

**California Regional Water Quality Control Board
Santa Ana Region**

March 14, 2014

STAFF REPORT

ITEM: 16

SUBJECT: Enclosed is a copy of the "Draft 2013 Emerging Constituents Sampling Report of the Emerging Constituents Program Task Force". Task Force consultants will brief the Board on the 2013 sampling program results (information item).

2013 Sampling Report for Emerging Constituents in the Santa Ana Region



Coordinated by:
Santa Ana Watershed Project Authority



DRAFT

2013 Sampling Report for Emerging Constituents in the Santa Ana Region

Contents

Section 1:	Executive Summary.....	2
Section 2:	Background & Purpose of Study.....	3
Section 3:	Study Approach and Methods.....	5
Section 4:	EC Sampling Results for 2013.....	8
Section 5:	QA/QC of Blank Samples.....	9
Section 6:	QA/QC of Samples Spiked with Known EC Concentrations.....	10
Section 7:	QA/QC of Identical Split Samples.....	11

Tables

Table 1:	Summary of Results for <u>26</u> Samples Analyzed in 2013.....	2
Table 2:	Emerging Constituents Analyzed in 2013.....	5
Table 3:	Members of the Emerging Constituents Task Force.....	7
Table 4a:	EC Sampling Results for Wastewater Treatment Plants in 2013.....	8
Table 4b:	EC Sampling Results for Aqueduct and River Sites in June, 2013.....	8
Table 4c:	EC Sampling Results for River Sites in September, 2012.....	8
Table 5a:	QA/QC Blank Data for Wastewater Treatment Plants in 2013.....	9
Table 5b:	QA/QC Blank Data for Aqueduct and River Sites in June, 2013.....	9
Table 5c:	QA/QC Blank Data for River Sites in Sept., 2012.....	9
Table 6a:	QA/QC Samples Spiked with Known EC Levels (MWD data)	10
Table 6b:	QA/QC Samples Spiked with Known EC Levels (OCWD, 6/13).....	10
Table 6c:	QA/QC Samples Spiked with Known EC Levels (OCWD, 9/12).....	10
Table 7a:	QA/QC Low Level Check Samples for 2013.....	11
Table 7b:	QA/QC Mid-Level Check Samples for 2013.....	11
Table 7c:	QA/QC Identical Splits of a Field Samples (Prado Dam).....	12

Appendices

Appendix A:	Tabular Summary of Results, by Analyte, for 2010 thru 2013
Appendix B:	Updated Sampling and Laboratory Analysis Plan for 2013

Section 1: Executive Summary

"Emerging Constituents" (EC) is a phrase used to describe a large number of pharmaceuticals, personal care products, food additives, pesticides and other common household chemicals for which federal and state authorities have not yet established an official water quality standard, approved a standard analytical method or required routine monitoring and reporting. In 2009, water and wastewater agencies in the Santa Ana River region developed a voluntary program to characterize "Emerging Constituents" in samples collected from the Santa Ana River, the Colorado River aqueduct, the State Project Water aqueduct and in recycled water produced by local wastewater treatment plants.¹

Commencing in June of 2010, samples were collected and analyzed annually each summer. The study was originally intended to last only three years and was scheduled to conclude when the State Water Resources Control Board established a more formal EC monitoring program in January of 2013. However, the EC Task Force elected to extend the voluntary study one additional year to develop baseline data consistent with the amended Recycled Water Policy.

Table 1: Summary of Results for 26 Samples Analyzed in 2013

Compound	Primary Use	Frequency of Detection	Reported Range²	Common Dose
Caffeine	Food Additive	42% (11 of 26)	ND – 0.000407 mg/L	100 mg
DEET ³	Insecticide	81% (21 of 26)	ND – 0.000270 mg/L	270 mg
17β Estradiol	Natural Hormone	0% (0 of 26)	Never Detected	1 mg
Gemfibrozil	Anti-cholesterol	31% (8 of 26)	ND – 0.002000 mg/L	600 mg
Iopromide	Xray Contrast Agent	58% (15 of 26)	ND – 0.000680 mg/L	500 mg
Sucralose	Artificial Sweetener	100% (26 of 26)	0.000670 - 0.100000 mg/L	5,000 mg
Triclosan	Antiseptic	58% (15 of 26)	ND – 0.001000 mg/L	1 mg

Note: "mg/L" = milligram per Liter; 1 mg/L is one part per million. "ND" = Not Detected.

Although ECs were detected at many of the sampling sites, the concentrations were extremely low. And, where detected, EC concentrations fell well within the range where other studies have shown that "no adverse health effects would be expected."^{4, 5} For example, caffeine was detected in 11 (42%) of the 26 samples. However, the highest reported concentration was only four-ten-thousandths of a milligram. By comparison, a large coffee or soda usually contains at least 100 milligrams of caffeine. Thus, a person would have to deliberately consume more than 660,000 gallons of treated municipal effluent in order to ingest an amount of caffeine equal to that found in popular beverage drinks.

¹ The proposed program was reviewed and endorsed by the Santa Ana Regional Water Quality Control Board in Res. No. R8-2009-0071 (Dec. 10, 2009). Task Force members are listed on page 7 of this report.

² The study imposed a mandatory reporting limit of 0.000010 mg/L (10 nanograms per liter). In some cases, a laboratory may have observed and recorded value less than this level.

³ DEET is the commonly used abbreviation for *N,N*-Diethyl-*meta*-toluamide; DEET is applied topically not orally.

⁴ Intertox, Inc. Comparison of Analytical Results for Trace Organics in the Santa Ana River at the Imperial Highway to Health Risk-based Screening Levels. Seattle, WA. June 25, 2009. This report did not develop or evaluate health based screening levels for BPA, 17α-Ethinyl Estradiol, 17β-Estradiol, Iopromide or Naproxen.

⁵ World Health Organization. Pharmaceuticals in Drinking Water (Ch. 2: Human health risk assessment); 2012. http://www.who.int/water_sanitation_health/publications/2012/pharmaceuticals/en/index.html

Section 2: Background & Purpose of Study

Water quality is routinely analyzed at thousands of locations all across the country. Samples are collected from rain water, storm water runoff, freshwater streams, lakes and reservoirs, groundwater wells and tap water to characterize the quality of these various sources. Additional samples from the sewage systems are analyzed to ensure pollution prevention programs and wastewater treatment plants are meeting all federal and state water quality standards.

Recent improvements in analytical laboratory technology have dramatically improved our ability to detect a wider range of chemicals at much lower concentrations.⁶ Today, we are able to identify and quantify these emerging constituents in the range of one part-per-trillion (ppt or nanogram per liter).⁷ One part per trillion is equal to just one second in 31,546 years. One nanogram per liter is equivalent to a single drop in a volume of water equal to twenty Olympic-sized swimming pools.

Trace levels (approx. 1 ppt to 100 ppt) of many different man-made chemicals (including pesticides, pharmaceuticals and personal care products) have been found in waters across the United States.⁸ Collectively, these compounds are referred to as "Emerging Constituents" not because they are new but, rather, because their presence can now be detected by more sensitive analytical technology.

Emerging Constituents is one of several similar phrases used to describe the same phenomena. Synonyms include: chemicals of emerging concern (CEC), micro-constituents, micro-pollutants, trace organics, etc. However, such phrases may mistakenly imply that it is the concern that is "emerging" rather than the technology to detect these compounds in a water sample. Similarly, referring to such compounds as "Emerging Pollutants" or "Emerging Contaminants" may unintentionally and improperly suggest that the levels detected pose a known hazard to people or the environment when the true risk, if any, has not yet been established by federal or state authorities.

In general, chemicals can be divided into two categories: regulated and unregulated compounds. Regulated chemicals include those for which formal water quality standards or state notification levels have been established. State and federal authorities may issue permits and orders governing the release of such compounds into the environment. The regulatory requirements may range from relatively simple monitoring and reporting obligations to strict discharge prohibitions.

By contrast, ECs are usually unregulated. However, regulatory requirements will likely change as new information is developed. To that end, additional data are needed to characterize the presence and persistence of ECs in various water sources. This information, along with epidemiological and toxicological data, is used to set priorities for developing new drinking water standards, new water quality standards, new state notification levels and new monitoring requirements.⁹

⁶ Vanderford, B.J., et al. "Analysis of Endocrine Disrupters and Personal Care Products in Water Using Liquid Chromatography and Tandem Mass Spectrometry." *Analytical Chemistry*. 2003 (75:6265-6274)

⁷ Vanderford, B.J. and Shane Snyder. "Analysis of Pharmaceuticals in Water by Isotope Dilution Liquid Chromatography/Tandem Mass Spectrometry." *Environmental Science and Technology*. 2006 (p. 7312-7320).

⁸ New York City Environmental Protection. 2010 Occurrence of Pharmaceutical and Personal Care Products (PPCPs) in Source Water of the New York City Water Supply. August 19, 2011.

⁹ Additional information on the regulatory process governing Emerging Constituents is available at U.S. EPA's official website: <http://www.epa.gov/oppt/existingchemicals/>

Once ECs have been detected, the question naturally arises as to what effect, if any, these compounds may have on people and the environment.¹⁰ Several different regulatory agencies share responsibility for determining the acceptable concentration of these chemicals. This is a formidable task as there are tens of thousands of chemical compounds in common use.¹¹ Consequently, state and federal authorities rely on sales/usage information and monitoring data (from studies such as this one) to help determine appropriate research and regulatory priorities.¹²

The California Office of Environmental Health Hazard Assessment and U.S. EPA have primary legal responsibility for making the necessary risk assessments and recommending appropriate water quality standards for all chemicals including ECs. The Regional Water Quality Control Boards and the California Department of Public Health (DPH) have primary responsibility for implementing the federal and state standards.¹³

DPH has suggested that periodic monitoring for trace organic chemicals, including some previously unregulated ECs, may serve as a useful surrogate indicators to evaluate treatment performance and effectiveness for recycled water projects. Therefore, as part of the proposed Groundwater Recharge Reuse Regulations, DPH prepared a draft list of ECs to guide planning and permitting efforts for recycled water recharge projects.¹⁴ DPH is now in the process of finalizing the new regulation.¹⁵

In early 2009, the California State Water Resources Control Board ("State Board") adopted the Recycled Water Policy (RWP).¹⁶ As part of that Policy, the State Board convened a Blue Ribbon Panel of Experts to recommend appropriate water quality monitoring strategies for ECs in recycled water based on the best available pharmacological and toxicological information taking into consideration the fate and transport of such chemicals through advanced treatments systems and the natural environment. The Blue Ribbon Panel published their report in mid-2010.¹⁷ And, the State Board established formal EC monitoring requirements in January of 2013 based largely on the expert Panel's official recommendations.¹⁸

¹⁰ See, for example, "How Safe is Our Water?" Reader's Digest. Aug., 2011; pg. 102.

¹¹ U.S. Senate Oversight Hearing on EPA's Unregulated Drinking Water Contaminants Program. July 12, 2011. <http://epw.senate.gov/public/index.cfm?FuseAction=Hearings.Hearings&HearingID=fc5a8756-8021-23ad-454a-b9eeb7bf1c36>

¹² U.S. Government Accountability Office. Environmental Health: Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water. GAO-11-346. August, 2011.

¹³ DPH serves several different regulatory roles with respect to groundwater recharge projects. DPH is responsible, under statute, for establishing water quality criteria for groundwater recharge projects. DPH also acts as a consultant to the Regional Boards on the permit requirements for specific groundwater recharge projects. And, DPH has a co-equal role with the Regional Boards in establishing appropriate permit requirements for groundwater recharge projects that rely on direct injection rather than surface percolation.

¹⁴ California Department of Public Health. Draft Regulations for Groundwater Replenishment with Recycled Water. Proposed revisions published and posted to DPH website on November 21, 2011.

¹⁵ See: <http://www.cdph.ca.gov/HealthInfo/environhealth/water/Pages/Waterrecycling.aspx>

¹⁶ SWRCB. Recycled Water Policy. Resolution No. 2009-0011 (adopted 2/3/09).

¹⁷ Drewes, J.E., P. Anderson, N. Denslow, A. Olivieri, D. Schlenk & S. Snyder. Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water. Final Report and Recommendations of a Science Advisory Panel convened by the State Water Resources Control Board. Sacramento, CA. June 25, 2010.

¹⁸ State Water Resources Control Board. Attachment A: Requirements for Monitoring Constituents of Emerging Concern for Recycled Water. Jan. 22, 2013 [SWRCB Resolution No. 2013-0003].

Section 3: Study Approach and Methods

In 2013, the EC Task Force elected to extend the voluntary study one additional year and modified the sampling protocol to conform to the State Board's new EC monitoring program.¹⁹ Thus, consistent with that statewide policy, water samples were tested for only seven compounds. These particular chemicals are believed to pose no known health threat at the levels routinely found in the environment. However, these compounds are believed to be reliable surrogate indicators to evaluate the efficiency and effectiveness of advanced wastewater treatment processes commonly used to produce recycled water.

Table 2: Emerging Constituents Analyzed in 2013

Compound	Category	Common Use
Caffeine	Food Additive	Non-Prescription Stimulant
DEET	Pesticide	Insect Repellent
17 β -Estradiol	Pharmaceutical	Prescription Hormone (natural)
Gemfibrozil	Pharmaceutical	Prescription Anti-Cholesterol
Iopromide	Pharmaceutical	X-ray Contrast Agent
Sucralose	Food Additive	Artificial Sweetener
Triclosan	Antiseptic	Commercial Antiseptic

Samples were collected from 20 different wastewater treatment plants operating in the region (see Fig. 1).²⁰ All 20 treatment facilities met Title-22 requirements for tertiary filtration prior to discharge. Samples were also collected from two locations along the Santa Ana River (MWD crossing and Prado Dam), one location in the State Water Project (Devil Canyon) and one location near the terminus of the Colorado River Aqueduct (San Jacinto West Portal). Tabular data for all 24 locations in the Santa Ana region are presented in Section 4.²¹ The results are consistent with those reported for a similar analysis recently conducted in the Los Angeles Region.²²

All of the samples were evaluated with the best analytical technology commercially available: Liquid Chromatography/Tandem Mass Spectrometry using the isotope dilution method. This technique is capable of detecting select ECs in de-ionized laboratory water at concentrations in the range of 1 to 10 ng/L. However, the specific laboratory reporting level (LRL) for more complex water matrices varies over time and between laboratories. Therefore, for all but one compound, the mandatory reporting level for samples in this study was set to a minimum of 10 ng/L. The mandatory reporting level for 17 β -Estradiol was set to 1 ng/L as specified in the amended Recycled Water Policy. Quality control and assurance data are presented in Sections 5, 6 and 7. The EC Task Force's 2013 sampling program was performed in accordance with the approved study plan and the reported results indicate a high level of quality control at all of the contract laboratories.

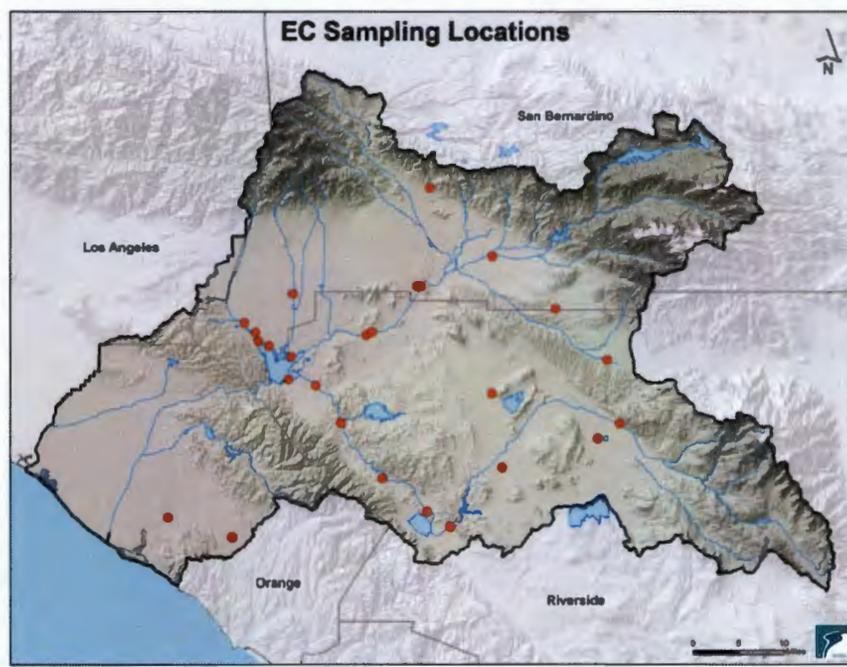
¹⁹ A copy of the revised Sampling and Laboratory Analysis Plan is provided in Appendix B.

²⁰ Samples were not collected at Beaumont WWTP #1, Corona WRF #2 or at the RIX treatment plant in 2013.

²¹ Santa Ana River sites were sampled twice in 2013 (June & Sept.); all other sites were sampled only once (June).

²² Southern California Coastal Water Research Project (SCCWRP). Screening Study for Constituents of Emerging Concern (CECs) in Selected Freshwater Rivers in the Los Angeles Region. June 22, 2012.

Figure 1: Sampling Locations for ECs in the Santa Ana River Watershed (2010 - 2013)



Because the specific laboratory methods used to analyze for ECs have not yet been formally approved by federal or state authorities, great care must be exercised when interpreting and reporting the results of such studies.²³ Data generated from the non-standard methods employed during this preliminary characterization study have not been evaluated or certified for regulatory purposes such as: 303(d) listing decisions, antidegradation analyses, or translating narrative criteria into numeric effluent limits. These regulatory determinations depend on more detailed risk assessments that are not yet available.

Nevertheless, data from studies such as this one are useful for determining which ECs, if any, should be prioritized for additional method development or more routine monitoring.²⁴ In fact, two of the fifteen ECs voluntarily analyzed by the EC Task Force during 2010-2012 have already been added to EPA's Unregulated Contaminant Monitoring Rule (UCMR-3).²⁵ And, six of the fifteen were eventually included in the formal EC monitoring program recently established by the SWRCB for recycled water projects.²⁶ Sucralose, which was not among the chemicals analyzed in the first three years of the Santa Ana EC study effort, was added to the list of analytes in 2013 to ensure consistency with the Recycled Water Policy.

Detailed laboratory results for the 2013 sampling program are provided in Section 4. And, tables summarizing the analytical data for all four years (2010-2013) of this study effort are presented in Appendix A.

²³ Federally-approved standard methods are promulgated in accordance with and identified within 40 CFR Part 136 and 40 CFR Part 141..

²⁴ U.S. Government Accountability Office. Environmental Health: Action Needed to Sustain Agencies' Collaboration on Pharmaceuticals in Drinking Water. GAO-11-346. August, 2011.

²⁵ 17 α Ethinyl Estradiol and 17 β Estradiol (see 77 FR 85, 26099; May 2, 2012).

²⁶ Caffeine, DEET, Gemfibrozil, Iopromide, Triclosan and 17 β Estradiol (SWRCB Resolution No. 2013-0003)

With this final report, the voluntary EC characterization study for the Santa Ana region is now concluded. Henceforth, future efforts to monitor for emerging constituents will be guided by the requirements set forth in the Recycled Water Policy and, when finalized, the Groundwater Recharge Reuse regulations.

Please direct all comments and questions to:

Mr. Mark Norton, P.E.
Water Resources and Planning Manager

Santa Ana Watershed Project Authority (SAWPA)
11615 Sterling Ave.
Riverside, CA 92503

Phone: (951) 354-4221
Email: mnorton@sawpa.org

Members of SAWPA's Emerging Constituents Task Force (2008 – 2013)

Eastern Municipal Water District	City of Beaumont
Inland Empire Utilities Agency	City of Redlands
Orange County Water District	City of Corona
San Bernardino Valley Muni. Water Dist.	City of Rialto
Western Municipal Water District	City of Riverside
Irvine Ranch Water District	Yucaipa Valley Water District
Metropolitan Water District of So. Calif.	Lee Lake Water District
San Geronio Pass Water Agency	Jurupa Community Services District
Elsinore Valley Municipal Water District	Chino Basin Watermaster
Western Riverside County Regional Wastewater Authority	Colton/San Bernardino Regional Tertiary and Wastewater Reclamation Authority

Section 4: EC Sampling Results (ng/L) for 2013**Table 4a: June 2013 - POTWs**

Sampling Location	Caffeine	DEET	17 β Estradiol (E2)	Gemfibrozil	Iopromide	Triclosan	Sucralose
City of Corona WRF 1B	15	270	<1	<10	68 ^{NMint}	<10	18000
City of Corona WRF 3	51	110	<1	<10	17	<10	22000
EMWD MV-RWRF	<10	170	<1	<10	240	<10	64000
EMWD PV-RWRF	<10	34 ^{M2}	<1	<10 ^{M1,R5}	<10	<10 ^{R5}	5600 ^{M3}
EMWD SJV-RWRF	18	190	<1	2000	13	<10	55000
EMWD TV-RWRF	<10	150	<1 ^{M2}	63	16	<10	49000
EVMWD Horsethief Canyon	<10	14	<1	<10	<10	<10	100000
EVMWD Railroad Canyon WRP	<10	18	<1	<10	<10	<10	30000
EVMWD Regional WRP	<10	48	<1	76	<10	10	24000 ^{M3}
IEUA CCWRF	<10	45 ^{M1}	<1	<10	50	<10	37000 ^{M3}
IEUA RP1 02	15	99 ^{M1}	<1	<10	100 ^{M1}	<10 ^{M2}	31000 ^{M3}
IEUA RP1 1B	<10	83	<1	<10	98	<10	48000
IEUA RP5	13	<10	<1	<10	<10	<10	54000
IRWD Los Alisos Plant	110	120	<1	1600	160	<10	48000
IRWD Michelson Plant	11	150	<1	<10	680	<10	27000
City of Redlands WWTP	<10	20	<1	<10	<10	<10	27000 ^{M3}
City of Rialto WWTP	<10	170	<1	<10 ^J	28	<10 ^J	20000
City of Riverside RWQCP	<10	<10	<1	12	320	<10	56000
WRCWRA Treatment Plant	<10	16	<1	<10 ^J	<10	<10 ^J	5200
YVWD WRF	<10	240	<1	520	60	<10	69000

Table 4b: June 2013 - River Sites

State Project Water at Devil Canyon (MWD)	<10	<10	NA	<10	<10	<10	670
Colo River at San Jacinto West Portal (MWD)	17	<10	NA	<10	<10	<10	730
Santa Ana River near MWD crossing (OCWD)	54.6	40.5	<1	58.6	<10	<10	22500
Santa Ana River near Prado Dam (OCWD)	33	90.6	<1	37.7	53.3	<10	28100

Table 4c: September 2012 - River Sites

Santa Ana River near MWD crossing (OCWD)	11.4	23.5	<1	<10	<10	<10	27300
Santa Ana River near Prado Dam (OCWD)	13.6	57.4	<1	<10	79.9	<10	26500

Notes:

	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
NA	No Sample Available
M1	Matrix spike recovery was high; the associated blank spike recovery was acceptable.
M2	Matrix spike recovery was low; the associated blank spike recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.
R5	MS/MSD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.
Nmint	Due to matrix interference, the matrix spike and/or matrix spike duplicate performed on this sample did not meet laboratory acceptance criteria.
J	Estimated value

Section 5: QA/QC Blank Data (ng/L) for 2013**Table 5a: June 2013 - POTWs**

Sampling Location	Caffeine	DEET	17 β Estradiol (E2)	Gemfibrozil	Iopromide	Triclosan	Sucralose
City of Corona WRF 1B	<10	<10	<1	<10	<10	<10	<100
City of Corona WRF 3	18	<10	<1	<10	<10	<10	<100
EMWD MV-RWRF	<10	<10	<1	<10	<10	<10	<100
EMWD PV-RWRF	<10	<10	<1	<10	<10	<10	<100
EMWD SJV-RWRF	<10	<10	<1	<10	<10	<10	<100
EMWD TV-RWRF	<10	<10	<1	<10	<10	<10	<100
EVMWD Horsethief Canyon	<10	<10	<1	<10	<10	<10	<100
EVMWD Railroad Canyon WRP	<10	<10	<1	<10	<10	<10	<100
EVMWD Regional WRP	<10	<10	<1	<10	<10	<10	<100
IEUA CCWRF	<10	<10	<1	<10	<10	<10	<100
IEUA RP1 02	<10	<10	<1	<10	<10	<10	<100
IEUA RP1 1B	<10	<10	<1	<10	<10	<10	<100
IEUA RP5	<10	<10	<1	<10	<10	<10	<100
IRWD Los Alisos Plant	<10	<10	<1	<10	<10	<10	<100
IRWD Michelson Plant	<10	<10	<1	<10	<10	<10	<100
City of Redlands WWTP	<10	<10	<1	<10	<10	<10	<100
City of Rialto WWTP	<10	<10	<1	<10	<10	<10 ^J	<100
City of Riverside RWQCP	<10	<10	<1	<10	<10	<10	<100
WRCWRA Treatment Plant	<10	120 ^{NBLK}	<1	<10	<10	<10	<100
YVWD WRF	<10	<10	<1	<10	<10	<10	<100

Table 5b: June 2013 - River Sites

State Project Water at Devil Canyon (MWD)	<10	<10	NA	<10	<10	<10	<100
Colo River at San Jacinto West Portal (MWD)	<10	<10	NA	<10	<10	<10	<100
Santa Ana River near MWD crossing (OCWD)	<10	<10	<1	<10	<10	<10	<100
Santa Ana River near Prado Dam (OCWD)	<10	<10	<1	<10	<10	<10	<100

Table 5c: September 2012 - River Sites

Santa Ana River near MWD crossing (OCWD)	<10	<10	<1	<10	<10	<10	<100
Santa Ana River near Prado Dam (OCWD)	<10	<10	<1	<10	<10	<10	<100

Notes:

	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
NBLK	Analyte was detected at <1 ng/L in the Method Blank.
J	Estimated value

Section 6: QA/QC Reference Samples Spiked with Known EC Concentrations

Table 6a: June 2013 - QC Data, MWD

Analyte	Caffeine		DEET		17b-Estradiol		Gemfibrozil		Iopromide		Triclosan	
MRL (ng/L)	5		2		NA		5		5		5	
		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery
Sample 1	0		0				0		0		0.885	
Sample 1_sp50	55.2	110%	57.1	114%			55.5	111%	47.6	95%	59.1	116%
Sample 1_sp50dp	53	106%	57.5	115%			55.8	112%	49.1	98%	56.2	111%
MS/MSD Relative % Diff (RPD)	4%		1%				1%		3%		5%	
Sample 2	3.39		4.91				0		0.233		0	
Sample 2_sp100	102	99%	102	97%			104	104%	86.8	87%	119	119%
Sample 2_sp100dp	103	100%	100	95%			103	103%	90.7	90%	109	109%
MS/MSD Relative % Diff (RPD)	1.0%		2.0%				1.0%		4.4%		8.8%	

June 2013 - QC Data, MWD (continued)

Analyte	Sucralose	
MRL (ng/L)	100	
		Recovery
L Silv Dvl Cyn North Park	666	
L Silv Dvl Cyn North Park sp1ppb	1570	90%
L Silv Dvl Cyn North Park sp1ppb Dup	1580	91%
MS/MSD Relative % Diff (RPD)	1%	
ERA Mid Fortification	14300	
ERA Mid Fortification_sp10ppb	24600	103%
ERA Mid Fortification_sp10ppb Dup	23900	96%
MS/MSD Relative % Diff (RPD)	6.0%	

Table 6b: June 2013 - QC Data, OCWD

Analyte	Caffeine		DEET		17b-Estradiol		Gemfibrozil		Iopromide		Triclosan		Sucralose	
MRL (ng/L)	3				1		1		10		1		100	
		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery
True Value Low LFB (ng/L)	3				1		1		10		1		100	
Laboratory Result Low LFB	2.6	88%	****		0.9	87%	0.7	70%	8.0	80%	1.2	116%	138.0	138%
True Value LFB (ng/L)	30		10		10		10		20		10		2000	
Laboratory Result LFB*	30.4	101%	9.6	96%	9.6	96%	10.2	102%	18.3	92%	9.9	99%	2070.0	104%
SAR BELOWDAM-01 (Initial)	33.2		90.6		<1.0		37.7		53.3		2.4		**2810	
SAR BELOWDAM-01 Matrix Spike*	636.0	106%	267.0	88%	207.0	104%	262.0	112%	249.0	98%	199.0	98%	7320.0	113%
SAR BELOWDAM-01 Matrix Spike (dup)	634.0	106%	265.0	87%	206.0	103%	255.0	109%	246.0	96%	202.0	100%	6930.0	103%
MS/MSD Relative Percent Difference (RPD)	0.3%		0.8%		0.5%		2.7%		1.2%		1.5%		5.5%	

**** The RDL for DEET is at 10ng/L because the results of the Low LFB (1ng/L) were inconsistent between multiple extractions.

* Spike concentration = 200ng/L except

Caffeine - spike concentration = 600ng/L

Sucralose - due to high concentration of the sucralose in the sample, we diluted the sample 10 times and spike with 4000ng/L to keep the analytical results within calibration range

** Final value from 10 times dilution is 28,100 ng/L

Table 6c: September 2012 - QC Data, OCWD

Analyte	Caffeine		DEET		17b-Estradiol		Gemfibrozil		Iopromide		Triclosan		Sucralose	
MRL (ng/L)	3		1		2		1		10		1		100	
		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery		Recovery
True Value Low LFB (ng/L)	3		1		2		1		10		1		100	
Laboratory Result Low LFB	3.2	105%	0.7	67%	1.2	60%	1.2	116%	6.6	66%	1.3	131%	88.0	88%
True Value LFB (ng/L)	30		10		10		10		20		10		2000	
Laboratory Result LFB	31.5	105%	10.1	101%	9.8	98%	10.0	100%	16.5	83%	9.2	92%	2150	108%
SAR BELOWDAM-01 (Initial)	13.6		57.4		0.0		9.6		79.9		3.4		26500	
SAR BELOWDAM-01 Matrix Spike*	657.0	107%	236.0	89%	200.0	100%	220.0	105%	301.0	111%	200.0	98%	NA	NA
SAR BELOWDAM-01 Matrix Spike (dup)	652.0	106%	228.0	85%	197.0	99%	222.0	106%	290.0	105%	205.0	101%	NA	NA
MS/MSD Relative Percent Difference (RPD)	0.8%		3.4%		1.5%		0.9%		3.7%		2.5%		NA	

*Spike concentration = 200ng/L except Caffeine, the spike concentration = 600ng/L

NA - No Sample Available

Section 7: QA/QC Identical Split Sample Data for June 2013

Table 7a: ERA - QC Low-Level Check

Analyte	%RSD	Assigned Value	Mean Recovery	Median Recovery	OCWD	EUROFINS	E.S.Babcock	MWD	OCWD	EUROFINS	E.S.Babcock	MWD
					Result (ng/L)	Result (ng/L)	Result (ng/L)	Result (ng/L)	% Recovery	% Recovery	% Recovery	% Recovery
17b-Estradiol	---	1.60	NA	---	1.38	See Table 7a-1	See Table 7a-1	NA	86.3	NA	NA	NA
Caffeine	14.7	11.0	115	114	10.6	15.0	12.0	13.0	96.4	137	109	118
DEET	20.5	14.0	110	110	11.8	16.8	14.0	19.0	84.3	120	100	136
Gemfibrozil	7.46	10.5	105	105	11.1	10.9	10.0	12.0	106	104	95.2	114
Iopromide	39.0	12.8	106	105	7.38	20.0	15.0	12.0	57.7	156	117	93.8
Triclosan	22.0	13.0	117	127	17.6	10.3	16.0	17.0	135	79.2	123	131
Sucralose	15.5	144	89.6	91.0	104	139	123	150	72.2	96.5	85.4	104

Table 7a-1

Analyte	%RSD	Assigned Value	Mean Recovery	Median Recovery
17b-Estradiol	20.6	1.50	94	94

EUROFINS	E.S.Babcock
Result (ng/L)	Result (ng/L)
1.61	1.20

EUROFINS	E.S.Babcock
% Recovery	% Recovery
107	80

Table 7b: ERA - QC Mid-Level Check

Analyte	%RSD	Assigned Value	Mean Recovery	Median Recovery	OCWD	EUROFINS	E.S.Babcock	MWD	OCWD	EUROFINS	E.S.Babcock	MWD
					Result (ng/L)	Result (ng/L)	Result (ng/L)	Result (ng/L)	% Recovery	% Recovery	% Recovery	% Recovery
17b-Estradiol	---	79.8	NA	---	76.0	See Table 7b-1	See Table 7b-1	NA	95.2	NA	NA	NA
Caffeine	8.06	175	85.0	88.0	156	131	152	156	89.1	74.9	86.9	89.1
DEET	20.1	37.8	108	107	33.5	48.8	34.0	47.0	88.6	129	89.9	124
Gemfibrozil	12.03	140	96.1	97.1	144	151	115	128	103	108	82.1	91.4
Iopromide	23.15	64.1	87.1	85.1	43.3	47.1	71.0	62.0	67.6	73.5	111	96.7
Triclosan	8.5	152	101	104	157	165	135	158	103	109	88.8	104
Sucralose	7.41	14700	87.8	85.4	12200	12700	12400	14300	83.0	86	84.4	97.3

Table 7b-1

Analyte	%RSD	Assigned Value	Mean Recovery	Median Recovery
17b-Estradiol	14.78	34.9	72.6	72.6

EUROFINS	E.S.Babcock
Result (ng/L)	Result (ng/L)
22.7	28.0

EUROFINS	E.S.Babcock
% Recovery	% Recovery
65.0	80.2

Table 7c: SAR-BELOWDAM-01 (Matrix Split)

Analyte	%RSD	Assigned Value	Mean Result (ng/L)	Median Result (ng/L)	OCWD	EUROFINS	E.S.Babcock	MWD
					Result (ng/L)	Result (ng/L)	Result (ng/L)	Result (ng/L)
17b-Estradiol	---	---	---	---	<1.0	See Table 7c-1	See Table 7c-1	NA
Caffeine	6.7	---	36.9	38	33.2	38.4	38.0	38.0
DEET	14.0	---	110	111	90.6	128	108	113
Gemfibrozil	15.9	---	38.2	39.35	37.7	44.2	30.0	41.0
Iopromide	40.7	---	55.6	60.2	53.3	77.2	25.0	67.0
Triclosan *	94.4	---	7.14	7.14	2.37	11.9	<10	<5
Sucralose	39.2	---	24975	27550	28100	27000	11000	33800

* Only OCWD and Eurofins data used in calculation of Triclosan

Table 7c-1

Analyte	%RSD	Assigned Value	Mean Result	Median Result
17b-Estradiol	---	---	---	---

EUROFINS	E.S.Babcock
Result (ng/L)	Result (ng/L)
<1.0	<1.0

Field (Site) Blank

Field (Site) Blank	OCWD	EUROFINS	E.S.Babcock	MWD
	Result (ng/L)	Result (ng/L)	Result (ng/L)	Result (ng/L)
17b-Estradiol	ND	ND	ND	ND
Caffeine	ND	ND	ND	ND
DEET	ND	ND	ND	ND
Gemfibrozil	ND	ND	ND	ND
Iopromide	ND	ND	ND	ND
Triclosan	ND	ND	ND	ND
Sucralose	ND	ND	ND	ND

Note: Regarding 17b-Estradiol

DRAFT (1/30/2014)

Page 11 of 20

The hormone results for Eurofins and Babcock are contained in a separate table, as they used the UCMR3 EPA Method 539 to achieve the required S-MRL. OCWD was able to achieve this MRL using its standard CEC method, and MWD chose not to analyze/report this compound.

Appendix A:

Tabular Summary of Results, by Analyte, for 2010 thru 2013

Table A-1: Acetaminophen
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	32	<10	<10	NA
City of Corona WRF 1B	18	45	<10	NA
City of Corona WRF 2	40	24	<10	NA
City of Corona WRF 3	<10	<10	<10	NA
EMWD MV-RWRF	20	<10	30	NA
EMWD PV-RWRF	<10	<10	<10	NA
EMWD SJV-RWRF	20	<10	<10	NA
EMWD TV-RWRF	23	10	<10	NA
EVMWD Horsethief Canyon	<10	<10	<10	NA
EVMWD Railroad Canyon WRP	<10	<10	20	NA
EVMWD Regional WRP	36	<10	30	NA
IEUA CCWRF	<10	<10	<10	NA
IEUA RP1 02	15	<10	<10	NA
IEUA RP1 1B	10	<10	<10	NA
IEUA RP5	<10	<10	NA	NA
IRWD Los Alisos Plant	<10	48	<10	NA
IRWD Michelson Plant	<10	<10	<10	NA
City of Redlands WWTP	11	<10	<10	NA
City of Rialto WWTP	<10	<10	<10	NA
City of Riverside RWQCP	11	<10	<10	NA
City of San Bernardino RIX	21	23	<10	NA
WRCWRA River Rd. Plant	19	<10	<10	NA
YVWD WRF	56	32	<10	NA
State Project Water at Devil Canyon	<10	<10	<10	NA
Colorado River at San Jacinto West Portal	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	<10	13	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<10	<10	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	14.8	<10	<10	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<10	<10	NA	NA

NS = "Not Sampled"

Table A-2: Bisphenol A

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	<10	<10	<10	NA
City of Corona WRF 1B	<10	<10	<10	NA
City of Corona WRF 2	12	<10	<10	NA
City of Corona WRF 3	<10	<10	<10	NA
EMWD MV-RWRF	<10	19	<10	NA
EMWD PV-RWRF	<10	<10	<10	NA
EMWD SJV-RWRF	<10	18	<10	NA
EMWD TV-RWRF	<10	<10	<10	NA
EVMWD Horsethief Canyon	<10	<10	<10	NA
EVMWD Railroad Canyon WRP	<10	110	<10	NA
EVMWD Regional WRP	<10	220	<10	NA
IEUA CCWRF	<10	<10	<10	NA
IEUA RP1 02	<10	<10	<10	NA
IEUA RP1 1B	<10	<10	<10	NA
IEUA RP5	<10	<10	NA	NA
IRWD Los Alisos Plant	43	44	45	NA
IRWD Michelson Plant	<10	<10	24	NA
City of Redlands WWTP	<10	<10	<10	NA
City of Rialto WWTP	<10	<10	<10	NA
City of Riverside RWQCP	10	<10	<10	NA
City of San Bernardino RIX	12	26	40	NA
WRCWRA River Rd. Plant	<10	<10	<10	NA
YVWD WRF	24	26	<10	NA
State Project Water at Devil Canyon	NA	<10	<10	NA
Colorado River at San Jacinto West Portal	NA	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	NA	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<100	<10	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	NA	<10	<10	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<100	68	NA	NA

NS = "Not Sampled"

Table A-3: Caffeine

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	34	40	43	NA
City of Corona WRF 1B	<10	<10	14 ^{BA}	15
City of Corona WRF 2	36	<10	190	NA
City of Corona WRF 3	<10	<10	23 ^{BA}	51
EMWD MV-RWRF	18	<10	200	<10
EMWD PV-RWRF	<10	<10	20	<10
EMWD SJV-RWRF	620	<10	170	18
EMWD TV-RWRF	66	280	31	<10
EVMWD Horsethief Canyon	<10	<10	<10	<10
EVMWD Railroad Canyon WRP	<10	<10	11 ^{BA}	<10
EVMWD Regional WRP	64 ^{R2}	97	170	<10
IEUA CCWRF	<10	20	13	<10
IEUA RP1 02	<10	<10	<10	15
IEUA RP1 1B	<10	<10	<10	<10
IEUA RP5	<10	14	NA	13
IRWD Los Alisos Plant	680	80	210 ^{FA}	110
IRWD Michelson Plant	34	10	26	11
City of Redlands WWTP	<10	<10	<10	<10
City of Rialto WWTP	<10	<10	15	<10
City of Riverside RWQCP	<10	<10	12	<10
City of San Bernardino RIX	34	<10	140	NA
WRCWRA River Rd. Plant	51	14	77	<10
YVWD WRF	21	20	33	<10
State Project Water at Devil Canyon	<10	<10	18	<10
Colorado River at San Jacinto West Portal	65.2	<10	<10	17
Santa Ana River - Reach 3 near MWD Crossing (June sample)	<10	59	49	54.6
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	14	11	11.4	<10
Santa Ana River - Reach 3 near Prado Dam (June sample)	28.2	52	15	33
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	15	55	13.6	407

NS = "Not Sampled"

Table A-4: Carbamazepine
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	350	360	230	NA
City of Corona WRF 1B	20	160	150	NA
City of Corona WRF 2	150	180	310	NA
City of Corona WRF 3	18	92	68	NA
EMWD MV-RWRF	52	<10	120	NA
EMWD PV-RWRF	<10	11	<10	NA
EMWD SJV-RWRF	210	320	190	NA
EMWD TV-RWRF	130	85	<10	NA
EVMWD Horsethief Canyon	140	54	69	NA
EVMWD Railroad Canyon WRP	<10	110	110	NA
EVMWD Regional WRP	460	220	220	NA
IEUA CCWRF	110	81	80	NA
IEUA RP1 02	160	110	110	NA
IEUA RP1 1B	180	130	88	NA
IEUA RP5	98	89	NA	NA
IRWD Los Alisos Plant	260	340	150	NA
IRWD Michelson Plant	48	38	82	NA
City of Redlands WWTP	140	210	390	NA
City of Rialto WWTP	76	140	160	NA
City of Riverside RWQCP	220	230	100	NA
City of San Bernardino RIX	250	<10	340	NA
WRCWRA River Rd. Plant	250	200	280	NA
YVWD WRF	370	350	200	NA
State Project Water at Devil Canyon	<10	<10	<10	NA
Colorado River at San Jacinto West Portal	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	116	113	90	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	108	110	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	105	97	97	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	127	92	NA	NA

NS = "Not Sampled"

Table A-5: DEET

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	270	64	75	NA
City of Corona WRF 1B	340	180	230	270
City of Corona WRF 2	270	610	350	NA
City of Corona WRF 3	140	120	160	110
EMWD MV-RWRF	150	320	350	170
EMWD PV-RWRF	68	160	180	34 ^{M2}
EMWD SJV-RWRF	280	<10	640	190
EMWD TV-RWRF	130	<10	340	150
EVMWD Horsethief Canyon	110	250	310	14
EVMWD Railroad Canyon WRP	32	200	190	18
EVMWD Regional WRP	38	180	280	48
IEUA CCWRF	36	98	50	45 ^{M1}
IEUA RP1 02	<10	380	400	99 ^{M1}
IEUA RP1 1B	230	320	550	83
IEUA RP5	28	100	NA	<10
IRWD Los Alisos Plant	340	290	520	120
IRWD Michelson Plant	140	<10	520	150
City of Redlands WWTP	33	180	87	20
City of Rialto WWTP	150	160	1300	170
City of Riverside RWQCP	180	410	370	<10
City of San Bernardino RIX	11	<10	180	NA
WRCWRA River Rd. Plant	220	400	420	16
YVWD WRF	190	<10	420	240
State Project Water at Devil Canyon	<10	<10	<10	<10
Colorado River at San Jacinto West Portal	<10	<10	<10	<10
Santa Ana River - Reach 3 near MWD Crossing (June sample)	14.4	42	43	40.5
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<10	<10	23.5	<10
Santa Ana River - Reach 3 near Prado Dam (June sample)	103	76	100	90.6
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	58	43	57.4	57.3

NS = "Not Sampled"

Table A-6: Diuron

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	57	24	21	NA
City of Corona WRF 1B	<10	<10	34	NA
City of Corona WRF 2	36	62	110	NA
City of Corona WRF 3	<10	<10	<10	NA
EMWD MV-RWRF	19	21	42	NA
EMWD PV-RWRF	<10	<10	12	NA
EMWD SJV-RWRF	46	170	65	NA
EMWD TV-RWRF	22	100	<10	NA
EVMWD Horsethief Canyon	24	15	<10	NA
EVMWD Railroad Canyon WRP	<10	80	<10	NA
EVMWD Regional WRP	25	24	39	NA
IEUA CCWRF	65 ^{M1}	100	220	NA
IEUA RP1 02	22	40	38	NA
IEUA RP1 1B	12	12	15	NA
IEUA RP5	29	31	NA	NA
IRWD Los Alisos Plant	92	120	84	NA
IRWD Michelson Plant	14	40	18	NA
City of Redlands WWTP	<10	39	35	NA
City of Rialto WWTP	<10	11	18	NA
City of Riverside RWQCP	50	41 ^{M1}	31	NA
City of San Bernardino RIX	15	<10	63	NA
WRCWRA River Rd. Plant	50	42	67	NA
YVWD WRF	110	51	81	NA
State Project Water at Devil Canyon	106	82	132	NA
Colorado River at San Jacinto West Portal	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	71.3	260	58	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	39	47	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	74.1	157	38	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	23	30	NA	NA

NS = "Not Sampled"

Table A-7: 17 α Ethynylestradiol (EE2)
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	<10	<10	<10	NA
City of Corona WRF 1B	<10	<10	<10	NA
City of Corona WRF 2	<10	<10	<10	NA
City of Corona WRF 3	<10	<10	<10	NA
EMWD MV-RWRF	<10	<10	<10	NA
EMWD PV-RWRF	<10	<10	<10	NA
EMWD SJV-RWRF	<10	<10	<10	NA
EMWD TV-RWRF	<10	<10	<10	NA
EVMWD Horsethief Canyon	<10	<10	<10	NA
EVMWD Railroad Canyon WRP	< 10 ^{RS}	<10	<10	NA
EVMWD Regional WRP	<10	<10	<10	NA
IEUA CCWRF	<10	<10	<10	NA
IEUA RP1 02	<10	<10	<10	NA
IEUA RP1 1B	<10	<10	<10	NA
IEUA RP5	<10	<10	NA	NA
IRWD Los Alisos Plant	<10	<10	<10	NA
IRWD Michelson Plant	<10	<10	<10	NA
City of Redlands WWTP	<10	<10	<10	NA
City of Rialto WWTP	<10	<10	<10	NA
City of Riverside RWQCP	<10	<10	<10	NA
City of San Bernardino RIX	<10	<10	<10	NA
WRCWRA River Rd. Plant	<10	<10	<10	NA
YVWD WRF	<10	<10	<10	NA
State Project Water at Devil Canyon	<10	<10	<10	NA
Colorado River at San Jacinto West Portal	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<10	<10	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	<10	<10	<10	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<10	<10	NA	NA

NS = "Not Sampled"

Table A-8: 17 β Estradiol (E2)
 All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	NA	<10	<10	NA
City of Corona WRF 1B	NA	<10	<10	<1
City of Corona WRF 2	NA	<10	<10	NA
City of Corona WRF 3	NA	<10	<10	<1
EMWD MV-RWRF	NA	<10	<10	<1
EMWD PV-RWRF	NA	<10	<10	<1
EMWD SJV-RWRF	NA	<10	<10	<1
EMWD TV-RWRF	NA	<10	<10	<1 ^{M2}
EVMWD Horsethief Canyon	NA	<10	<10	<1
EVMWD Railroad Canyon WRP	NA	<10	<10	<1
EVMWD Regional WRP	NA	<10	<10	<1
IEUA CCWRF	NA	<10	<10	<1
IEUA RP1 02	NA	<10	<10	<1
IEUA RP1 1B	NA	<10	<10	<1
IEUA RP5	NA	<10	NA	<1
IRWD Los Alisos Plant	NA	<10	<10	<1
IRWD Michelson Plant	NA	<10	<10	<1
City of Redlands WWTP	NA	<10	<10	<1
City of Rialto WWTP	NA	<10	<10	<1
City of Riverside RWQCP	NA	<10	<10	<1
City of San Bernardino RIX	NA	<10	<10	NA
WRCWRA River Rd. Plant	NA	<10	<10	<1
YVWD WRF	NA	<10	<10	<1
State Project Water at Devil Canyon	NA	<10	<10	NA
Colorado River at San Jacinto West Portal	NA	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	NA	<10	<10	<1
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<10	<10	<1	<1
Santa Ana River - Reach 3 near Prado Dam (June sample)	NA	<10	<10	<1
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<10	<10	<1	<1

NS = "Not Sampled"

Table A-9: Gemfibrozil

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	630	210	57	NA
City of Corona WRF 1B	<10	11	<10	<10
City of Corona WRF 2	180	750	330	NA
City of Corona WRF 3	<10	15	<10	<10
EMWD MV-RWRF	<10	43	970	<10
EMWD PV-RWRF	<10	28	<10	<10 ^{M1,R5}
EMWD SJV-RWRF	1100	5800	930	2000
EMWD TV-RWRF	92	940	<10	63
EVMWD Horsethief Canyon	<10	<10	<10	<10
EVMWD Railroad Canyon WRP	<10	140	250	<10
EVMWD Regional WRP	<10	49	<10	76
IEUA CCWRF	<10	<10	<10	<10
IEUA RP1 02	<10	<10	<10	<10
IEUA RP1 1B	<10	<10	<10	<10
IEUA RP5	<10	<10	NA	<10
IRWD Los Alisos Plant	2200	1900	670	1600
IRWD Michelson Plant	<10	<10	24	<10
City of Redlands WWTP	<10	17	<10	<10
City of Rialto WWTP	<10	43	15	<10 ^J
City of Riverside RWQCP	<10	27	<10	12
City of San Bernardino RIX	26	2700	350	NA
WRCWRA River Rd. Plant	25	250	440	<10 ^J
YVWD WRF	410	2200	220	520
State Project Water at Devil Canyon	<10	<10	<10	<10
Colorado River at San Jacinto West Portal	<10	<10	<10	<10
Santa Ana River - Reach 3 near MWD Crossing (June sample)	<10	158	49	58.6
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<10	<10	<10	<10
Santa Ana River - Reach 3 near Prado Dam (June sample)	<10	15	23	37.7
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<10	<10	<10	<10

NS = "Not Sampled"

Table A-10: Ibuprofen
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	<10	<10	15	NA
City of Corona WRF 1B	22	120	69	NA
City of Corona WRF 2	70	150	100	NA
City of Corona WRF 3	57	160	68	NA
EMWD MV-RWRF	36	29	<10	NA
EMWD PV-RWRF	14	<10	<10	NA
EMWD SJV-RWRF	130	92	<10	NA
EMWD TV-RWRF	100	170	<10	NA
EVMWD Horsethief Canyon	<10	840	<10	NA
EVMWD Railroad Canyon WRP	<10	25	<10	NA
EVMWD Regional WRP	<10	<10	<10	NA
IEUA CCWRF	<10	<10	<10	NA
IEUA RP1 02	10	24	<10	NA
IEUA RP1 1B	<10	19	<10	NA
IEUA RP5	<10	<10	NA	NA
IRWD Los Alisos Plant	890	72	55	NA
IRWD Michelson Plant	14	31	24	NA
City of Redlands WWTP	<10	<10	<10	NA
City of Rialto WWTP	<10	<10	<10	NA
City of Riverside RWQCP	12	14	<10	NA
City of San Bernardino RIX	<10	1800	110	NA
WRCWRA River Rd. Plant	<10	85	97	NA
YVWD WRF	17	150	<10	NA
State Project Water at Devil Canyon	<10	<10	<10	NA
Colorado River at San Jacinto West Portal	<10	12	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	<10	49	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	14	<10	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	<10	<10	<10	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<10	<10	NA	NA

NS = "Not Sampled"

Table A-11: Iopromide
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	NA	NA	<10	NA
City of Corona WRF 1B	NA	NA	46	68 ^{NMint}
City of Corona WRF 2	NA	NA	210	NA
City of Corona WRF 3	NA	NA	26	17
EMWD MV-RWRF	NA	NA	110	240
EMWD PV-RWRF	NA	NA	<10	<10
EMWD SJV-RWRF	NA	NA	<10	13
EMWD TV-RWRF	NA	NA	<10	16
EVMWD Horsethief Canyon	NA	NA	<10	<10
EVMWD Railroad Canyon WRP	NA	NA	<10	<10
EVMWD Regional WRP	NA	NA	<10	<10
IEUA CCWRF	NA	NA	88	50
IEUA RP1 02	NA	NA	110	100 ^{M1}
IEUA RP1 1B	NA	NA	120	98
IEUA RP5	NA	NA	NA	<10
IRWD Los Alisos Plant	NA	NA	340	160
IRWD Michelson Plant	NA	NA	<10	680
City of Redlands WWTP	NA	NA	<10	<10
City of Rialto WWTP	NA	NA	27	28
City of Riverside RWQCP	NA	NA	860	320
City of San Bernardino RIX	NA	NA	27	NA
WRCWRA River Rd. Plant	NA	NA	27	<10
YVWD WRF	NA	NA	<10	60
State Project Water at Devil Canyon	NA	NA	<10	<10
Colorado River at San Jacinto West Portal	NA	NA	<10	<10
Santa Ana River - Reach 3 near MWD Crossing (June sample)	NA	NA	<10	<10
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	NA	NA	<10	<10
Santa Ana River - Reach 3 near Prado Dam (June sample)	NA	NA	42	53.3
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	NA	NA	79.9	70.2

NS = "Not Sampled"

Table A-12: Naproxen
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	NA	NA	<10	NA
City of Corona WRF 1B	NA	NA	<10	NA
City of Corona WRF 2	NA	NA	50	NA
City of Corona WRF 3	NA	NA	<10	NA
EMWD MV-RWRF	NA	NA	<10	NA
EMWD PV-RWRF	NA	NA	<10	NA
EMWD SJV-RWRF	NA	NA	<10	NA
EMWD TV-RWRF	NA	NA	<10 ^{R7}	NA
EVMWD Horsethief Canyon	NA	NA	<10	NA
EVMWD Railroad Canyon WRP	NA	NA	<10	NA
EVMWD Regional WRP	NA	NA	<10	NA
IEUA CCWRF	NA	NA	<10	NA
IEUA RP1 02	NA	NA	<10	NA
IEUA RP1 1B	NA	NA	<10	NA
IEUA RP5	NA	NA	NA	NA
IRWD Los Alisos Plant	NA	NA	19	NA
IRWD Michelson Plant	NA	NA	<10	NA
City of Redlands WWTP	NA	NA	<10	NA
City of Rialto WWTP	NA	NA	<10	NA
City of Riverside RWQCP	NA	NA	<10	NA
City of San Bernardino RIX	NA	NA	140	NA
WRCWRA River Rd. Plant	NA	NA	90	NA
YVWD WRF	NA	NA	34 ^E	NA
State Project Water at Devil Canyon	NA	NA	<10	NA
Colorado River at San Jacinto West Portal	NA	NA	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	NA	NA	24	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	NA	NA	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	NA	NA	<10	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	NA	NA	NA	NA

NS = "Not Sampled"

Table A-13: Sucralose

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	NA	NA	NA	NA
City of Corona WRF 1B	NA	NA	NA	18000 *
City of Corona WRF 2	NA	NA	NA	NA
City of Corona WRF 3	NA	NA	NA	22000 *
EMWD MV-RWRF	NA	NA	NA	64000
EMWD PV-RWRF	NA	NA	NA	5600
EMWD SJV-RWRF	NA	NA	NA	55000
EMWD TV-RWRF	NA	NA	NA	49000
EVMWD Horsethief Canyon	NA	NA	NA	100000
EVMWD Railroad Canyon WRP	NA	NA	NA	30000
EVMWD Regional WRP	NA	NA	NA	24000
IEUA CCWRF	NA	NA	NA	37000
IEUA RP1 02	NA	NA	NA	31000
IEUA RP1 1B	NA	NA	NA	48000
IEUA RP5	NA	NA	NA	54000
IRWD Los Alisos Plant	NA	NA	NA	48000
IRWD Michelson Plant	NA	NA	NA	27000
City of Redlands WWTP	NA	NA	NA	27000
City of Rialto WWTP	NA	NA	NA	20000 *
City of Riverside RWQCP	NA	NA	NA	56000
City of San Bernardino RIX	NA	NA	NA	NA
WRCWRA River Rd. Plant	NA	NA	NA	5200 *
YVWD WRF	NA	NA	NA	69000
State Project Water at Devil Canyon	NA	NA	NA	670
Colorado River at San Jacinto West Portal	NA	NA	NA	730
Santa Ana River - Reach 3 near MWD Crossing (June sample)	NA	NA	NA	22500
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	NA	NA	27300	16700 **
Santa Ana River - Reach 3 near Prado Dam (June sample)	NA	NA	NA	28100
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	NA	NA	26500	32400 ***

NS = "Not Sampled"

Table A-14: Sulfamethoxazole
All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	360	340	200	NA
City of Corona WRF 1B	<10	<10	20	NA
City of Corona WRF 2	1600	620	2900	NA
City of Corona WRF 3	<10	<10	<10	NA
EMWD MV-RWRF	<10	<10	400	NA
EMWD PV-RWRF	<10	<10 ^{M2}	<10	NA
EMWD SJV-RWRF	790	1800	460	NA
EMWD TV-RWRF	150	150	<10	NA
EVMWD Horsethief Canyon	<10	<10	<10	NA
EVMWD Railroad Canyon WRP	<10	55	190	NA
EVMWD Regional WRP	410	200	150	NA
IEUA CCWRF	<10	<10	<10	NA
IEUA RP1 02	<10	<10	<10	NA
IEUA RP1 1B	<10	<10	<10	NA
IEUA RP5	<10	<10	NA	NA
IRWD Los Alisos Plant	580	1300	1000	NA
IRWD Michelson Plant	< 10	<10	<10	NA
City of Redlands WWTP	<10	<10	<10	NA
City of Rialto WWTP	20	<10	35	NA
City of Riverside RWQCP	16	11 ^{M2}	14	NA
City of San Bernardino RIX	240	<10	1200	NA
WRCWRA River Rd. Plant	1100	520	1600	NA
YVWD WRF	1900	1100	1300	NA
State Project Water at Devil Canyon	13	<10	12	NA
Colorado River at San Jacinto West Portal	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	89.4	208	198	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	104	169	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	56.6	78	108	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	91	94	NA	NA

NS = "Not Sampled"

Table A-15: TCEP

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	94	250	240	NA
City of Corona WRF 1B	590	390	370	NA
City of Corona WRF 2	530	670	420	NA
City of Corona WRF 3	520	240	240	NA
EMWD MV-RWRF	400	130	660	NA
EMWD PV-RWRF	370	190	650	NA
EMWD SJV-RWRF	180	220	520	NA
EMWD TV-RWRF	520	140	510	NA
EVMWD Horsethief Canyon	160	460	780	NA
EVMWD Railroad Canyon WRP	69	310	500	NA
EVMWD Regional WRP	140	330	580	NA
IEUA CCWRF	77	210	480	NA
IEUA RP1 02	130	340	550	NA
IEUA RP1 1B	84	230	560	NA
IEUA RP5	90	250	NA	NA
IRWD Los Alisos Plant	150	120	330 ^{M2}	NA
IRWD Michelson Plant	77	98	360 ^{M2}	NA
City of Redlands WWTP	60	200	460	NA
City of Rialto WWTP	530	270	930	NA
City of Riverside RWQCP	150	170	660	NA
City of San Bernardino RIX	110	<10	150	NA
WRCWRA River Rd. Plant	780	540	370	NA
YVWD WRF	120	190	710	NA
State Project Water at Devil Canyon	<10	<10	<10	NA
Colorado River at San Jacinto West Portal	<10	<10	<10	NA
Santa Ana River - Reach 3 near MWD Crossing (June sample)	63.4	69	79	NA
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	72	77	NA	NA
Santa Ana River - Reach 3 near Prado Dam (June sample)	239	229	223	NA
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	287	198	NA	NA

NS = "Not Sampled"

Table A-16: Triclosan

All values reported as nanograms per liter (ng/L)

Sample Site	2010	2011	2012	2013
City of Beaumont WWTP No. 1	NA	21	<10	NA
City of Corona WRF 1B	NA	<10	15	<10
City of Corona WRF 2	NA	<10	180	NA
City of Corona WRF 3	NA	<10	<10	<10
EMWD MV-RWRF	NA	<10	<10	<10
EMWD PV-RWRF	NA	27	<10	<10 ^{R5}
EMWD SJV-RWRF	NA	<10	66	<10
EMWD TV-RWRF	NA	<10	<10	<10
EVMWD Horsethief Canyon	NA	<10	<10	<10
EVMWD Railroad Canyon WRP	NA	<10	<10	<10
EVMWD Regional WRP	NA	26	1000	10
IEUA CCWRF	NA	130	<10	<10
IEUA RP1 02	NA	<10	18	<10 ^{M2}
IEUA RP1 1B	NA	<10	25	<10
IEUA RP5	NA	<10	NA	<10
IRWD Los Alisos Plant	NA	42	45	<10
IRWD Michelson Plant	NA	<10	31	<10
City of Redlands WWTP	NA	<10	<10	<10
City of Rialto WWTP	NA	<10	<10	<10 ^J
City of Riverside RWQCP	NA	<10	<10	<10
City of San Bernardino RIX	NA	77	28	NA
WRCWRA River Rd. Plant	NA	<10	24	<10 ^J
YVWD WRF	NA	79	86	<10
State Project Water at Devil Canyon	NA	<10	<10	<10
Colorado River at San Jacinto West Portal	NA	<10	<10	<10
Santa Ana River - Reach 3 near MWD Crossing (June sample)	NA	<10	<10	<10
Santa Ana River - Reach 3 near MWD Crossing (Sept. sample)	<10	<10	<10	<10
Santa Ana River - Reach 3 near Prado Dam (June sample)	NA	<10	<10	<10
Santa Ana River - Reach 3 near Prado Dam (Sept. sample)	<10	<10	<10	<10

NS = "Not Sampled"

Notes:

2010	10 ng/L was the Mandatory Reporting Limit (MRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
M1	Matrix spike recovery was high, but the associated blank spike recovery was acceptable. The diuron spike amount (25 ppt) was less than 50% of the ambient concentration so the high spike recovery is not meaningful as per project QAPP. Analysis and spiking of follow up samples from this site would be desirable for assessing accuracy of result.
NA	Not Available
R2 or R5	RPD/RSD exceeded lab acceptance limit (note that the example of R2 is actually a caffeine MS/MSD so with the codes listed R2 and R5 go together). For ethynyl estradiol spike recoveries on this sample were 72 and 105%, both well within project expected variability, but the calculated RPD exceeds the 30%, so data must be flagged. Because of the good spike recovery there is no impact on the data from these spike results. For caffeine, spike recoveries were 52% and 105%, but the amount spiked (25 ppt) was less than 50% of the amount found in the native sample before spiking. As per the project QAPP the spike recovery is therefore not relevant. For caffeine based on the QAPP we should remove the flag because it would fit the M3 category.
	City of Redlands WWTP data was a re-sampling of facility.
2011	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
M1	Matrix spike recovery was high, but the associated blank spike recovery was acceptable.
M2	Matrix spike recovery was low, but the associated blank spike recovery was acceptable.
2012	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
NA	No Sample Available.
B4	Only needed for Elsinore. Detected in FB above MRL, may be false positive.
E	Estimated value. Isotopic analog had multiple peaks.
FA	Field blank contains target analyte but sample >10X field blank level or not detected in sample. (only needed for Los Alisos IRWD)
M2	Matrix spike recovery was low, but the associated blank spike recovery was acceptable. Only applicable to the 2 TCEP samples for IRWD. Possible low bias due to matrix, but spike level also <1/3 of ambient level so may not be meaningful.
R7	LFB/LFBD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.
BA	Analyte was detected at 24 ng/L in the filtered Method Blank associated with the reported samples. IEUA RP5 no discharge to sample
2013	10 ng/L is the designated Study Reporting Limit (SRL) for this study. The Laboratory Reporting Limits (LRL) are provided in the supporting documentation.
*	Isotope dilution not used for quantitation. Potential low bias as a result of signal suppression in complex matrices.
**	Sucralose Sample reported from result of 5x dilution
***	Sucralose Sample reported from result of 10x dilution
NA	No Sample Available
M1	Matrix spike recovery was high; the associated blank spike recovery was acceptable.
M2	Matrix spike recovery was low; the associated blank spike recovery was acceptable.
M3	The spike recovery value is unusable since the analyte concentration in the sample is disproportionate to the spike level. The associated blank spike recovery was acceptable.
R5	MS/MSD RPD exceeded the laboratory acceptance limit. Recovery met acceptance criteria.
Nmint	Due to matrix interference, the matrix spike and/or matrix spike duplicate performed on this sample did not meet laboratory acceptance criteria.
J	Estimated value
	The following facilities were not sampled in 2013: City of Beaumont WWTP No. 1; City of San Bernardino RIX; and City of Corona WRF 2