260
Boron	mg/L	**0.75**	-na-	-na-	0.32	0.29
Calcium	mg/L		-na-	-na-	77	70
Carbonate (as CaCO3)	mg/L		-na-	-na-	0.0	0.0
Chemical Oxygen Demand	mg/L	**30**	-na-	-na-	47	42
Chloride	mg/L	**140**	-na-	-na-	130	130
Electrical Conductivity	umhos/cm		-na-	-na-	1000	1000
Hydroxide (as CaCO3)	mg/L		-na-	-na-	0.0	0.0
Magnesium	mg/L		-na-	-na-	19	18
Nitrate-Nitrogen	mg/L		4.3	6	6.3	5.1
Nitrite-Nitrogen	mg/L		0.01	0.01	0.02	0.03
Organic Nitrogen	mg/L		1.3	1.1	1	1.2
pH	units		8.2	8.2	8.2	8.1
Potassium	mg/L		-na-	-na-	15	13
Sodium	mg/L	**110**	-na-	-na-	100	100
Sulfate	mg/L	**150**	-na-	-na-	110	110
Total Alkalinity (as CaCO3)	mg/L		-na-	-na-	200	210
Total Dissolved Solids	mg/L	**700**	570	600	590	*
Total Hardness (as CaCO3)	mg/L	**350**	-na-	-na-	270	250
Total Kjeldahl Nitrogen	mg/L		1.4	1.2	1.1	1.3
Total Nitrogen	mg/L	**10**	5.7	7.2	7.4	6.4
Total Organic Carbon	mg/L		4.5	3.8	6.3	4.5

Note: Exceedances are shown in red lettering.

** Note: the TDS measurement of 750 mg/L collected on 9/27/2007 was removed from this table. According to the Standard Methods Equation adding up the ions that make up TDS should equate to the following; TDS= (.6 x Alkalinity) + Na + K + Ca + Mg + Cl + SO4 + SiO3 + NO3-N + F*
We have TDS = .6x210 + 100 + 13 + 70 + 18 + 130 + 110 + SiO3 + 5.1 + F = 572.1 mg/L + SiO3 + F
Assuming SiO3 is = 10 and F is = 1 we would have TDS = 583.1 not 750 (note: SiO3 and F are usually considered negligible and not analyzed, the use of 10 and 1 is conservative)
Standard convention is that (Measured TDS)/(calculated TDS) should not exceed 1.20. Here we have 750/583.1 = 1.29
The TDS for the prior weeks are 585 and 590 which are consistent with the calculated concentration of 583.1 (with SiO3 and F assumptions)

Data collected by RWQCB staff during 2007 for each constituent were summarized as average annual values (based upon the September sampling) and compared to the Reach 3 water quality objectives. Total Organic Carbon (TOC) was included in this analysis as California Department of Public Health (CDPH) is expected to finalize groundwater recharge regulations for TOC in the near future and a TOC objective may be incorporated in the Basin Plan (Hope Smythe, personal communication, 2006). The results of this analysis for 2007, as well as, historical summaries dating back to 1983 are summarized in Table 3-4.

For 2007, as shown in Table 3-4, one of the constituents, based upon sample averages, exceeded the water quality objectives specified in the Basin Plan. In 2007, samples of COD taken from base flow below Prado Dam reported an average value of 45 mg/L exceeding the Basin Plan objective of 30 mg/L. Over the twenty-five year period that records have been maintained, including 2007 data, these water quality objectives have only been exceeded by COD ten times, total hardness twice, sulfate twice, TDS once, and TN seven times. These exceedances are shown in red lettering in Table 3-4.

Table 3-4. Historical Results of RWQCB Annual Baseflow Monitoring Program for the Santa Ana River at Below Prado Dam 1983-2007

Year	Boron (mg/L)	Calcium	Carbonate (as CaCO3)	Chemical Oxygen Demand (mg/L)	Chloride (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Total Dissolved Solids (mg/L)	Total Hardness (as CaCO3) (mg/L)	Total Nitrogen (mg/L)	Total Organic Carbon (mg/L)
1983	0.30	-na-	-na-	86	85	91	-na-	716	356	8.3	-na-
1984	0.40	-na-	-na-	58	116	96	159	683	350	7.3	-na-
1985	0.33	-na-	-na-	33	115	96	150	682	339	9.8	-na-
1986	0.25	-na-	-na-	43	115	97	127	656	290	10.2	-na-
1987	0.45	-na-	-na-	23	97	97	134	641	323	10.2	-na-
1988	0.25	-na-	-na-	37	111	100	130	629	297	10.3	-na-
1989	0.30	-na-	-na-	31	116	102	128	635	290	10.2	9.9
1990	0.36	-na-	-na-	26	117	107	128	640	289	11.9	9.0
1991	0.36	-na-	-na-	18	101	90	114	648	281	10.9	5.3
1992	0.36	-na-	-na-	18	110	98	108	617	282	10.6	4.9
1993	-na-	-na-	-na-	33	126	102	128	672	288	8.2	-na-
1994	0.38	-na-	-na-	43	114	101	140	629	286	8.6	5.5
1995	0.28	-na-	-na-	27	103	91	104	636	276	7.5	4.8
1996	0.27	-na-	-na-	21	89	88	106	578	250	9.5	6.4
1997	0.36	-na-	-na-	20	70	89	112	607	218	7.2	9.7
1998	0.30	-na-	-na-	27	96	85	100	524	264	7.4	4.7
1999	0.34	-na-	-na-	30	104	100	110	586	271	6.3	4.8
2000	0.32	-na-	-na-	16	107	105	105	562	251	6.8	4.9
2001	0.33	-na-	-na-	15	109	97	100	633	276	6.2	5.1
2002	0.32	-na-	-na-	12	103	97	92	497	228	4.3	6.1
2003	0.28	-na-	-na-	13	108	94	93	603	254	5.8	5.0
2004*	0.30	-na-	-na-	16	113	105	115	660	269	6.1	5.4
2005	0.26	-na-	-na-	14	96	85	89	538	250	3.6	7.1
2006	0.25	83.5	0	12	112	106	116	666	295	6.3	4.4
2007	0.31	73.5	0	45	130	100	110	587	260	6.7	4.8
Basin Plan Objective	**0.75**			**30**	**140**	**110**	**150**	**700**	**350**	**10.0**	

Note: Exceedances are shown in red lettering.

** In 2004 RWQCB Data was adjusted to account for water imports at OC-59.*

This was performed as follows:
1. Determine the mass of pollutants for the imported water at OC-59 (average measured water conc x total imported volume).
2. Determine the mass of pollutants that passed through Prado for comparable time period "at below Prado" (average measured water conc x total flow volume).
3. Subtract out the imported pollutant mass and flow from the data recorded "at below Prado".

A summary of all monitoring data collected by the RWQCB, USGS, OCWD, and CBWM/IEUA at *Below Prado Dam* during 2007 along with Basin Plan objectives for SAR Reach 3 water quality are presented in Table 3-5. This data includes the three monitoring events conducted by the RWQCB for their annual water quality monitoring of baseflow in the SAR during September 2007. The CBWM/IEUA, through the HCMP, conducted bi-monthly monitoring at *Below Prado Dam* during 2007, including twenty-six sampling events during 2007. OCWD conducted seventeen near monthly monitoring events at *Below Prado Dam*, including five monitoring events conducted in August and September 2007. The USGS

conducted bi-monthly monitoring at *Below Prado Dam*, including twenty-four sampling events during 2007.

In 2007, a lack of rainfall resulted in low-flow conditions similar to summer baseflow conditions throughout much of the year. This resulted in higher annual average water quality concentrations for parameters of interest, which were similar or higher than reported for the summer baseflow period of August – September.

Table 3-5. Summary of All Water Quality Observations for the SAR at Below Prado Dam

Constituent	Units	Basin Plan Objectives Santa Ana River Reach 3	Annual Average	# of Samples	Baseflow Average	# of Samples
Ammonia-Nitrogen	mg/L		0.09	60	0.08	15
Bicarbonate (as CaCO3)	mg/L		213	58	205	13
Boron	mg/L	**0.75**	0.30	26	0.31	7
Calcium	mg/L		80	40	76	11
Carbonate (as CaCO3)	mg/L		9.1	52	14.0	13
Chemical Oxygen Demand	mg/L	**30**	17	6	17	6
Chloride	mg/L	**140**	123	58	124	13
Electrical Conductivity	umhos/cm		982	378	1003	43
Hydroxide (as CaCO3)	mg/L		0.00	40	0.00	11
Magnesium	mg/L		20	40	19	11
Nitrate-Nitrogen	mg/L		5.3	60	5.2	15
Nitrite-Nitrogen	mg/L		0.05	60	0.05	15
Organic Nitrogen	mg/L		0.7	30	0.5	10
pH	units		8.3	60	8.4	15
Potassium	mg/L		13	40	13	11
Sodium	mg/L	**110**	109	40	108	11
Sulfate	mg/L	**150**	108	58	104	13
Total Alkalinity (as CaCO3)	mg/L		206	58	205	13
Total Dissolved Solids	mg/L	**700**	628	65	621	16
Total Hardness (as CaCO3)	mg/L	**350**	264	17	256	7
Total Inorganic Nitrogen	mg/L	**10**	5.2	23	4.7	4
Total Kjeldahl Nitrogen	mg/L		1.1	42	1.2	13
Total Nitrogen	mg/L		6.3	60	5.9	15
Total Organic Carbon	mg/L		4.9	44	5.0	15
Turbidity	NTU		54	38	60	9

A long time-history of water quality data has been collected by USGS along with data collected by OCWD, RWQCB baseflow monitoring program, and by CBWM/IEUA at *Below Prado Dam* and *MWD Crossing*. These data were plotted for each constituent that has a Basin Plan objective and are shown in Figures 3-2 through 3-16. To show the longer-term trends in baseflow data, and non-baseflow water quality samples, as well as five-year moving averages.

Figure 3-2. Total Nitrogen (TN) Below Prado Dam

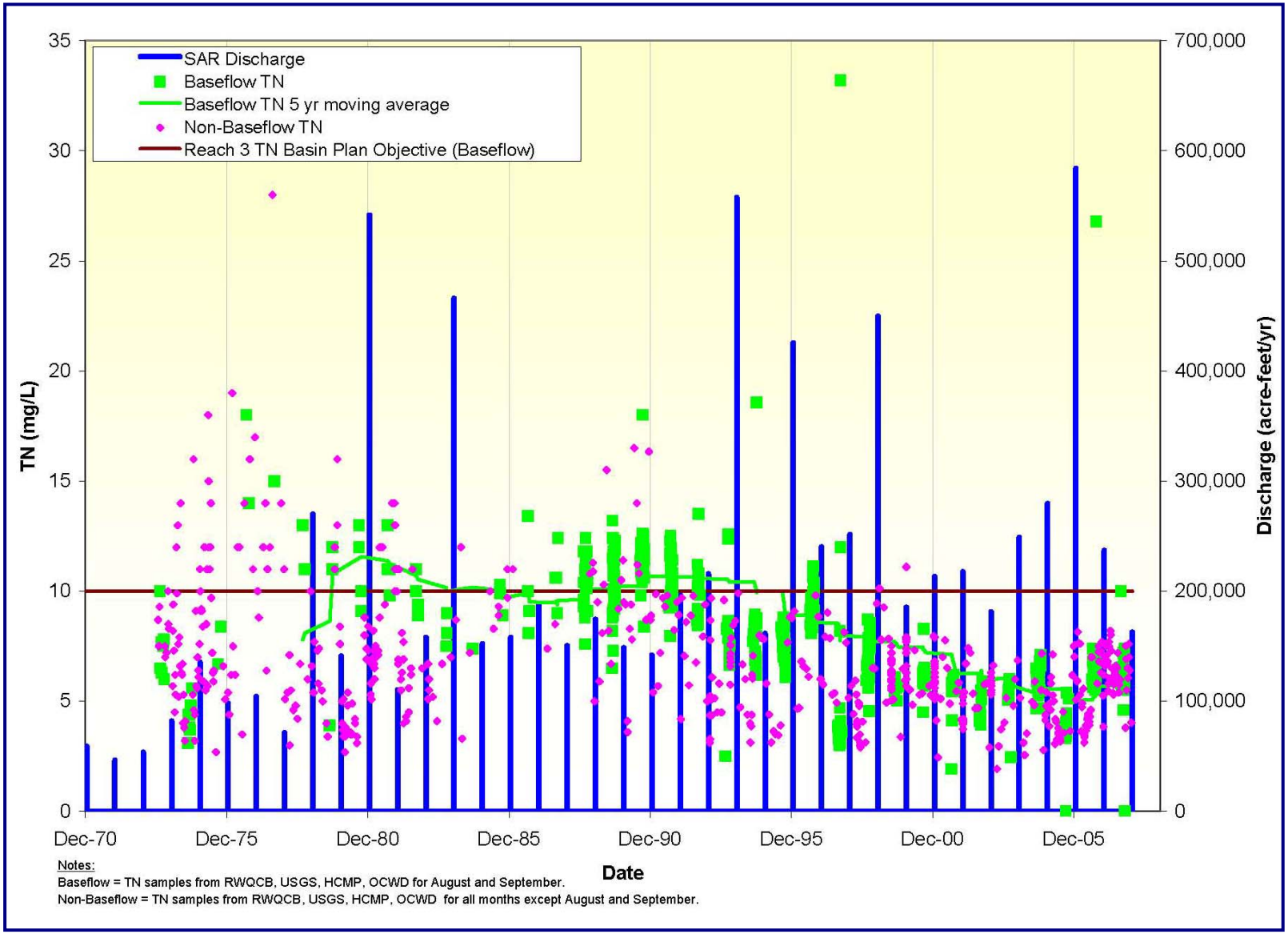


Figure 3-3. Boron (B) Below Prado Dam

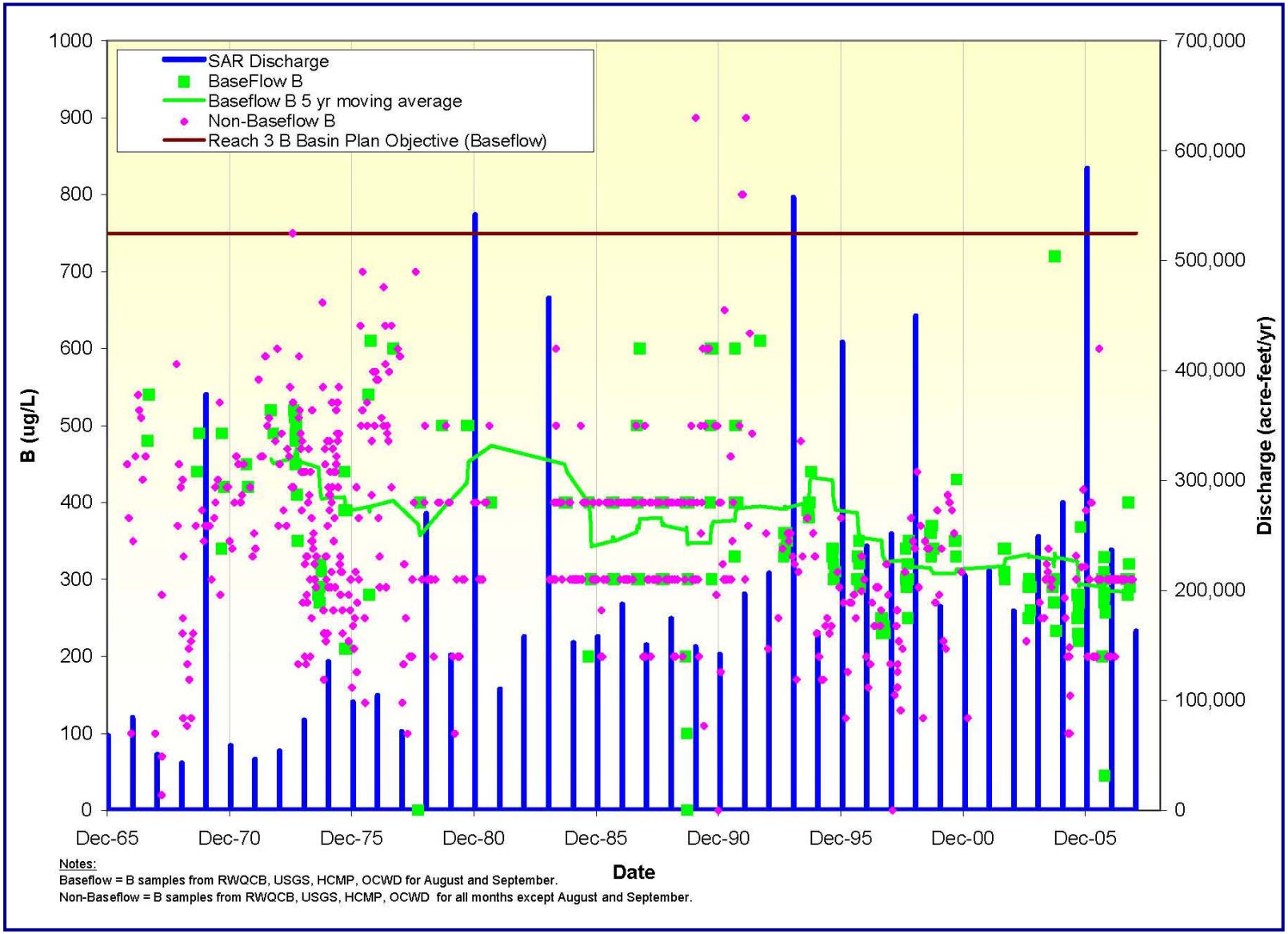


Figure 3-4. Chloride (Cl) Below Prado Dam

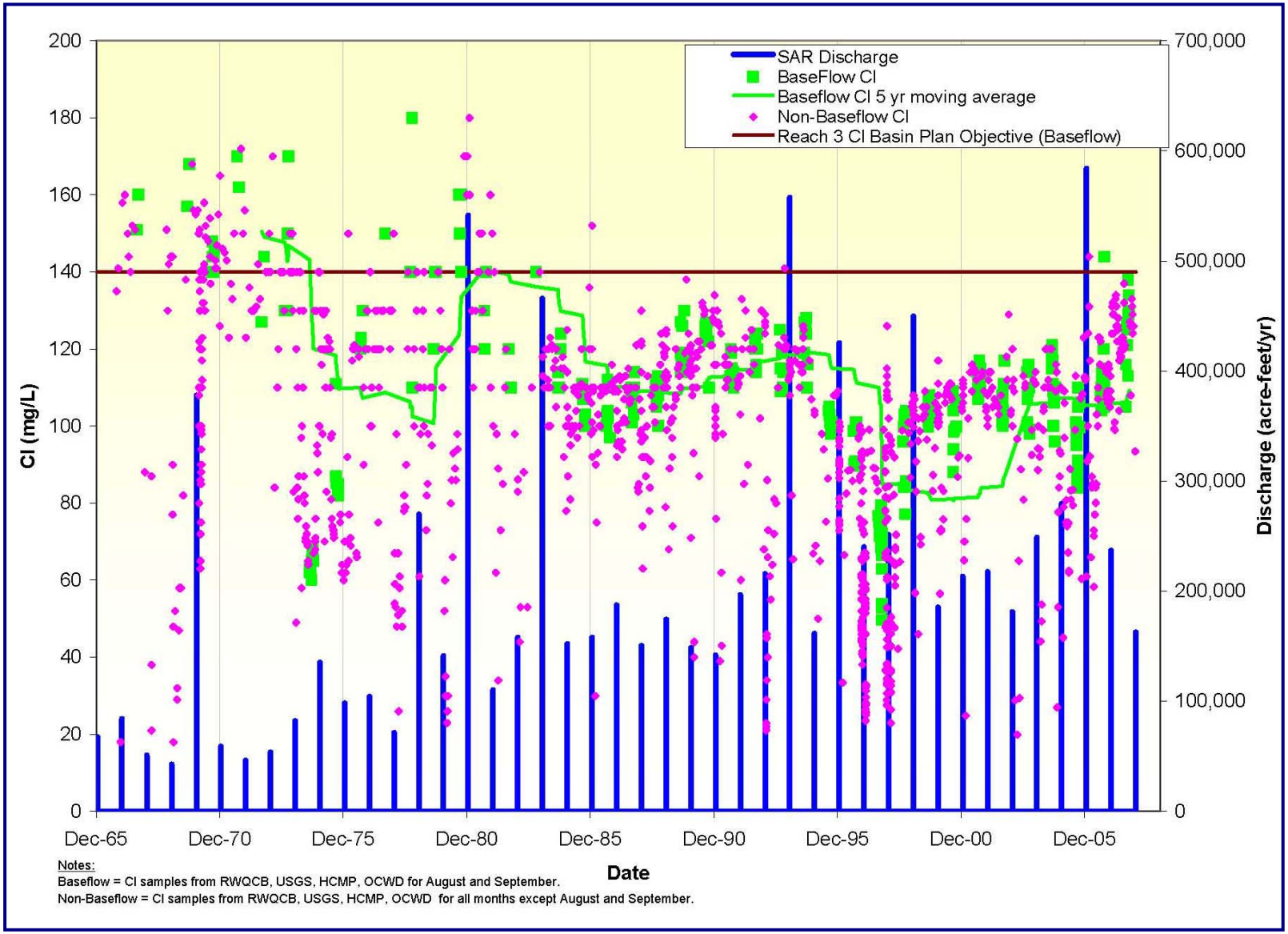


Figure 3-5. Chemical Oxygen Demand (COD) Below Prado Dam

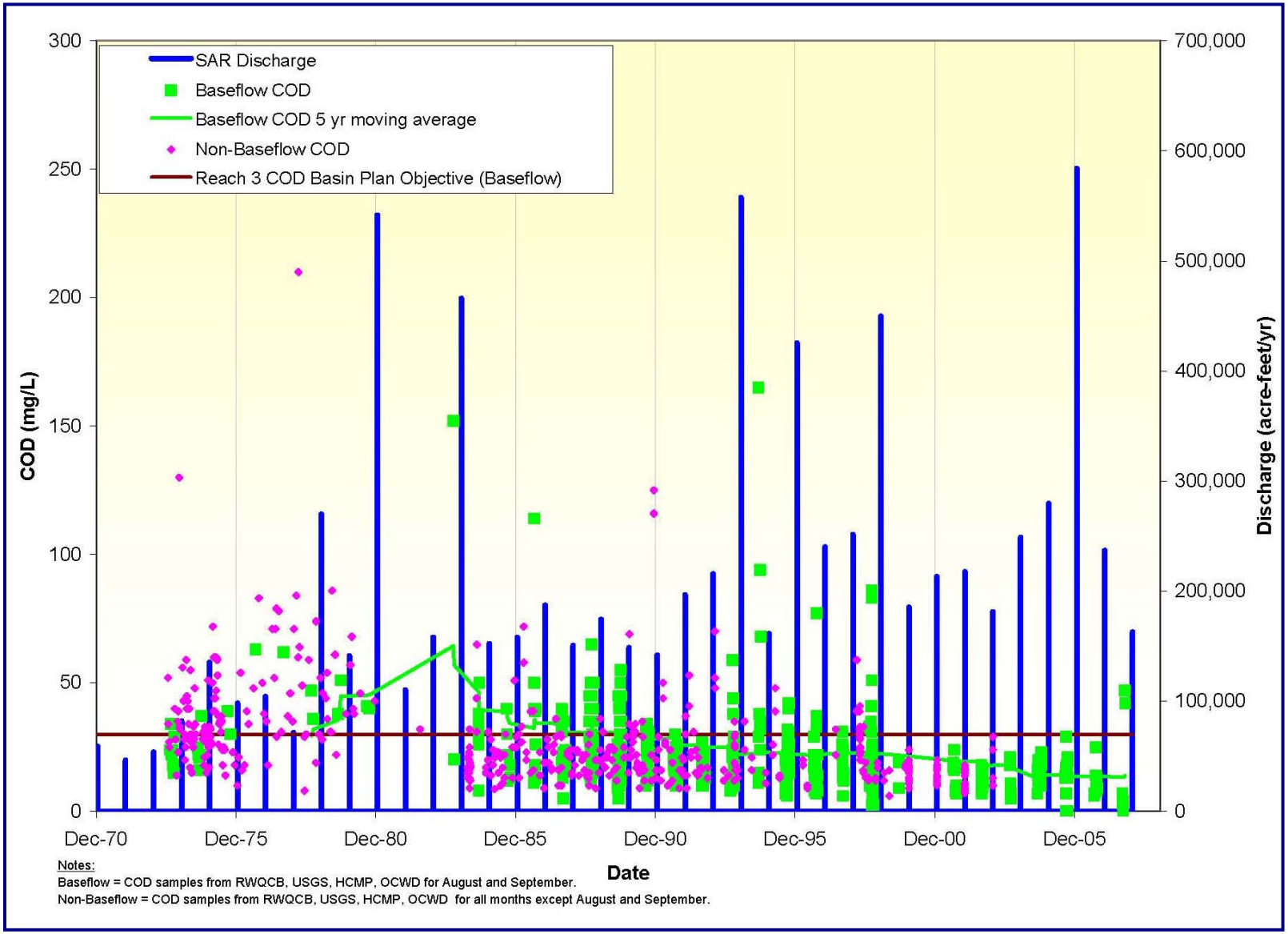


Figure 3-6. Sodium (Na) Below Prado Dam

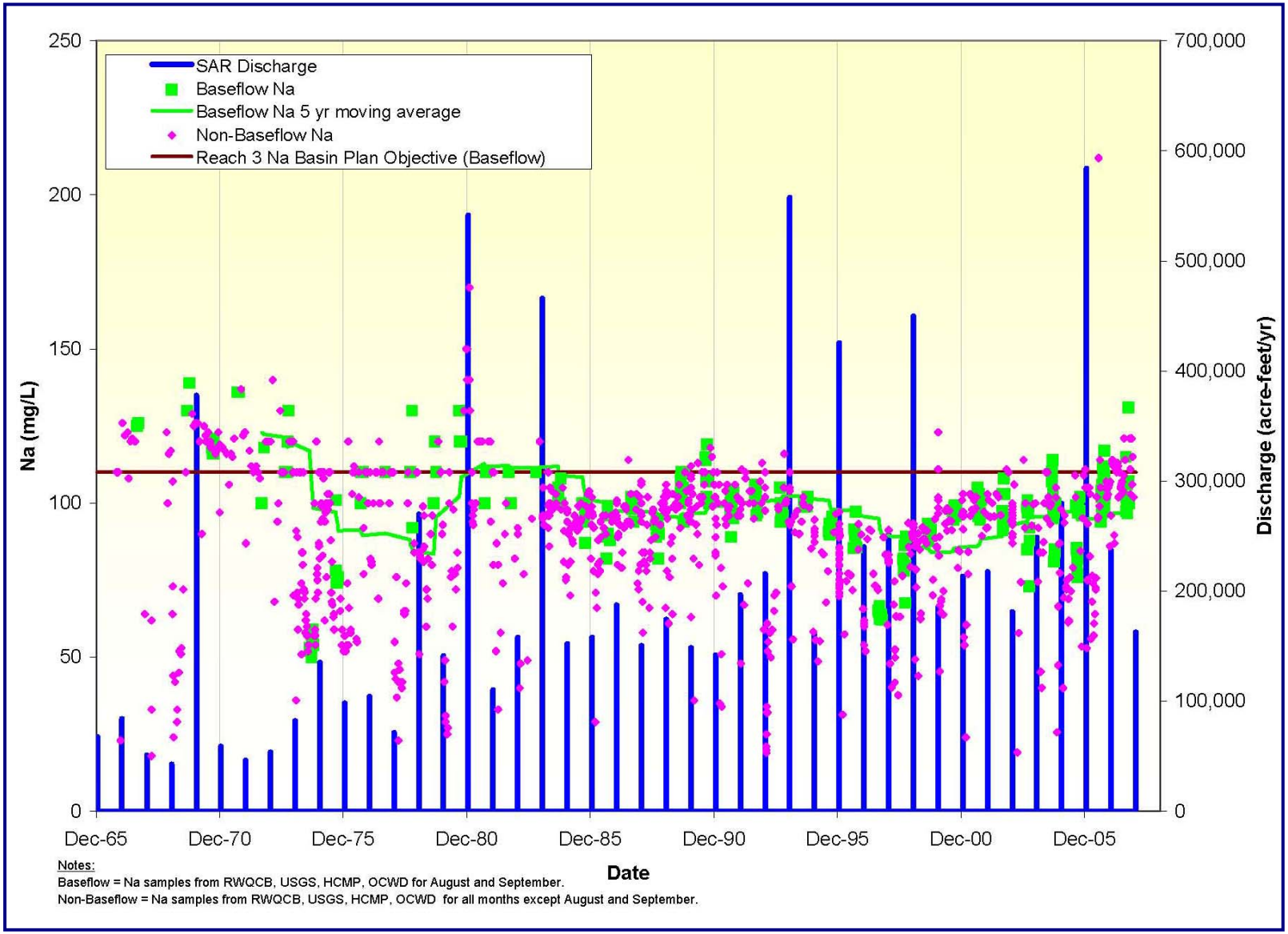


Figure 3-7. Sulfate (SO4) Below Prado Dam

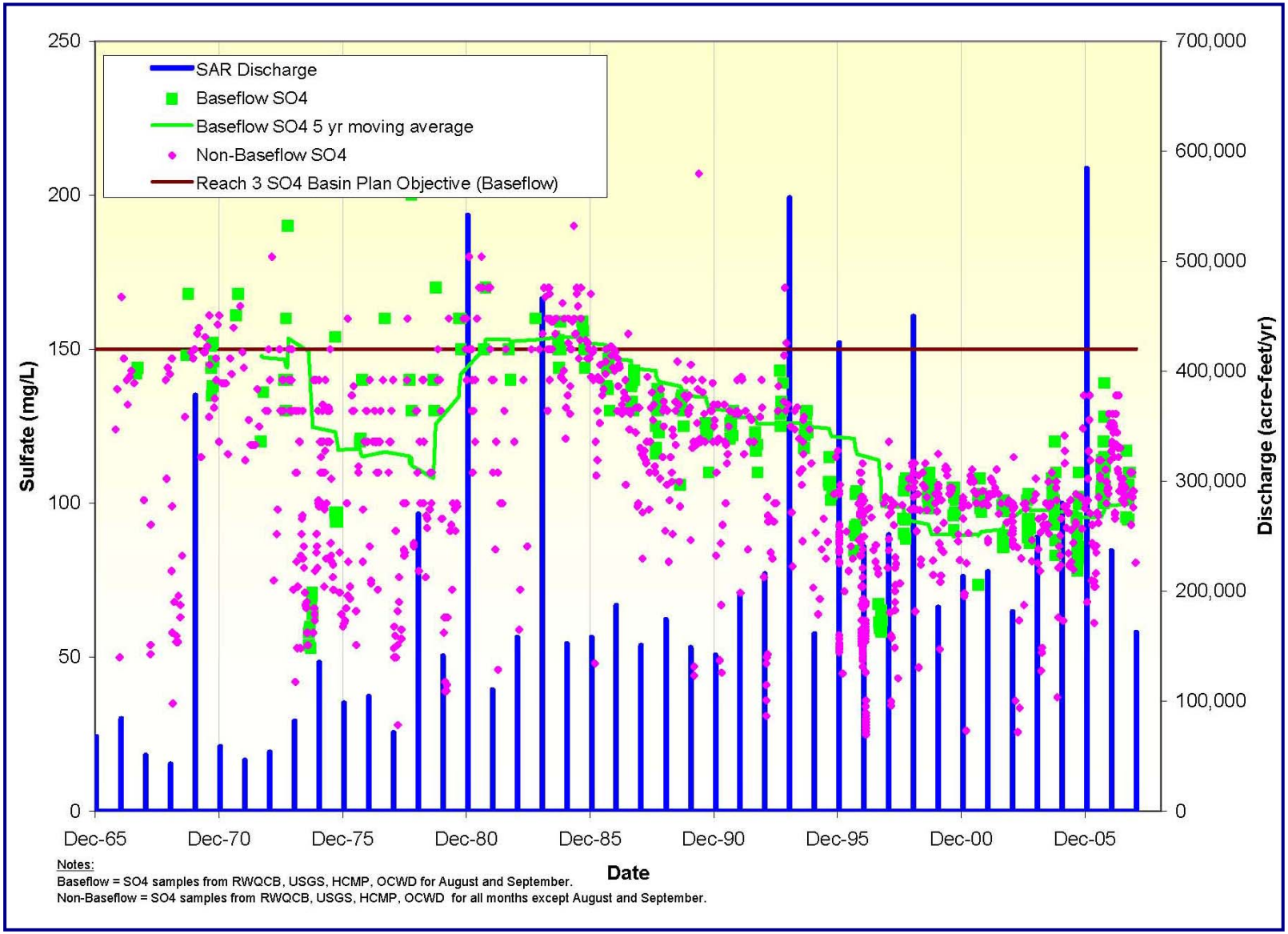


Figure 3-8. Total Hardness Below Prado Dam

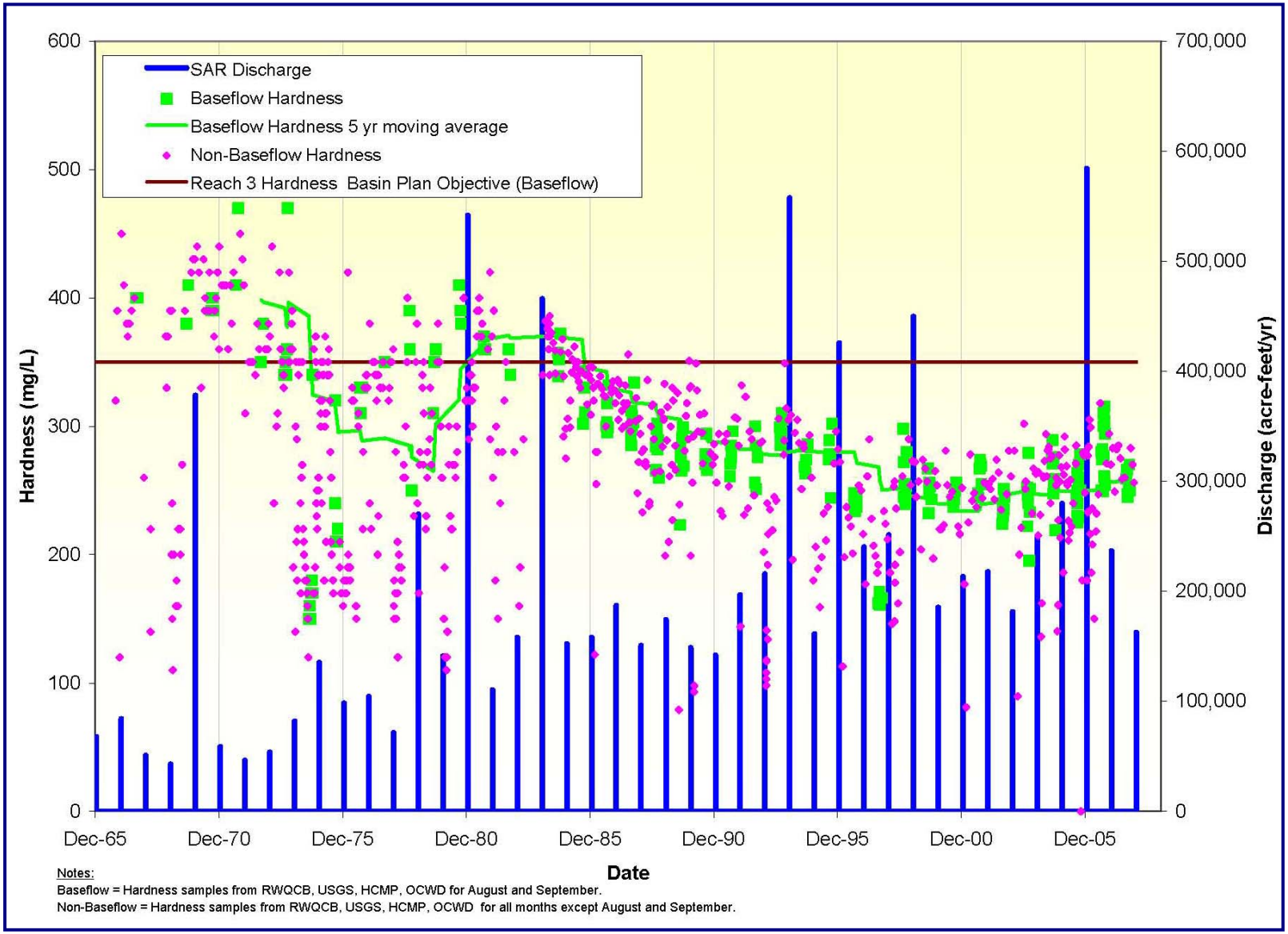


Figure 3-9. Total Dissolved Solids (TDS) MWD Crossing

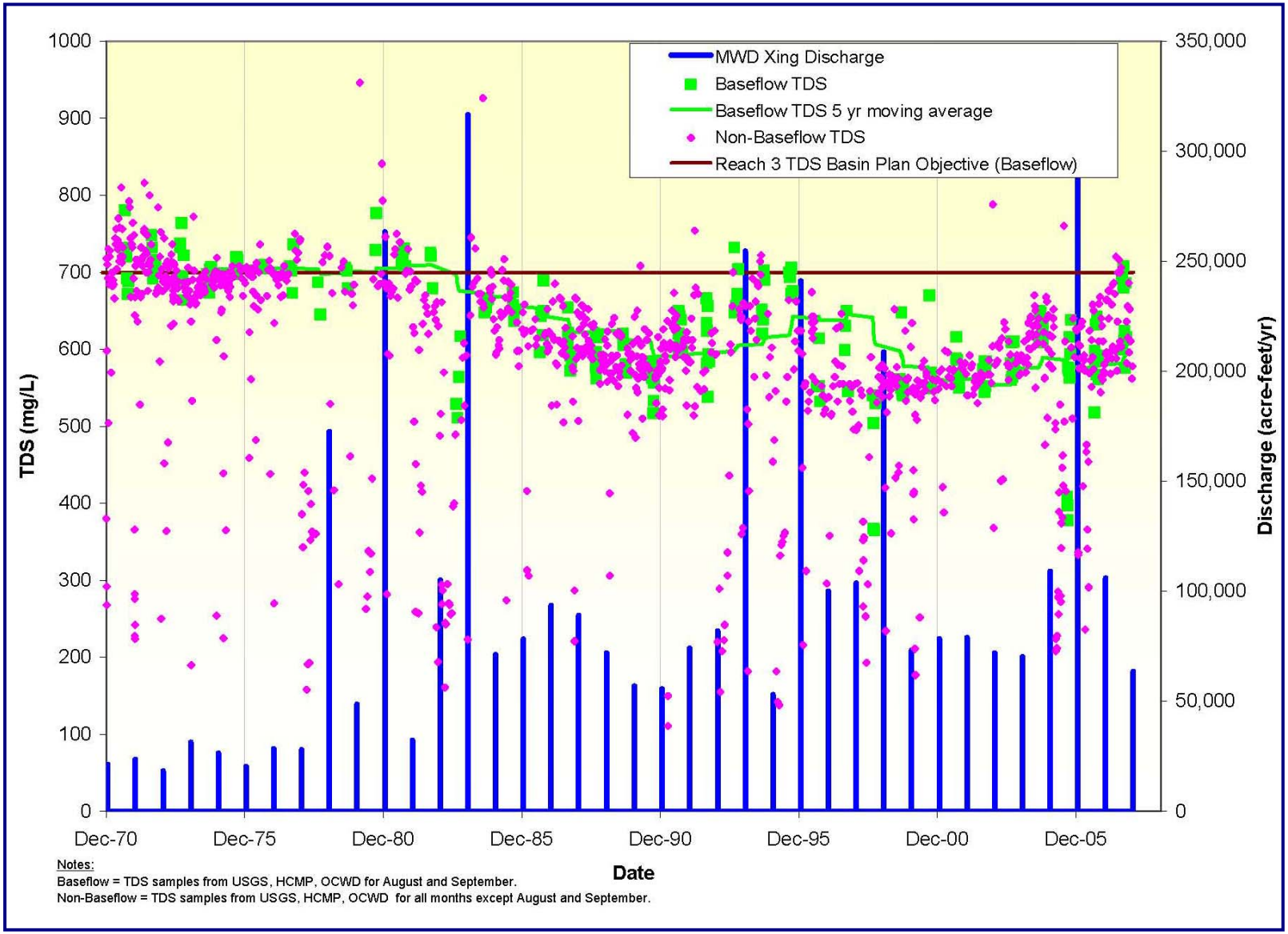


Figure 3-10. Total Nitrogen (TN) MWD Crossing

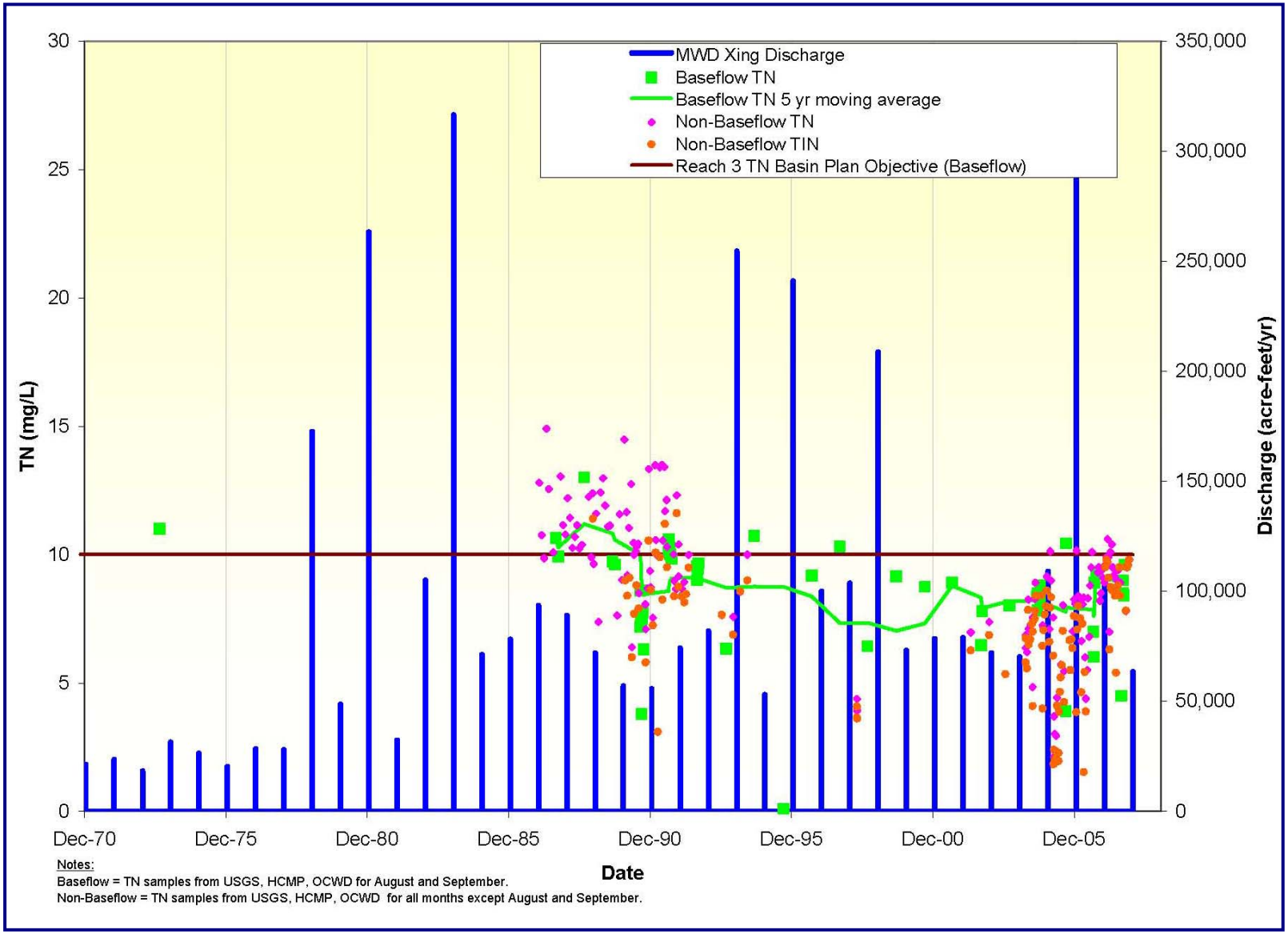


Figure 3-11. Boron (B) MWD Crossing

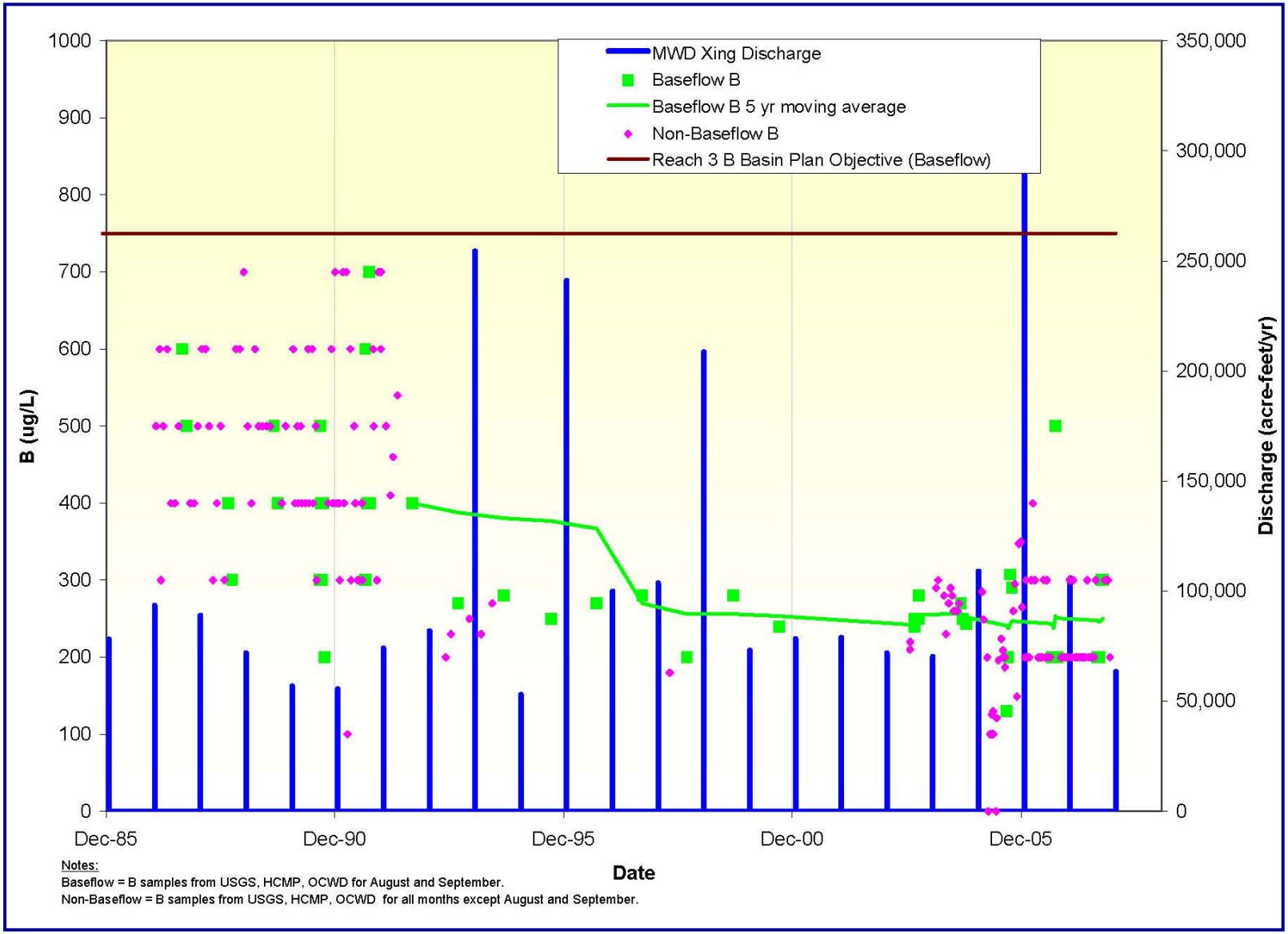


Figure 3-12. Chloride (Cl) MWD Crossing

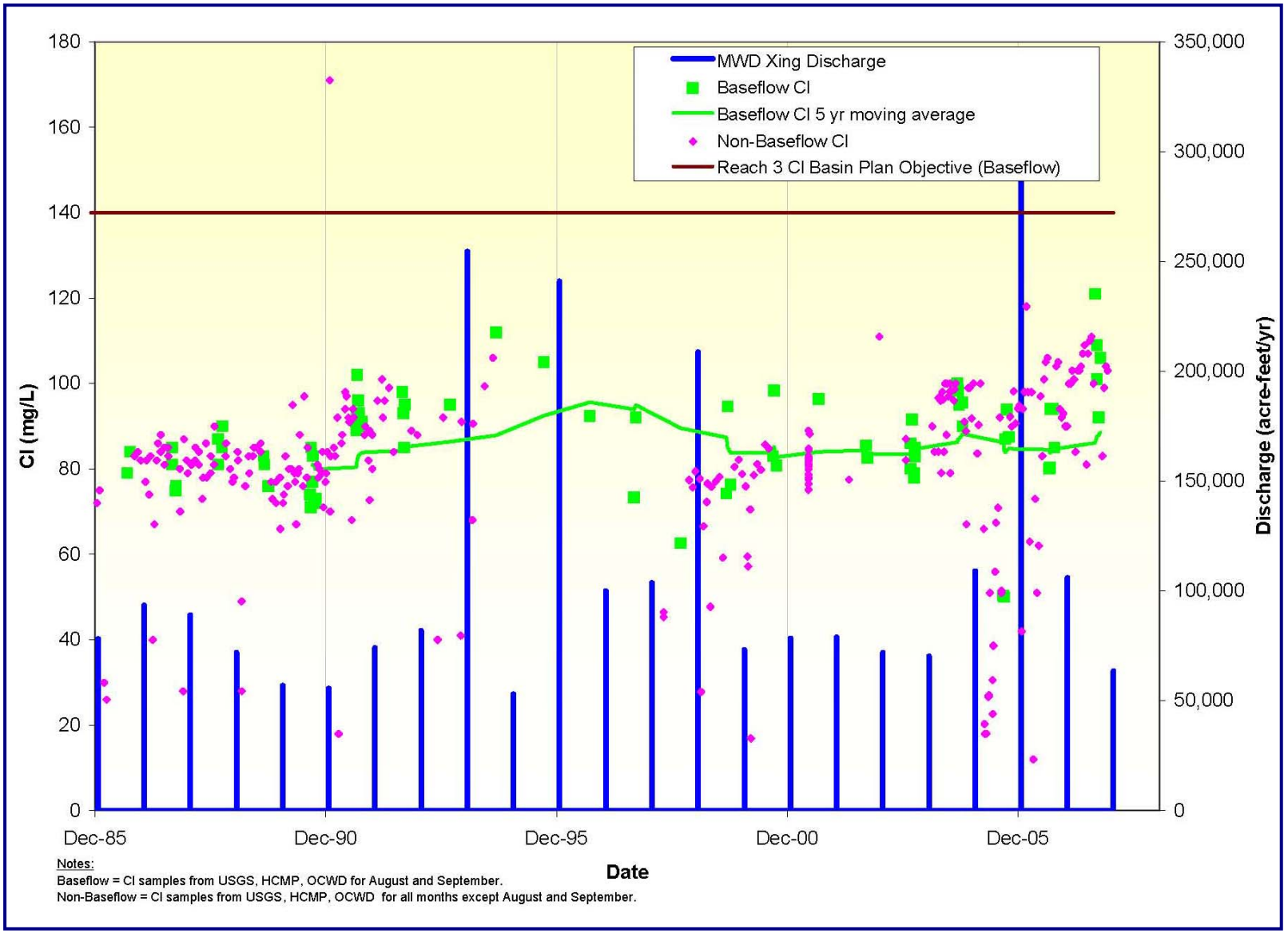


Figure 3-13. Chemical Oxygen Demand (COD) MWD Crossing

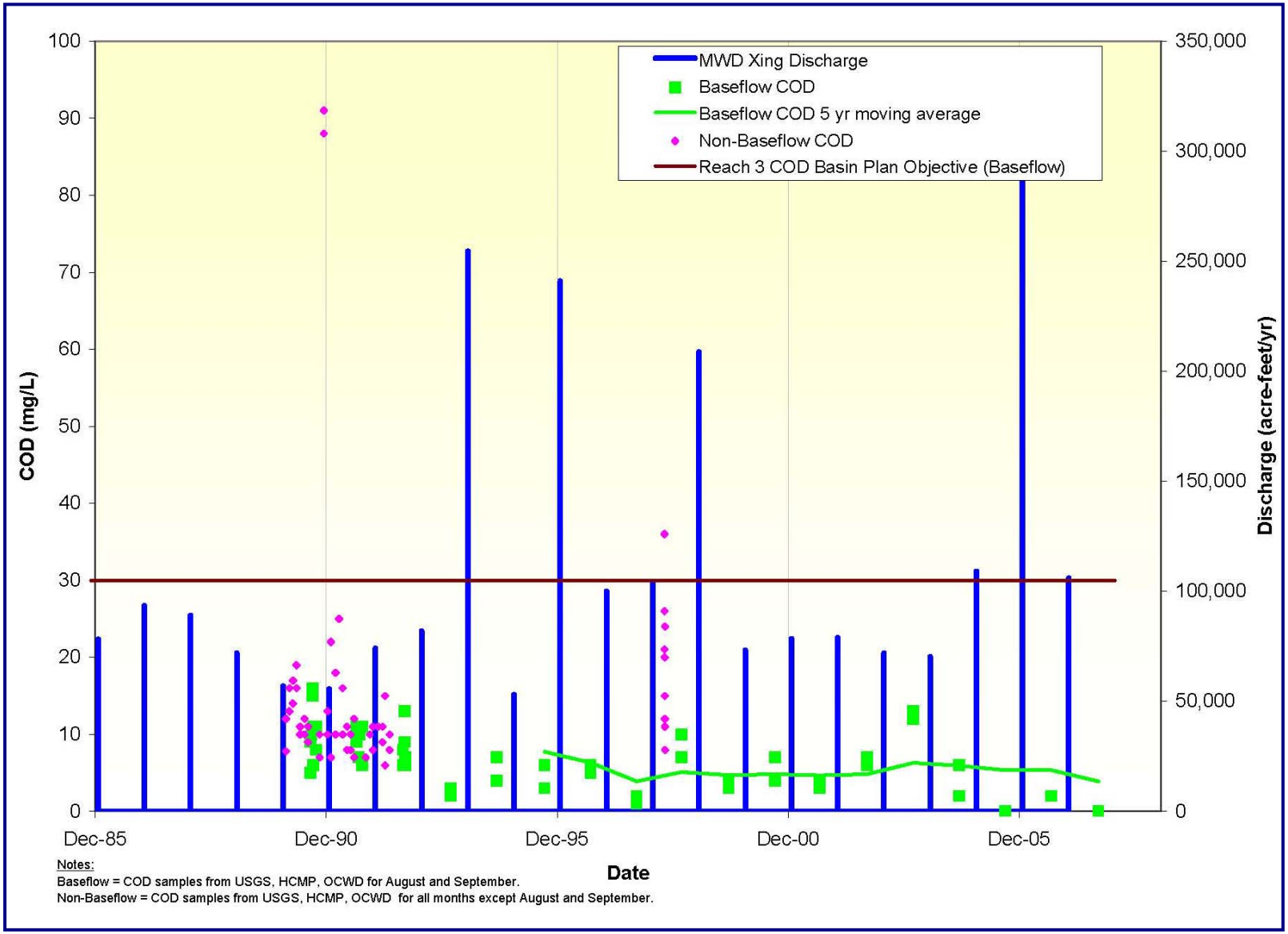


Figure 3-14. Sodium (Na) MWD Crossing

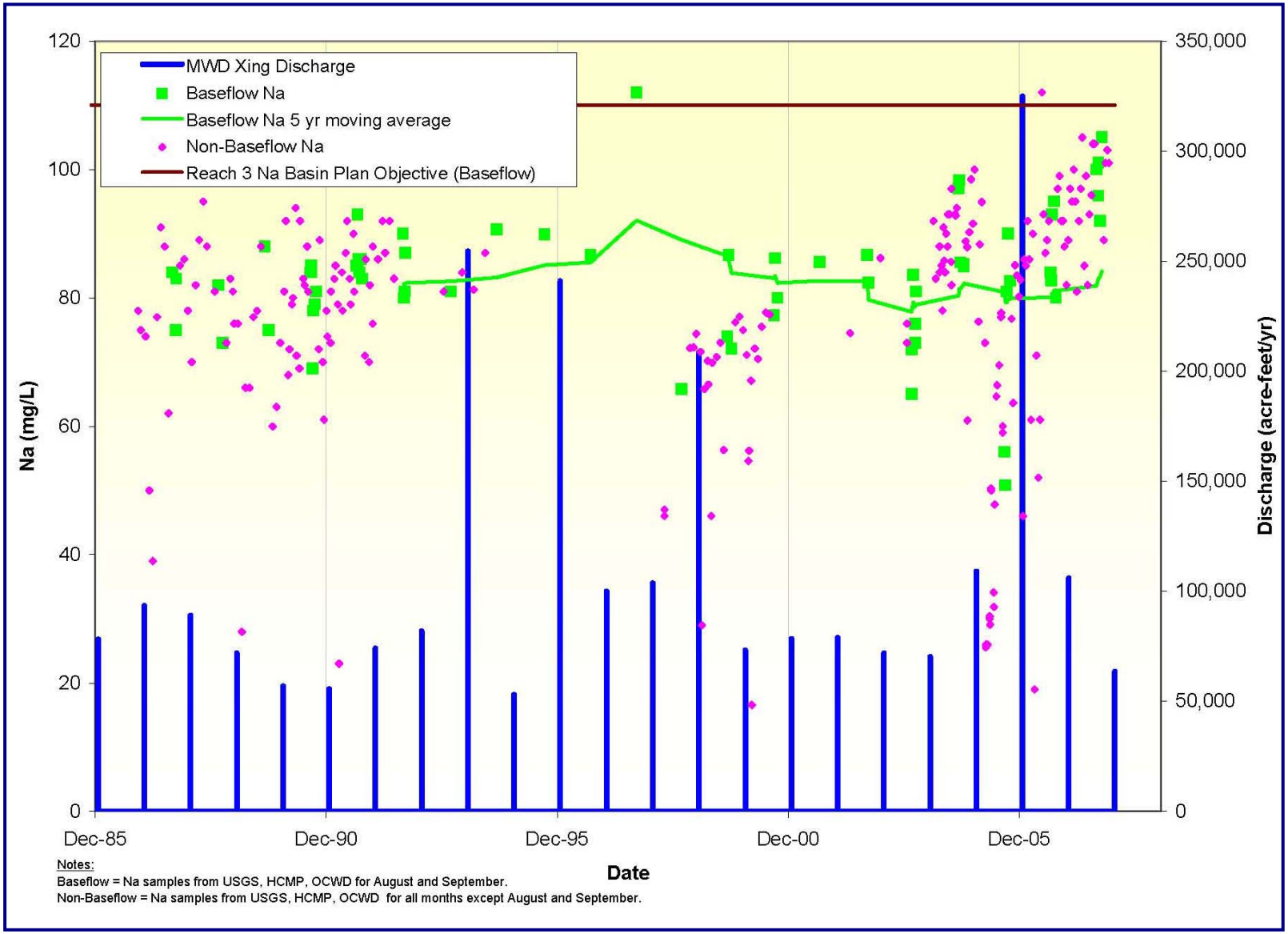


Figure 3-15. Sulfate (SO4) MWD Crossing

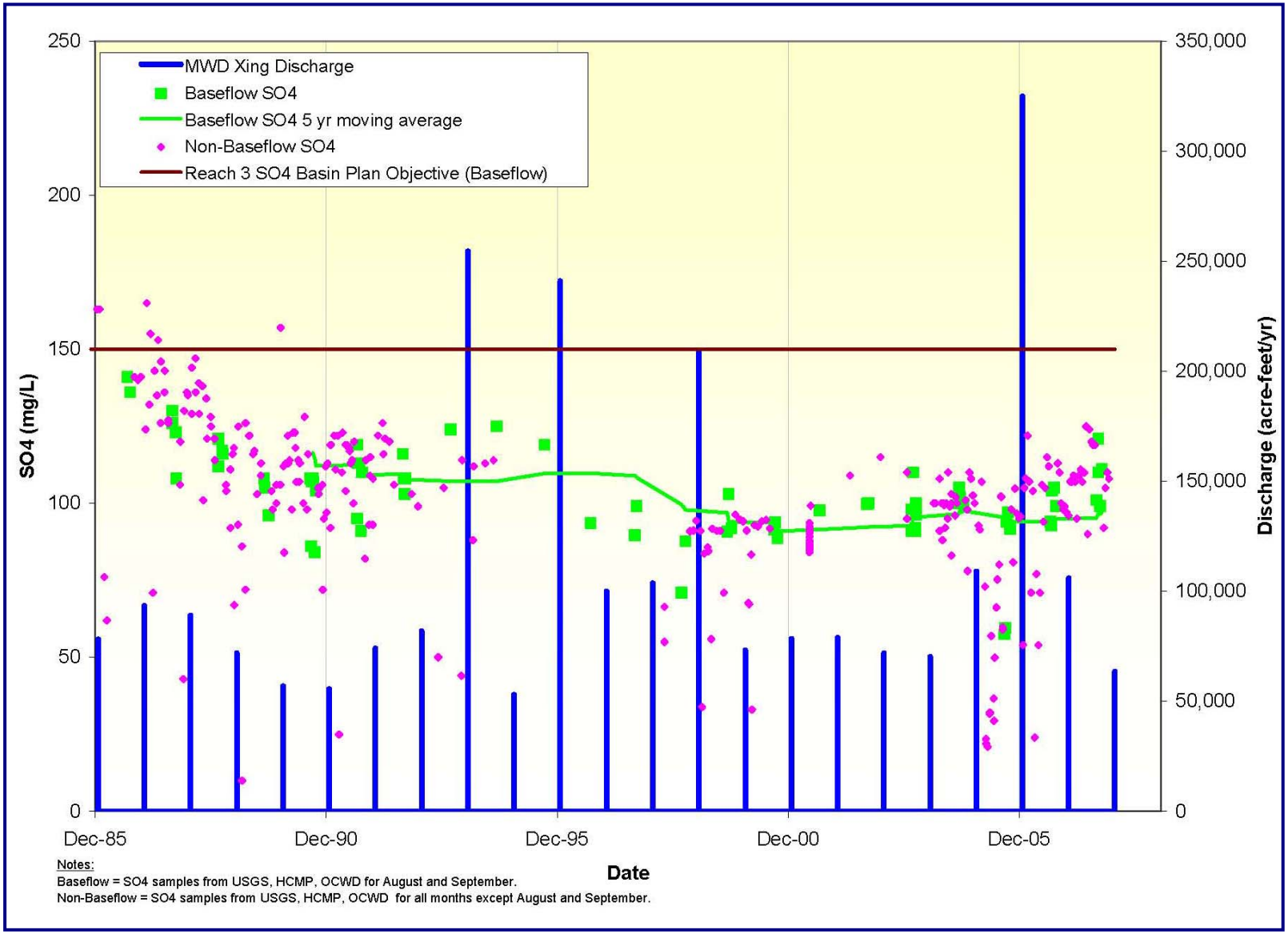
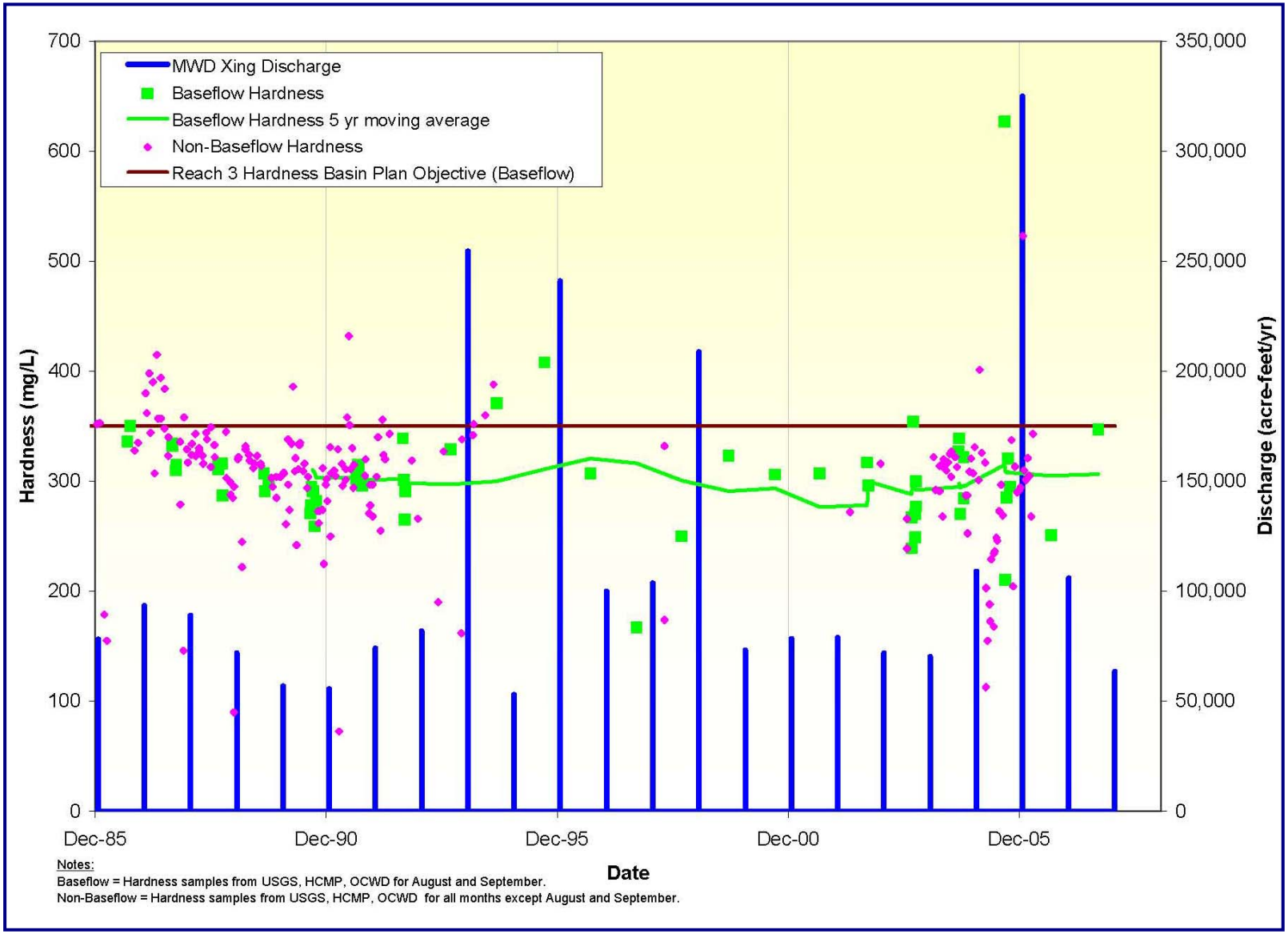


Figure 3-16. Total Hardness MWD Crossing



3.2.2 Santa Ana River Mainstem between Riverside Narrows and Prado Wetlands

Monitoring of Reach 3, above Prado Dam is performed regularly by CBWM/IEUA for the HCMP and OCWD for their SAR water quality monitoring program. This included monitoring of the following locations: *MWD Crossing, Van Buren Blvd, Day Creek at Lucretia, Hole Lake Outlet, Etiwanda Avenue, Hamner Road, and River Road*, as shown in Figure 2-1a. In 2007, CBWM/IEUA through the HCMP monitored each of these locations on a bi-monthly basis. OCWD performed limited monitored of the following locations: *MWD Crossing, Van Buren Blvd, Etiwanda Avenue, Hamner Road and River Road* in August of 2007. Table 3-6 presents a summary of the results of these monitoring efforts.

Overall in 2007, water quality measured at locations along Reach 3 of the SAR met water quality objectives specified in the Basin Plan. In general, these data showed increasing water quality concentrations from the *MWD Crossing* station downstream to the *River Road* station.

Data collected at sites tributary to Reach 3 of the SAR through the HCMP at *Hole Lake Outlet* and *Day Creek at Lucretia*, reported poorer water quality and showed exceedances of Basin Plan water quality objectives. Samples collected at *Hole Lake Outlet*, showed exceedances of water quality objectives for TDS, chloride, sodium, sulfate and TIN specified in the Basin Plan. Samples collected for *Day Creek at Lucretia*, another tributary to the SAR, exceeded the Basin Plan water quality objective for TIN.

Baseflow water quality, as represented by the average of samples collected in August and September, for the above stations is presented in Table 3-7. This data reported water quality concentrations similar to average annual water quality. Overall, average baseflow concentrations as shown in Table 3-7 met water quality objectives specified in the Basin Plan. Again the exceptions were data recorded at *Hole Lake Outlet* and *Day Creek at Lucretia*, which showed exceedances of water quality objectives specified in the Basin Plan. These included exceedances of chloride, TDS, sodium, sulfate and TIN for *Hole Lake Outlet* and exceedances of chloride, TDS and TIN for *Day Creek at Lucretia*.

Table 3-6. Summary of Water Quality Observations for the Santa Ana River between Riverside Narrows and Prado Wetlands

Constituent	Units	Basin Plan Objectives Santa Ana River Reach 3	SAR River Road	# of Samples	SAR Hamner	# of Samples	SAR Etiwanda	# of Samples	Hole Lake Outlet*	# of Samples	Day Creek at Lucretia*	# of Samples	SAR Van Buren	# of Samples	SAR MWD	# of Samples
Ammonia-Nitrogen	mg/L		0.03	24	0.03	24	0.03	24	0.15	23	0.08	15	0.03	24	0.01	24
Bicarbonate (as CaCO3)	mg/L		227	24	223	24	218	24	339	23	138	15	226	24	254	24
Boron	mg/L	**0.75**	0.29	23	0.30	23	0.30	23	0.35	23	0.00	15	0.25	23	0.23	23
Calcium	mg/L		91	24	86	24	85	24	116	23	93	15	85	24	102	24
Carbonate (as CaCO3)	mg/L		0.28	24	0.80	24	0.82	24	0.09	23	4.87	15	0.62	24	0.99	24
Chemical Oxygen Demand	mg/L	**30**	12.0	2	4.0	2	0.00	2	-na-	-na-	-na-	-na-	0.00	2	0.00	2
Chloride	mg/L	**140**	114	24	109	24	108	24	190	23	84	15	85	24	102	24
Electrical Conductivity	umhos/cm		998	24	984	24	963	24	1564	23	704	15	884	24	991	48
Hydroxide (as CaCO3)	mg/L		0.00	24	0.00	24	0.00	24	0.00	23	0.00	15	0.00	24	0.00	24
Magnesium	mg/L		19	24	18	24	18	24	43	23	11	15	17	24	21	24
Nitrate-Nitrogen	mg/L		7.6	24	7.3	24	8.3	24	14.8	23	11.6	15	6.5	24	8.5	24
Nitrite-Nitrogen	mg/L		0.00	24	0.01	24	0.01	24	0.02	23	0.08	15	0.01	24	0.01	24
Organic Nitrogen	mg/L		0.30	1	0.00	1	0.00	1	-na-	-na-	-na-	-na-	0.00	1	0.40	1
pH	units		8.3	24	8.2	24	8.2	24	8.1	23	8.4	15	8.3	24	8.2	24
Potassium	mg/L		12.6	24	13.3	24	13.4	24	5.7	23	3.1	15	11.5	24	9.7	24
Sodium	mg/L	**110**	105	24	105	24	102	24	181	23	37	15	85	24	96	24
Sulfate	mg/L	**150**	106	24	105	24	105	24	185	23	46	15	96	24	109	24

Constituent	Units	Basin Plan Objectives Santa Ana River Reach 3	SAR River Road	# of Samples	SAR Hamner	# of Samples	SAR Etiwanda	# of Samples	Hole Lake Outlet*	# of Samples	Day Creek at Lucretia*	# of Samples	SAR Van Buren	# of Samples	SAR MWD	# of Samples
Total Alkalinity (as CaCO3)	mg/L		227	24	223	24	219	24	339	23	143	15	227	24	255	24
Total Dissolved Solids	mg/L	**700**	640	24	624	24	616	24	1025	23	482	15	566	24	635	48
Total Hardness (as CaCO3)	mg/L	**350**	288	1	279	1	288	1	-na-	-na-	-na-	-na-	298	1	347	1
Total Inorganic Nitrogen	mg/L	**10**	7.7	23	7.3	23	8.4	23	15.0	23	11.7	15	6.6	23	8.5	23
Total Kjeldahl Nitrogen	mg/L		0.65	24	0.55	24	0.54	24	1.08	23	0.23	15	0.22	24	0.42	24
Total Nitrogen	mg/L		8.3	24	7.8	24	8.9	24	15.9	23	12.0	15	6.9	24	8.9	24
Total Organic Carbon	mg/L		2.9	24	3.1	24	3.3	24	3.6	23	1.9	15	2.2	24	2.5	24
Turbidity	NTU		15.7	24	8.9	24	7.6	24	8.3	23	1.5	15	6.9	24	6.3	24

Note: Exceedances are shown in red lettering.
** sampling locations tributary to the SAR*

Table 3-7. Baseflow Water Quality Observations for the SAR between Riverside Narrows and Prado Wetlands (August - September 2007)

Constituent	Units	Basin Plan Objectives Santa Ana River Reach 3	SAR River Road	# of Samples	SAR Hamner	# of Samples	SAR Etiwanda	# of Samples	Hole Lake Outlet*	# of Samples	Day Creek at Lucretia*	# of Samples	SAR Van Buren	# of Samples	SAR MWD	# of Samples
Ammonia-Nitrogen	mg/L		0.02	5	0.02	5	0.02	5	0.10	4	0.20	2	0.02	5	0.00	5
Bicarbonate (as CaCO3)	mg/L		227	5	217	5	212	5	339	4	227	2	222	5	254	5
Boron	mg/L	**0.75**	0.30	4	0.28	4	0.28	4	0.33	4	0.00	2	0.28	4	0.25	4
Calcium	mg/L		91	5	88	5	84	5	117	4	162	2	87	5	105	5
Carbonate (as CaCO3)	mg/L		1.3	5	2.8	5	3.5	5	0.00	4	0.00	2	3.0	5	4.7	5
Chemical Oxygen Demand	mg/L	**30**	12.0	2	4.0	2	0.0	2	-na-	-na-	-na-	-na-	0.0	2	0.0	2
Chloride	mg/L	**140**	114	5	112	5	106	5	166	4	149	2	84	5	106	5
Electrical Conductivity	umhos/cm		997	5	981	5	951	5	1448	4	1165	2	889	5	1010	9
Hydroxide (as CaCO3)	mg/L		0.00	5	0.00	5	0.00	5	0.00	4	0.00	2	0.00	5	0.00	5
Magnesium	mg/L		19	5	18	5	17	5	42	4	16	2	18	5	21	5
Nitrate-Nitrogen	mg/L		6.9	5	7.2	5	7.8	5	12.7	4	16.7	2	6.5	5	7.7	5
Nitrite-Nitrogen	mg/L		0.00	5	0.00	5	0.00	5	0.04	4	0.04	2	0.00	5	0.01	5
Organic Nitrogen	mg/L		0.30	1	0.00	1	0.00	1	-na-	-na-	-na-	-na-	0.00	1	0.40	1
pH	units		8.3	5	8.1	5	8.2	5	8.1	4	8.1	2	8.3	5	8.2	5
Potassium	mg/L		13.6	5	14.5	5	14.1	5	6.3	4	4.0	2	12.5	5	11.2	5
Sodium	mg/L	**110**	105	5	109	5	98	5	168	4	56	2	87	5	99	5
Sulfate	mg/L	**150**	100	5	103	5	98	5	170	4	111	2	93	5	108	5

Constituent	Units	Basin Plan Objectives Santa Ana River Reach 3	SAR River Road	# of Samples	SAR Hamner	# of Samples	SAR Etiwanda	# of Samples	Hole Lake Outlet*	# of Samples	Day Creek at Lucretia*	# of Samples	SAR Van Buren	# of Samples	SAR MWD	# of Samples
Total Alkalinity (as CaCO3)	mg/L		229	5	220	5	216	5	339	4	227	2	225	5	258	5
Total Dissolved Solids	mg/L	**700**	636	5	624	5	607	5	962	4	834	2	571	5	644	9
Total Hardness (as CaCO3)	mg/L	**350**	288	1	279	1	288	1	-na-	-na-	-na-	-na-	298	1	347	1
Total Inorganic Nitrogen	mg/L	**10**	7.0	4	7.3	4	8.0	4	12.8	4	17.0	2	6.4	4	7.7	4
Total Kjeldahl Nitrogen	mg/L		0.30	5	0.52	5	0.44	5	0.47	4	0.00	2	0.34	5	0.24	5
Total Nitrogen	mg/L		7.2	5	7.7	5	8.2	5	13.2	4	17.4	2	6.9	5	8.0	5
Total Organic Carbon	mg/L		3.2	5	3.4	5	3.2	5	3.6	4	1.2	2	2.5	5	2.3	5
Turbidity	NTU		35.3	5	28.7	5	25.0	5	5.2	4	0.53	2	19.8	5	15.1	5

Note: Exceedances are shown in red lettering.
** sampling locations tributary to the SAR*

Recorded non-tributary discharges to the SAR Reach 3 consisted of wastewater effluent discharges from the City of Riverside Regional Water Quality Control Plant, the Western Riverside County Regional Wastewater Treatment Plant (WRCRWTP) and Gage Canal , shown in Figure 2-1b. Table 3-8 summarizes the non-tributary discharges of flow and water quality to Reach 3 of the SAR for 2007.

The USGS also maintains a gauging station, 11066460, located along Reach 3 of the SAR at the MWD Crossing, shown in Figure 2-1a. In 2007, this station recorded flows totaling 63,421 AF.

Table 3-8. Annual Recycled Water Discharge to Santa Ana River Reach 3 and Associated Average Water Quality for Parameters of Interest

Parameter	Units	City of Riverside Regional Water Quality Control Plant	# of Samples	Western Riverside County Regional Wastewater Treatment Plant	# of Samples	Gage Canal Discharge	# of Samples
Discharge	AFY	36,153	365	4,984	365	1,470	14
Ammonia-Nitrogen	mg/L	0.07	186	0.05	23	-na-	-na-
Bicarbonate (as CaCO3)	mg/L	183	25	153	26	240	2
Boron	mg/L	0.31	26	0.61	29	-na-	-na-
Calcium	mg/L	70	26	55	31	83	2
Carbonate (as CaCO3)	mg/L	0.00	25	0.00	26	0.00	2
Chloride	mg/L	119	26	149	29	-na-	-na-
Electrical Conductivity	umhos/cm	898	277	1004	365	685	2
Hydroxide (as CaCO3)	mg/L	0.00	23	0.00	23	0.00	2
Magnesium	mg/L	13.5	26	12.3	31	11.5	2
Nitrate-Nitrogen	mg/L	9.6	185	6.1	31	14.0	2
Nitrite-Nitrogen	mg/L	0.03	185	0.04	23	0.00	2
pH	units	7.4	23	7.3	365	7.5	2
Potassium	mg/L	19.2	23	20.5	23	4.0	2
Sodium	mg/L	122	26	123	29	39	2
Sulfate	mg/L	101	26	74	31	95	2
Total Alkalinity (as CaCO3)	mg/L	183	23	150	23	195	2
Total Dissolved Solids	mg/L	609	79	575	29	445	2
Total Hardness (as CaCO3)	mg/L	210	3	178	11	250	2
Total Inorganic Nitrogen	mg/L	9.7	185	6.1	31	-na-	-na-
Total Kjeldahl Nitrogen	mg/L	1.2	23	1.0	23	-na-	-na-
Total Nitrogen	mg/L	10.4	23	7.9	23	-na-	-na-
Total Organic Carbon	mg/L	6.1	26	5.5	31	-na-	-na-
Turbidity	NTU	0.49	276	1.40	191	0.35	2

3.2.3 Tributaries to Reach 3 of the Santa Ana River

The three tributaries to Reach 3 of the SAR that are regularly monitored for water quality and discharge by OCWD, USGS, and by CBWM/IEUA for the HCMP are Chino Creek, Cucamonga Creek (which becomes Mill Creek in the Prado reservoir area), and Temescal Creek.

3.2.3.1 Chino Creek

Chino Creek extends from its confluence with the SAR (directly behind Prado Dam) along the eastern base of the Chino Hills and into southern Pomona. Chino Creek is divided into two reaches. Reach 1 is that portion of the creek that extends from the confluence with the SAR upstream to the beginning of the concrete-lined channel south of Los Serranos Road. In 2004, Reach 1 of Chino Creek was further subdivided into two reaches, 1A and 1B. Reach 1A extends from the SAR confluence to downstream of the confluence with Mill Creek. Reach 1B extends from the confluence of Mill Creek to the beginning of the concrete-lined channel south of Los Serranos Road.

Chino Creek Reach 2 extends from Los Serranos Road to the boundary of Region 8 with that of the Los Angeles Regional Water Quality Control Board (Region 4) at the Los Angeles/San Bernardino County line. Reach 2 of Chino Creek is concrete-lined along the bottom and banks throughout its length. San Antonio Creek, an important drainage feature in western Chino Basin, is tributary to Reach 2 of Chino Creek at a location just north of Chino Avenue.

Chino Creek Reach 1A

The Basin Plan has specified water quality objectives for Chino Creek Reaches 1A for TDS, hardness, sodium, chloride, TIN, sulfate and COD. However, there are no data collected along Chino Creek Reach 1A for it encompasses an area upstream of Prado Dam which is difficult to access and in the winter months is commonly inundated.

Chino Creek Reach 1B

The Basin Plan has specified water quality objectives for Chino Creek Reaches 1B for TDS, hardness, sodium, chloride, TIN, sulfate and COD. Water quality monitoring in Chino Creek Reach 1B is preformed regularly by CBWM/IEUA for the HCMP and by OCWD for their SAR water quality monitoring program, as shown in Figure 2-1a. In 2007, CBWM/IEUA through the HCMP, monitored the *Chino Creek at Pine Avenue* site on a bi-monthly basis (23 sampling events), while OCWD monitored station *CK-CHINO-03,* located north of Pine Avenue Bridge and just west of El Prado Road once in August of 2007. A review of these data showed four constituents to exceed Basin Plan objectives. These constituents included TDS, chloride, sodium, and sulfate. Table 3-9 presents the results of this monitoring.

Non-tributary discharges to Chino Creek Reach 1B include recycled water produced at two IEUA waste water treatment facilities – RP-5 and RP-1 Prado, shown in Figure 2-1b. Table 3-10 summarizes the non-tributary discharges of flow and water quality to Chino Creek Reaches 1B for 2007.

The USGS also maintains a gauging station, 11073360, located along Chino Creek at Schaefer Avenue below the confluence with San Antonio Creek, shown in Figure 2-1a. In 2007, this station recorded flows totaling 2,755 AF.

Table 3-9. Summary of Water Quality and Flow Observations for Chino Creek, Reach 1B

Constituent	Units	Basin Plan Objective Chino Creek Reach 1B	Chino Creek Reach 1B	# of Samples
Ammonia-Nitrogen	mg/L		0.05	25
Bicarbonate (as CaCO3)	mg/L		155	25
Boron	ug/L		0.30	23
Calcium	mg/L		61	25
Carbonate (as CaCO3)	mg/L		0.91	25
Chemical Oxygen Demand	mg/L	**15**	11.8	4
Chloride	mg/L	**75**	130	25
Electrical Conductivity	umhos/cm		926	24
Hydroxide (as CaCO3)	mg/L		0.00	25
Magnesium	mg/L		17.1	26
Nitrate-Nitrogen	mg/L		5.2	25
Nitrite-Nitrogen	mg/L		0.01	25
Organic Nitrogen	mg/L		0.30	2
pH	units		7.8	25
Potassium	mg/L		14.7	24
Sodium	mg/L	**75**	107	25
Sulfate	mg/L	**60**	95	25
Total Alkalinity (as CaCO3)	mg/L		156	25
Total Dissolved Solids	mg/L	**550**	571	25
Total Hardness (as CaCO3)	mg/L	**240**	146	2
Total Inorganic Nitrogen	mg/L	**8**	5.4	23
Total Kjeldahl Nitrogen	mg/L		0.78	25
Total Nitrogen	mg/L		6.0	25
Total Organic Carbon	mg/L		4.2	25
Turbidity	NTU		3.5	25

Note: Exceedances are shown in red lettering.

Table 3-10. Annual Discharges of Flow and Average Water Quality to Chino Creek, Reach 1B

Constituent	Units	IEUA RP-1 Prado	# of Samples	IEUA RP-5	# of Samples
Discharge	AFY	7652	365	12574	365
Ammonia-Nitrogen	mg/L	0.03	23	0.03	23
Bicarbonate (as CaCO3)	mg/L	135	23	147	23
Boron	mg/L	0.29	23	0.30	23
Calcium	mg/L	42	23	51	23
Carbonate (as CaCO3)	mg/L	0.00	23	0.00	23
Chloride	mg/L	111	23	125	23
Electrical Conductivity	umhos/cm	789	23	842	23
Hydroxide (as CaCO3)	umhos/cm	0.00	23	0.00	23
Magnesium	mg/L	9.7	23	12.5	23
Nitrate-Nitrogen	mg/L	6.6	23	4.4	23
Nitrite-Nitrogen	mg/L	0.00	23	0.01	23
pH	units	7.3	365	7.1	365
Potassium	mg/L	14.8	23	16.1	23
Sodium	mg/L	108	23	109	23
Sulfate	mg/L	58	23	61	23
Total Alkalinity (as CaCO3)	mg/L	136	20	147	20
Total Dissolved Solids	mg/L	480	22	509	23
Total Hardness (as CaCO3)	mg/L	145	11	175	8
Total Kjeldahl Nitrogen	mg/L	1.2	21	0.9	22
Total Organic Carbon	mg/L	6.0	23	4.1	23
Turbidity	NTU	0.87	365	0.88	365

Chino Creek Reach 2

In Reach 2 of Chino Creek, water quality samples were collected at the HCMP monitoring station *San Antonio Creek and Chino Creek at Schaefer Avenue*, shown in Figure 2-1a. These sites were monitored bi-monthly throughout 2007 (23 sampling events); however the Basin Plan specifies no water quality objectives for Chino Creek Reach 2. Table 3-11 presents a summary of the results of this monitoring effort.

Non-tributary discharges to Chino Creek Reach 2 include recycled water produced at IEUA's Carbon Canyon Water Reclamation Facility (CCWRF) and imported SWP water released to San Antonio Creek, at turnout OC-59, shown in Figure 2-1b. In 2007, there were no recorded releases of imported water to San Antonio Creek, at turnout OC-59. Table 3-12 summarizes the non-tributary discharges of flow and water quality to Chino Creek Reach 2 for 2007.

Table 3-11. Summary of Water Quality and Flow Observations for Chino Creek, Reach 2

Constituent	Units	Chino Creek at Schaefer	# of Samples	San Antonio Creek	# of Samples
Ammonia-Nitrogen	mg/L	0.05	23	0.05	23
Bicarbonate (as CaCO3)	mg/L	71	23	43	23
Boron	mg/L	0.06	23	0.10	23
Calcium	mg/L	83	23	64	23
Carbonate (as CaCO3)	mg/L	34	23	48	23
Chloride	mg/L	104	23	92	23
Electrical Conductivity	umhos/cm	803	23	641	23
Hydroxide (as CaCO3)	mg/L	3.1	23	15.1	23
Magnesium	mg/L	20.3	23	12.0	23
Nitrate-Nitrogen	mg/L	1.2	23	0.8	23
Nitrite-Nitrogen	mg/L	0.05	23	0.05	23
pH	units	9.2	23	9.9	23
Potassium	mg/L	3.6	23	7.6	23
Sodium	mg/L	64	23	54	23
Sulfate	mg/L	145	23	67	23
Total Alkalinity (as CaCO3)	mg/L	108	23	106	23
Total Dissolved Solids	mg/L	545	23	455	23
Total Hardness (as CaCO3)	mg/L	-na-	-na-	-na-	-na-
Total Inorganic Nitrogen	mg/L	1.3	23	0.9	23
Total Kjeldahl Nitrogen	mg/L	3.0	22	4.4	23
Total Nitrogen	mg/L	4.2	23	5.3	23
Total Organic Carbon	mg/L	7.9	24	22.4	23
Turbidity	NTU	48.2	23	6.9	23

Table 3-12. Annual Discharges of Flow and Average Water Quality to Chino Creek, Reach 2

Constituent	Units	IEUA - Carbon Canyon Water Reclamation Facility	# of Samples
Discharge	AFY	7260	365
Ammonia-Nitrogen	mg/L	0.03	23
Bicarbonate (as CaCO3)	mg/L	127	23
Boron	mg/L	0.30	23
Calcium	mg/L	47	23
Carbonate (as CaCO3)	mg/L	0.00	23
Chloride	mg/L	136	23
Electrical Conductivity	umhos/cm	878	23
Hydroxide (as CaCO3)	mg/L	0.00	23
Magnesium	mg/L	12.1	23
Nitrate-Nitrogen	mg/L	6.3	23
Nitrite-Nitrogen	mg/L	0.01	23
pH	units	7.3	365
Potassium	mg/L	16.7	23
Sodium	units	113	23
Sulfate	mg/L	70	23
Total Alkalinity (as CaCO3)	mg/L	127	20
Total Dissolved Solids	mg/L	547	23
Total Hardness (as CaCO3)	mg/L	167	8
Total Kjeldahl Nitrogen	mg/L	0.76	22
Total Organic Carbon	mg/L	4.4	23
Turbidity	NTU	0.52	365

3.2.3.2 Cucamonga Creek

As identified in Figure 2.1a, Cucamonga Creek is located just upstream of Chino-Corona Road and is designated as a natural channel with unlined bottom and banks. Cucamonga Creek, Reach 1 extends from this "confluence" to the point where 23rd Street crosses the channel in the city of Upland. The segment of Cucamonga Creek upstream of this location is designated as Reach 2.

Cucamonga Creek becomes Mill Creek just north of Chino-Corona Road and travels a couple of miles before flowing into Prado Flood Control Basin. Mill Creek extends from its confluence with Chino Creek to a location just upstream of Chino-Corona Road near the San Bernardino/Riverside County border.

Water quality monitoring in Cucamonga Creek is preformed regularly by CBWM/IEUA for the HCMP and by OCWD for their SAR water quality monitoring program. This included monitoring of the following locations: *Cucamonga Creek above Ely Basin, Cucamonga Creek near Mira Loma, and Mill Creek*, as shown in Figure 2-1a. In 2007, CBWM/IEUA through the HCMP, monitored the *Cucamonga*

Creek above Ely Basin, Cucamonga Creek near Mira Loma and *Mill Creek* sites on a bi-monthly basis (23 sampling events). OCWD monitored the *Cucamonga Creek near Mira Loma (CK-CUCAMONGA_02), and Mill Creek* sites once in August of 2007. The Basin Plan specifies no water quality objectives for Reach 1 of Cucamonga Creek. Table 3-13 presents a combined summary of the results of these monitoring efforts.

Non-tributary discharges to Cucamonga Creek include recycled water produced at IEUA's RP-1 Cucamonga, shown in Figure 2-1b. Table 3-14 summarizes the non-tributary discharges of flow and water quality to Cucamonga Creek for 2007.

The USGS also maintains a gauging station, 11073495, located along Cucamonga Creek near Mira Loma, shown in Figure 2-1a. In 2007, this station recorded flows totaling 37,892 AF.

Table 3-13. Summary of Water Quality and Flow Observations for Cucamonga Creek

Parameter	Units	Cucamonga Creek Above Ely Basin	# of Samples	Cucamonga Creek Near Mira Loma	# of Samples	Mill Creek	# of Samples
Ammonia-Nitrogen	mg/L	0.23	23	0.14	24	0.08	24
Bicarbonate (as CaCO3)	mg/L	79	22	120	24	64	24
Boron	mg/L	0.03	23	0.24	23	0.23	23
Calcium	mg/L	45	23	43	24	40	24
Carbonate (as CaCO3)	mg/L	44	23	21	24	60	24
Chemical Oxygen Demand	mg/L	-na-	-na-	22	2	20	2
Chloride	mg/L	38	23	105	24	95	24
Electrical Conductivity	umhos/cm	463	23	734	24	675	24
Hydroxide (as CaCO3)	mg/L	12.5	22	0.0	24	5.1	24
Magnesium	mg/L	10.7	23	10.1	24	9.3	24
Nitrate-Nitrogen	mg/L	2.0	22	3.9	24	2.9	24
Nitrite-Nitrogen	mg/L	0.06	23	0.04	24	0.02	24
Organic Nitrogen	mg/L	-na-	-na-	0.50	1	0.60	1
pH	units	9.4	23	8.6	24	9.4	24
Potassium	mg/L	4.4	23	13.9	24	12.6	24
Sodium	mg/L	39	23	100	24	95	24
Sulfate	mg/L	29	23	58	24	54	24
Total Alkalinity (as CaCO3)	mg/L	136	23	141	24	129	24
Total Dissolved Solids	mg/L	308	23	454	24	426	24
Total Hardness (as CaCO3)	mg/L	-na-	-na-	124	1	131	1
Total Inorganic Nitrogen	mg/L	2.3	23	4.1	23	3.0	23
Total Kjeldahl Nitrogen	mg/L	2.0	23	1.4	24	2.1	24
Total Nitrogen	mg/L	4.0	23	5.3	24	5.1	24
Total Organic Carbon	mg/L	15.3	26	7.3	24	10.3	24
Turbidity	NTU	8.1	23	3.7	24	7.7	24

Table 3-14. Annual Discharges of Flow and Average Water Quality to Cucamonga Creek

Constituent	Units	IEUA RP-1 Cucamonga	# of Samples
Discharge	AFY	23,227	365
Ammonia-Nitrogen	mg/L	0.04	22
Bicarbonate (as CaCO3)	mg/L	135	23
Boron	mg/L	0.29	23
Calcium	mg/L	42	23
Carbonate (as CaCO3)	mg/L	0.00	23
Chloride	mg/L	112	23
Electrical Conductivity	umhos/cm	792	23
Hydroxide (as CaCO3)	mg/L	0.00	23
Magnesium	mg/L	9.7	23
Nitrate-Nitrogen	mg/L	6.4	23
Nitrite-Nitrogen	mg/L	0.01	23
pH	units	6.9	365
Potassium	mg/L	14.9	23
Sodium	mg/L	108	23
Sulfate	mg/L	60	23
Total Alkalinity (as CaCO3)	mg/L	135	20
Total Dissolved Solids	mg/L	482	22
Total Hardness (as CaCO3)	mg/L	141	8
Total Kjeldahl Nitrogen	mg/L	1.2	21
Total Organic Carbon	mg/L	6.2	23
Turbidity	NTU	0.64	365

3.2.3.3 Temescal Creek

Temescal Creek begins at the outfall of Lake Elsinore extending down to its confluence with the SAR in the Prado Basin. Water quality monitoring in Temescal Creek is preformed by CBWM/IEUA for the HCMP at *Temescal Channel above Main Street at Corona* and by OCWD at *Temescal Creek (SAR-TEMESCAL-02)* for their SAR water quality monitoring program, as shown in Figure 2-1a. In 2007, CBWM/IEUA monitored the *Temescal Channel above Main Street at Corona* site, on a bi-monthly basis (23 sampling events), OCWD monitored the *Temescal Creek (SAR-TEMESCAL-02)* site once in 2007. The Basin Plan specifies no water quality objectives for Temescal Creek. Table 3-15 presents a summary of the results of this monitoring effort.

Non-tributary discharges to Temescal Creek include recycled water produced at EMWD's Wastewater Treatment Plant (WWTP), EVMWD's Regional WRF, City of Corona's WWTP 1B, and Lee Lake Water District's (LLWD) WWTP, shown in Figure 2-1b. In 2007, the Arlington Desalter released 938 AF of treated, potable water to the SAR via the Arlington Channel. Table 3-16 summarizes the non-tributary discharges of flow and water quality to Temescal Creek for 2007.

The USGS also maintains a gauging station, 11072100, located along Temescal Creek above Main Street at Corona, shown in Figure 2-1a. In 2007, this station recorded flows totaling 14,325 AF.

Table 3-15. Summary of Water Quality and Flow Observations for Temescal Creek

Constituent	Units	Temescal Channel above Main at Corona	# of Samples	CK-TEMESCAL-02	# of Samples
Ammonia-Nitrogen	mg/L	0.06	23	0.20	1
Bicarbonate (as CaCO3)	mg/L	132	23	102	1
Boron	mg/L	0.32	23	-na-	-na-
Calcium	mg/L	85	23	67	1
Carbonate (as CaCO3)	mg/L	54	23	21	1
Chloride	mg/L	159	23	177	1
Electrical Conductivity	umhos/cm	1185	23	1280	1
Hydroxide (as CaCO3)	mg/L	0.00	23	0.00	1
Magnesium	mg/L	37	23	31	1
Nitrate-Nitrogen	mg/L	5.1	23	3.7	1
Nitrite-Nitrogen	mg/L	0.07	23	0.23	1
pH	units	9.1	23	8.7	1
Potassium	mg/L	7.0	23	6.6	1
Sodium	mg/L	134	23	137	1
Sulfate	mg/L	192	23	224	1
Total Alkalinity (as CaCO3)	mg/L	186	23	123	1
Total Dissolved Solids	mg/L	787	23	818	1
Total Hardness (as CaCO3)	mg/L	-na-	-na-	292	1
Total Inorganic Nitrogen	mg/L	5.2	23	-na-	-na-
Total Kjeldahl Nitrogen	mg/L	1.7	23	1.5	1
Total Nitrogen	mg/L	6.8	23	5.4	1
Total Organic Carbon	mg/L	6.1	23	11.2	1
Turbidity	NTU	7.8	23	7.3	1

Table 3-16. Annual Discharges of Flow and Average Water Quality to Temescal Creek

Constituent	Units	City of Corona Plant 1B	# of Samples	Arlington Desalter	# of Samples	EMWD Wastewater Treatment	# of Samples	EVMWD Regional Water Reclamation Facility	# of Samples	LLWD Water Treatment Plant	# of Samples
Discharge	AFY	4,240	365	938	-na-	9,134	12	4,394	365	710	12
Ammonia-Nitrogen	mg/L	1.3	133	-na-	-na-	1.4	135	-na-	-na-	6.4	12
Bicarbonate (as CaCO3)	mg/L	179	24	-na-	-na-	97	5	189	12	-na-	-na-
Boron	mg/L	0.55	27	-na-	-na-	0.44	5	0.36	12	-na-	-na-
Calcium	mg/L	81	25	-na-	-na-	59	5	63	12	-na-	-na-
Carbonate (as CaCO3)	mg/L	0.00	23	-na-	-na-	0.00	5	0.00	12	-na-	-na-
Chemical Oxygen Demand	mg/L	-na-	-na-	-na-	-na-	-na-	-na-	25	365	-na-	-na-
Chloride	mg/L	181	25	-na-	-na-	203	5	165	12	148	12
Electrical Conductivity	umhos/cm	1135	372	-na-	-na-	1232	5	-na-	-na-	-na-	-na-
Hydroxide (as CaCO3)	mg/L	0.00	23	-na-	-na-	0.00	5	-na-	-na-	-na-	-na-
Magnesium	mg/L	25	25	-na-	-na-	19	5	20	1	-na-	-na-
Nitrate-Nitrogen	mg/L	4.0	48	27.3	7	6.1	5	-na-	-na-	-na-	-na-
Nitrite-Nitrogen	mg/L	0.14	46	-na-	-na-	0.32	5	-na-	-na-	-na-	-na-
pH	units	7.1	372	7.9	6	7.1	5	7.8	365	7.1	12
Potassium	mg/L	21	23	-na-	-na-	19	5	-na-	-na-	-na-	-na-
Sodium	mg/L	167	25	-na-	-na-	142	5	144	12	120	12
Sulfate	mg/L	220	25	-na-	-na-	184	5	179	12	103	12
Total Alkalinity (as CaCO3)	mg/L	180	23	-na-	-na-	97	5	-na-	-na-	-na-	-na-
Total Dissolved Solids	mg/L	843	28	309	7	719	8	720	1	542	12
Total Hardness (as CaCO3)	mg/L	298	8	-na-	-na-	226	5	243	12	123	12
Total Inorganic Nitrogen	mg/L	5.9	47	-na-	-na-	8.3	5	2.8	12	9.2	12
Total Kjeldahl Nitrogen	mg/L	3.0	23	-na-	-na-	-na-	-na-	-na-	-na-	-na-	-na-
Total Nitrogen	mg/L	7.2	23	-na-	-na-	-na-	-na-	-na-	-na-	-na-	-na-
Total Organic Carbon	mg/L	7.4	271	-na-	-na-	-na-	-na-	-na-	-na-	-na-	-na-
Turbidity	NTU	1.1	372	-na-	-na-	-na-	-na-	0.6	365	1.0	12

3.3 Santa Ana River Reach 4

The Basin Plan has specified water quality objectives for SAR Reach 4 for TDS, TIN, and COD. Along SAR Reach 4, OCWD monitors sites, *SAR-MISSION, SAR-RIVERSIDEAVE, WR-RIX-01 and SAR-LACADENA-01*, shown in Figure 2-1a. In 2007, the *SAR-MISSION, SAR-RIVERSIDEAVE and WR-RIX-01* sites were monitored once by OCWD in August. Based upon limited available data collected by OCWD, no constituents were shown to exceed Basin Plan objectives. Table 3-17 presents a summary of the results of this monitoring effort.

Non-tributary discharges to SAR Reach 4 include recycled water produced at City of San Bernardino's Rapid Infiltration Facility (RIX), City of Rialto's WWTP, and City of Colton's Waste Water Treatment Facility, shown in Figure 2-1b. In 2007, no data was reported for the City of Colton's Waste Water Treatment Facility. Table 3-18 summarizes the non-tributary discharges of flow and water quality to Reach 4 of the SAR for 2007.

Table 3-17. Summary of Water Quality and Flow Observations for Santa Ana River Reach 4

Constituent	Units	Basin Plan Objective SAR Reach 4	SAR at Mission Ave	# of Samples	SAR at Riverside Avenue	# of Samples	WR-RIX-01	# of Samples
Ammonia-Nitrogen	mg/L		0.00	1	0.00	1	0.30	1
Bicarbonate (as CaCO3)	mg/L		180	1	188	1	194	1
Boron	mg/L		-na-	-na-	-na-	-na-	-na-	-na-
Calcium	mg/L		64	1	63	1	67	1
Carbonate (as CaCO3)	mg/L		9.9	1	0	1	0	1
Chemical Oxygen Demand	mg/L	**30**	5.0	2	2.0	2	4.0	2
Chloride	mg/L		72	1	72	1	70	1
Electrical Conductivity	umhos/cm		813	1	816	1	821	1
Hydroxide (as CaCO3)	mg/L		0.00	1	0.00	1	0.00	1
Magnesium	mg/L		12.1	1	11.4	1	12.6	1
Nitrate-Nitrogen	mg/L		7.1	1	7.0	1	6.9	1
Nitrite-Nitrogen	mg/L		0.07	1	0.13	1	0.25	1
Organic Nitrogen	mg/L		0.00	1	0.40	1	0.10	1
pH	units		8.4	1	8.1	1	7.7	1
Potassium	mg/L		15.7	1	14.5	1	15.6	1
Sodium	mg/L		81	1	77	1	81	1
Sulfate	mg/L		79	1	80	1	82	1
Total Alkalinity (as CaCO3)	mg/L		189	1	188	1	194	1
Total Dissolved Solids	mg/L	**550**	512	1	512	1	512	1
Total Hardness (as CaCO3)	mg/L		210	1	204	1	220	1
Total Kjeldahl Nitrogen	mg/L		0.00	1	0.50	1	0.40	1
Total Nitrogen	mg/L		7.2	1	7.7	1	7.5	1
Total Inorganic Nitrogen	mg/L	**10**	7.2	1	7.2	1	7.4	1
Total Organic Carbon	mg/L		3.4	1	2.9	1	2.8	1
Turbidity	NTU		0.80	1	0.80	1	0.30	1

Note: Exceedances are shown in red lettering.

Table 3-18. Annual Discharges of Flow and Average Water Quality to Santa Ana River Reach 4

Constituent	Units	City of Rialto Waste Water Treatment Plant	# of Samples	City of San Bernardino Rapid Infiltration Facility (RIX)	# of Samples
Discharge	AFY	7436	365	27892	365
Ammonia-Nitrogen	mg/L	0.20	97	0.49	51
Bicarbonate (as CaCO3)	mg/L	175	6	229	52
Boron	mg/L	0.24	6	-na-	-na-
Calcium	mg/L	53	6	64	12
Carbonate (as CaCO3)	mg/L	0.00	6	0.00	52
Chloride	mg/L	83	5	68	12
Hydroxide (as CaCO3)	mg/L	0.00	1	0.00	52
Magnesium	mg/L	8.5	6	11.9	12
Nitrate-Nitrogen	mg/L	7.5	15	6.8	51
Nitrite-Nitrogen	mg/L	0.00	3	0.15	51
pH	units	7.4	11	-na-	-na-
Potassium	mg/L	-na-	-na-	14.9	12
Sodium	mg/L	91	2	76	12
Sulfate	mg/L	65	6	78	12
Total Alkalinity (as CaCO3)	mg/L	167	3	187	52
Total Dissolved Solids	mg/L	490	13	495	12
Total Hardness (as CaCO3)	mg/L	172	12	209	12
Total Inorganic Nitrogen	mg/L	7.7	13	7.5	51
Total Kjeldahl Nitrogen	mg/L	1.4	1	-na-	-na-
Total Organic Carbon	mg/L	6.2	108	2.7	12
Turbidity	NTU	0.53	12	0.57	257

3.4 Santa Ana River Reach 5

The Basin Plan has specified water quality objectives for SAR Reach 5 for TDS, hardness, sodium, chloride, TIN, sulfate, and COD. Along SAR Reach 5, OCWD monitors a single site, *SAR-WATERMAN-01*, shown in Figure 2-1a. However, in 2007, during the time scheduled for sampling there was no stream flow, and therefore no data was collected for this site.

Non-tributary discharges to SAR Reach 5 include recycled water inflows from the City of San Bernardino Water Reclamation facility and potential inflows from San Timoteo Creek produced at Yucaipa Valley Water District's (YVWD) Wastewater Reclamation Facility and City of Beaumont's WWTP Plant No. 1, shown in Figure 2-1b. As demonstrated in previous year's measurements of streamflow conducted by YVWD, during dry-weather conditions, the City of Beaumont's recycled water discharge completely infiltrates into the streambed in Cooper's Creek, a tributary of San Timoteo Creek. Prior to San Timoteo Creek confluence with SAR, almost all of YVWD's recycled water discharge infiltrates the streambed nearby. Table 3-19 summarizes the non-tributary discharges of flow and water quality to Reach 5 of the SAR for 2007.

The USGS also maintains two gauging stations for this segment of the SAR – station 11059300 located along the SAR at E Street near San Bernardino and station 11057500 located along San Timoteo Creek near Loma Linda, shown in Figure 2-1a. In 2007, these station recorded flows totaling 9,235 AF and 4,135 AF, respectively.

Table 3-19. Annual Discharges of Flow and Average Water Quality to San Timoteo Wash

Constituent	Units	City of San Bernardino WRP*	# of Samples	City of Beaumont Wastewater Treatment Plant No.1	# of Samples	YVWD Wastewater Reclamation Facility	# of Samples
Discharge	AFY	79	8	2,577	12	4,108	365
Ammonia-Nitrogen	mg/L	-na-	-na-	3.4	12	0.2	112
Bicarbonate (as CaCO3)	mg/L	-na-	-na-	-na-	-na-	116	4
Boron	mg/L	-na-	-na-	0.27	12	0.28	4
Calcium	mg/L	-na-	-na-	42	12	43	4
Carbonate (as CaCO3)	mg/L	-na-	-na-	0.00	12	0.00	4
Chemical Oxygen Demand	mg/L	-na-	-na-	-na-	-na-	16.9	82
Chloride	mg/L	-na-	-na-	60	12	93	3
Electrical Conductivity	umhos/cm	-na-	-na-	943	365	790	249
Hydroxide (as CaCO3)	mg/L	-na-	-na-	-na-	-na-	-na-	-na-
Magnesium	mg/L	-na-	-na-	12.7	12	11.4	4
Nitrate-Nitrogen	mg/L	-na-	-na-	-na-	-na-	12.7	66
Sodium	mg/L	-na-	-na-	72	12	86	3
Sulfate	mg/L	-na-	-na-	34	11	50	3
Total Alkalinity (as CaCO3)	mg/L	-na-	-na-	-na-	-na-	-na-	-na-
Total Dissolved Solids	mg/L	-na-	-na-	398	12	489	12
Total Hardness (as CaCO3)	mg/L	-na-	-na-	164	12	-na-	-na-
Total Inorganic Nitrogen	mg/L	-na-	-na-	0.7	12	-na-	-na-
Turbidity	NTU	-na-	-na-	0.9	365	1.1	248

* Plant discharges only when there is a 20:1 dilution with SAR. No analytical samples required.

4 Summary

This 2007 Annual Report of Santa Ana River Water Quality presents water quality data required to implement the surface water monitoring program used to determine compliance with the nitrogen and TDS objectives of the SAR and, thereby, the effectiveness of the wasteload allocations established by the RWQCB. Water quality and discharge data used to prepare the 2007 Annual Report of Santa Ana Water Quality were collected from a number of various sources. These sources include a number of regional efforts to monitor surface water quality along the SAR and its tributaries and in-stream gauges employed by the USGS. This information is detailed in Figure 4-1. Additional sources of data included non-tributary discharges from water recycling facilities and imported water releases to the SAR and its tributaries.

The evaluation of this data showed the SAR to be in compliance with regional water quality objectives. Analysis showed the most downstream stream segment, Reach 2 of the SAR to have complied with its Basin Plan objective for TDS.

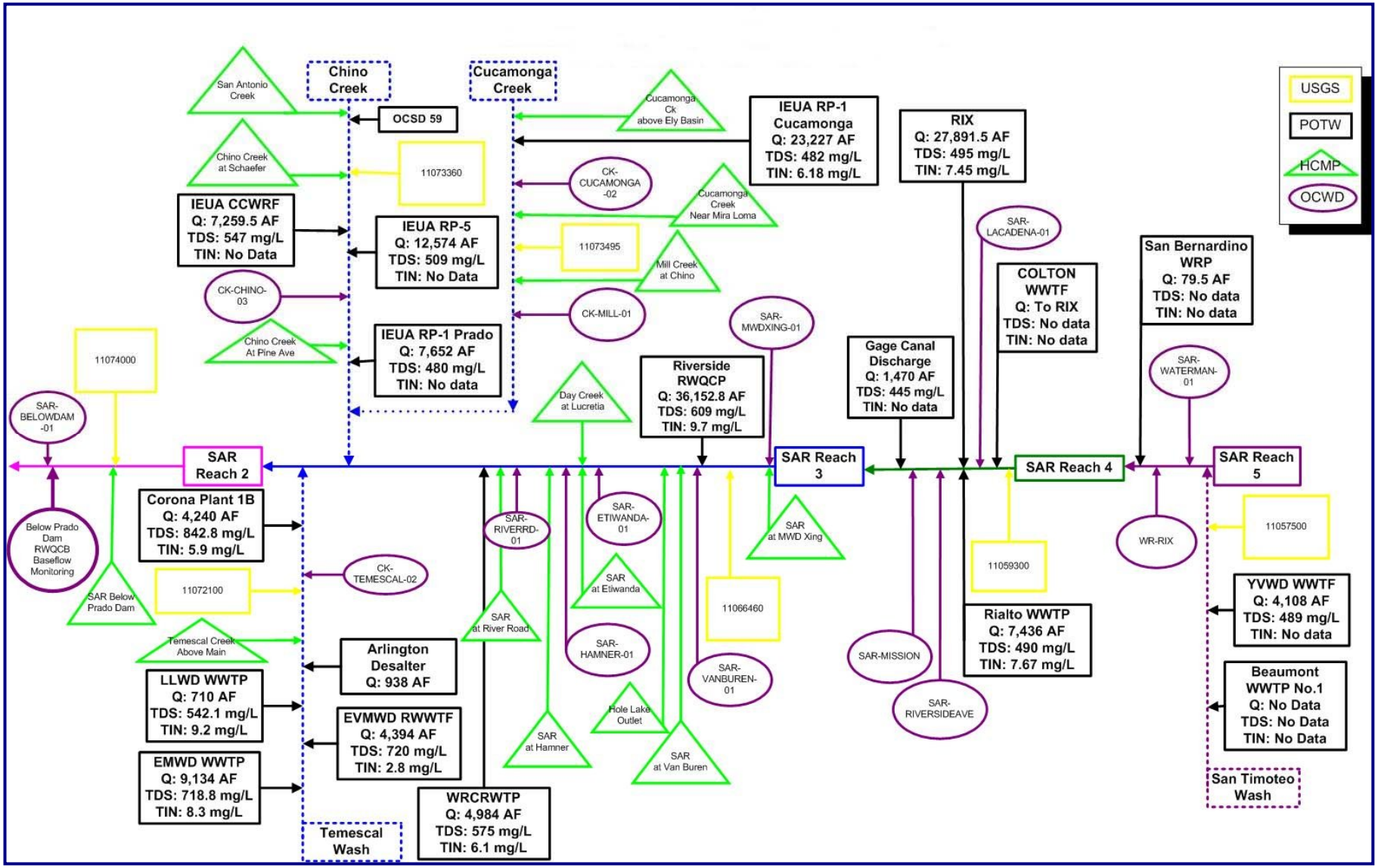
Water quality objectives specified for Reach 3 of the SAR by the Basin Plan include TDS, hardness, sodium, chloride, TN, sulfate, COD, and boron. Analysis of annual data showed Reach 3 of the SAR to have complied with the water quality objectives specified in the Basin Plan. However, monitoring data collected at *Hole Lake Outlet* and *Day Creek at Lucretia*, which are tributary to Reach 3 of the SAR, showed exceedences. Data collected at *Hole Lake Outlet*, which historically is of poorer water quality showed exceedences of water quality objectives for TDS, chloride, sodium, sulfate and TIN specified in the Basin Plan. Samples collected for *Day Creek at Lucretia*, another tributary to the SAR, exceeded the Basin Plan water quality objective for TIN.

As for the three tributaries to Reach 3 of the SAR that are regularly monitored for water quality, only Reach 1 of Chino Creek has established numeric objectives for water quality. Surface water quality monitoring of Reach 1B of Chino Creek in 2007 showed exceedences of water quality objectives specified in the Basin Plan. These included exceedances of TDS, chloride, sodium, and sulfate.

Water quality objectives specified for Reach 4 of the SAR by the Basin Plan include TDS, TIN, and COD. An analysis of available surface monitoring data showed Reach 4 of the SAR to have complied with the water quality objectives specified in the Basin Plan.

Water quality objectives specified for Reach 5 of the SAR by the Basin Plan include TDS, TIN, hardness, sodium, chloride, sulfate and COD. An analysis of available surface monitoring data showed Reach 5 of the SAR to have complied with the water quality objectives specified in the Basin Plan.

Figure 4-1. Annual Average Water Quality and Volume Discharged to Santa Ana River and Tributaries in 2007



Appendix A

All 2007 Water Quality and Flow Data
(*included on enclosed CD*)