

CONTAMINANTS OF EMERGING CONCERN SENTRY PROGRAM



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2017 RESULTS SUMMARY

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2017 RESULTS SUMMARY

TABLE OF CONTENTS

TABLE OF CONTENTS.....	1
1.0 EXECUTIVE SUMMARY	2
2.0 BACKGROUND	2
3.0 SAMPLING SITES.....	2
4.0 DETECTED CECs	3
5.0 REGULATORY OUTLOOK.....	4
6.0 CONTINUED ACTION PLAN	4

FIGURES

FIGURE 1. CECs SENTRY PROGRAM SAMPLING PLAN

TABLES

TABLE 1. 2017 SENTRY PROGRAM – CECs ANALYZED

TABLE 2. 2017 SENTRY PROGRAM – CECs DETECTED

1.0 EXECUTIVE SUMMARY

Recent scientific research has indicated that exposure to contaminants of emerging concern (CECs, a.k.a. emerging contaminants) may pose risks to human health. To respond to these potential health concerns, Tucson Water established the “Sentry Program” in 2008 under the direction of the City Manager. The Sentry Program has detected trace levels of CECs in the drinking water system and Tucson Water has been tracking the annual sampling results to proactively identify and address potential CECs contamination issues. The Sentry Program is a proactive, voluntary monitoring component of the routine water quality management program. Results of the 2017 Sentry Program are summarized in this report and are largely consistent with historical CECs data.

2.0 BACKGROUND

CECs can best be described as newly identified or re-emerging manufactured or naturally occurring compounds that may have lacked public health impact data or may not have an applicable regulatory maximum contaminant level (MCL) or health advisory (HA) established for drinking water. The lack of regulatory drinking water standards is driven by a cumbersome regulatory rule making process and critical research gaps in toxicity information associated with individual CECs, mixtures of CECs, and cumulative exposure over time. Typically, CECs are categorized by their type and source, and the most common categories are fire retardants and other per- and polyfluoroalkyl substances (PFAS), industrial chemicals, personal care products, pesticides, and pharmaceuticals. State-of-the-art advances in analytical technologies and instrumentation have made it possible to identify trace concentrations of CECs measured in parts per trillion (ppt). A list of all 109 CECs analyzed under the 2017 Sentry Program is provided (**Table 1**).

3.0 SAMPLING SITES

As part of the 2017 Sentry Program, water samples were collected at single entry points to the distribution system (EPDS) representing native groundwater wells and at combined entry points to the distribution system (CEPDS) that represent combined groundwater well flows from blended groundwater sources. Water samples were collected in July 2017 from a total of nine sample locations as follows (**Figure 1**).

Samples were collected at four EPDS sampling sites located at native groundwater wells located in close proximity to the Santa Cruz River, downstream of Pima County's Agua Nueva Water Reclamation and Tres Rios Water Reclamation facilities. These four samples represent drinking water wells impacted by treated wastewater.

1. EPDS 109 (Z-013A)
2. EPDS 166 (Y-001B)
3. EPDS 160 (Y-004A)
4. EPDS 230 (W-001B)

Samples were collected at three CEPDS sampling sites comprised of combined flow of groundwater wells that represent the blended drinking water from the Clearwater supply entering the distribution system at different locations.

5. CEPDS 124 (167R) represents the Southern Avra Valley Storage and Recovery Project (SAVSARP) wellfield
6. CEPDS 125 (310) represents the Santa Cruz wellfield
7. CEPDS 159 (EP1) represents the Central Avra Valley Storage and Recovery Project (CAVSARP) wellfield

Samples were collected at two locations at the Tucson Airport Remediation Project/Advanced Oxidation Process (TARP/AOP) Water Treatment Plant. Tucson Water's AOP Water Treatment Facility uses state-of-the-art technology to effectively remove trichloroethylene (TCE) and 1,4-dioxane from water. The facility operates in conjunction with the adjacent TARP facility to produce up to 7 million gallons of purified water a day. The two samples represent groundwater before and after treatment prior to entering the distribution system.

8. TA-030A (influent) represents untreated groundwater collected at the influent booster station
9. TA-050T (effluent) represents treated groundwater collected after the granular activated carbon (GAC) vessels prior to the packed column aeration system

4.0 DETECTED CECs

Trace levels of CECs were detected in all nine samples collected in July 2017 (**Table 2**). Within active wells serving Tucson Water customers, all 2017 trace detections were well below any established health-based MCLs or HAs, if applicable. Within inactive wells not serving Tucson Water customers, Y-001B and Z-013A were above the HA of 70 ppt for PFOS and PFOA. Stand by emergency use only Y-004A was also above the HA of 70 ppt for PFOS and PFOA. Out of a total of 109 CECs analyzed, the following number of detects are noted in **Table 2**.

Drinking Water Served or Active Wells

- CEPDS 124 (167R) had three CECs detections
- CEPDS 125 (310) had one CECs detection
- CEPDS 159 (EP1) had one CECs detection
- EPDS 230 (W-001B) had two CECs detections
- Effluent from TARP/AOP Plant TA-050T had seven CECs detections

Drinking Water Not Served or Inactive Wells

- EPDS 109 (Z-013A) had 15 CECs detections
- EPDS 160 (Y-004A) had 16 CECs detections
- EPDS 166 (Y-001B) had 14 CECs detections
- Influent to TARP/AOP Plant TA-030A had six CECs detections

The types of CECs and concentrations detected in the 2017 Sentry Program were generally consistent with historical data, with no CECs showing discernable trends.

5.0 REGULATORY OUTLOOK

Tucson Water takes seriously the detection of CECs in its drinking water. However, it is important to put their presence into context. The Environmental Protection Agency (EPA) has not determined whether standards are necessary for many CECs. EPA uses the Unregulated Contaminant Monitoring Rule (UCMR) to collect data for contaminants that are suspected to be present in drinking water and do not have health-based standards set under the Safe Drinking Water Act (SDWA). The UCMR program was developed in coordination with the Contaminant Candidate List (CCL). The CCL is a list of contaminants that:

- Are not regulated by the National Primary Drinking Water Regulations
- Are known or anticipated to occur at public water systems
- May warrant regulation under the SDWA

Tucson Water is scheduled for the fourth Unregulated Contaminant Monitoring Rule (UCMR4) sampling in 2019 - 2020 and some of the Sentry Program CECs are listed on the UCMR4 CCL. The UCMR program provides a basis for future EPA regulatory actions to protect public health. The previous and current UCMR CCL results are being and will be reviewed by EPA. Depending on the outcome of the EPA review, some of the Sentry Program CECs may or may not be considered for regulation in the future.

6.0 CONTINUED ACTION PLAN

Given the current monitoring results, it is recommended that Tucson Water continue the CECs Sentry Program on an annual basis utilizing the same representative sample locations. In addition, Tucson Water plans to participate in future national and regional research programs that focus on monitoring and treatment of CECs and any potential health impacts that may be associated with the presence of these contaminants in source water and drinking water.

FIGURE 1 CECs SENTRY PROGRAM SAMPLING PLAN

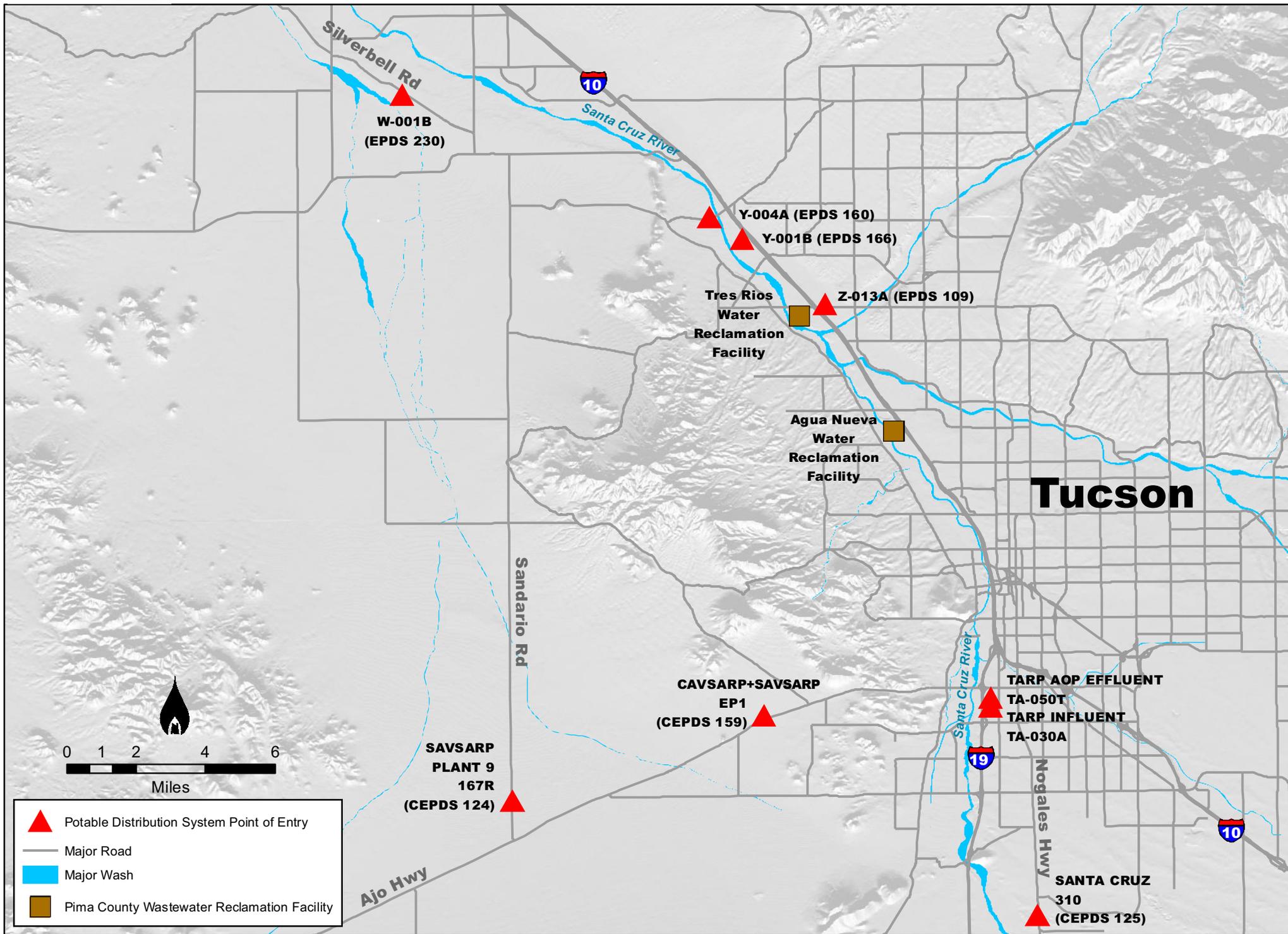


TABLE 1. 2017 SENTRY PROGRAM - CECs ANALYZED

No.	Contaminant of Emerging Concern Name	General Category
1	PERFLUORO BUTANOIC ACID - PFBA	Fire Retardant/PFAS
2	PERFLUORO OCTANESULFONIC ACID - PFOS	
3	PERFLUORO OCTANOIC ACID - PFOA	
4	PERFLUORO-1-BUTANESULFONIC ACID - PFBS	
5	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS	
6	PERFLUOROHEPTANOIC ACID - PFHpA	
7	PERFLUORO-N-DECANOIC ACID	
8	PERFLUORO-N-HEXANOIC ACID	
9	PERFLUORO-N-NONANOIC ACID - PFNA	
10	PERFLUOROPENTANOIC ACID	
11	ACESULFAME-K	Food Additive
12	SUCRALOSE	
13	4-TERT-OCTYLPHENOL	Industrial Chemical
14	BIS PHENOL A (BPA)	
15	CHROMIUM, HEXAVALENT	
16	QUINOLINE	
17	TCEP	
18	TCPP	
19	TDCPP	
20	BUTYLPARABEN	Personal Care Product
21	ETHYLPARABEN	
22	ISOBUTYLPARABEN	
23	PROPYLPARABEN	
24	TRICLOSAN	
25	2,4-D	Pesticide
26	4-NONYLPHENOL	
27	ATRAZINE	
28	BROMACIL	
29	CHLORIDAZON	
30	CHLOROTOLURON	
31	CLOFIBRIC ACID	
32	CYANAZINE	
33	DACT	
34	DEA	
35	DEET	
36	DIA	
37	DIURON	
38	ISOPROTURON	
39	LINURON	
40	METAZACHLOR	
41	METOLACHLOR	
42	PROPAZINE	
43	SIMAZINE	

TABLE 1. 2017 SENTRY PROGRAM - CECs ANALYZED

No.	Contaminant of Emerging Concern Name	General Category
44	SULFOMETURON METHYL	Pharmaceutical
45	THIABENDAZOLE	
46	ACETAMINOPHEN	
47	ALBUTEROL	
48	AMOXICILLIN	
49	ANDROSTENEDIONE	
50	ATENOLOL	
51	AZITHROMYCIN	
52	BENDROFLUMETHIAZIDE	
53	BEZAFIBRATE	
54	BUTALBITAL	
55	CAFFEINE	
56	CARBADOX	
57	CARBAMAZEPINE	
58	CARISOPRODOL	
59	CHLORAMPHENICOL	
60	CIMETIDINE	
61	DIAZEPAM	
62	DICLOFENAC	
63	DILANTIN	
64	DILTIAZEM	
65	ERYTHROMYCIN	
66	ESTRADIOL	
67	ESTRIOL	
68	ESTRONE	
69	ETHINYL ESTRADIOL-17 ALPHA	
70	FLUMEQUINE	
71	FLUOXETINE	
72	GEMFIBROZIL	
73	IBUPROFEN	
74	IOHEXAL	
75	IOPROMIDE	
76	KETOPROFEN	
77	KETOROLAC	
78	LIDOCAINE	
79	LINCOMYCIN	
80	LOPRESSOR	
81	MECLOFENAMIC ACID	
82	MEPROBAMATE	
83	METHYLPARABEN	
84	NAPROXEN	
85	NIFEDIPINE	
86	NORETHISTERONE	

TABLE 1. 2017 SENTRY PROGRAM - CECs ANALYZED

No.	Contaminant of Emerging Concern Name	General Category
87	OXOLINIC ACID	
88	PENTOXIFYLLINE	
89	PHENAZONE	
90	PRIMIDONE	
91	PROGESTERONE	
92	SALICYLIC ACID	
93	SULFACHLOROPYRIDAZINE	
94	SULFADIAZINE	
95	SULFADIMETHOXINE	
96	SULFAMERAZINE	
97	SULFAMETHAZINE	
98	SULFAMETHIZOLE	
99	SULFAMETHOXAZOLE	
100	SULFATHIAZOLE	
101	TESTOSTERONE	
102	THEOBROMINE	
103	THEOPHYLLINE	
104	TRICLOCARBAN	
105	TRIMETHOPRIM	
106	WARFARIN	
107	1,7-DIMETHYLXANTHINE	Pharmaceutical (Metabolite of Caffeine)
108	COTININE	Pharmaceutical (Metabolite of Nicotine)
109	DEHYDRONIFEDIPINE	Pharmaceutical (Metabolite of Nifedipene)

Acronym/Abbreviations:

PFAS = Perfluorinated alkylated substances

TABLE 2. 2017 SENTRY PROGRAM - CECs DETECTED

Sample Point	Sample Date	CECs Name	WQ Standard	Sample Result	MRL	Units
310	7/17/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	1.7	0.02	ppb
167R	7/17/2017	ACESULFAME-K		52	20	ppt
167R	7/17/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	0.88	0.02	ppb
167R	7/17/2017	SUCRALOSE		130	100	ppt
EPI	7/17/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	0.69	0.02	ppb
TA-030A	7/17/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	1.7	0.02	ppb
TA-030A	7/17/2017	DILTIAZEM		95	5	ppt
TA-030A	7/17/2017	ERYTHROMYCIN		93	10	ppt
TA-030A	7/17/2017	PERFLUORO OCTANESULFONIC ACID - PFOS	² HA 70	14	5	ppt
TA-030A	7/17/2017	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		5.7	5	ppt
TA-030A	7/17/2017	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		29	5	ppt
TA-050T	7/17/2017	4-NONYLPHENOL- (SEMI-QUANT)		240	100	ppt
TA-050T	7/17/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	3.1	0.02	ppb
TA-050T	7/17/2017	PERFLUORO OCTANESULFONIC ACID - PFOS	² HA 70	55	5	ppt
TA-050T	7/17/2017	PERFLUORO OCTANOIC ACID - PFOA	² HA 70	5.3	5	ppt
TA-050T	7/17/2017	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		19	5	ppt
TA-050T	7/17/2017	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		160	25	ppt
TA-050T	7/17/2017	PERFLUORO-N-HEXANOIC ACID		21	5	ppt
W-001B	7/17/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	0.12	0.02	ppb
W-001B	7/17/2017	SIMAZINE	MCL 4,000	11	5	ppt
Y-001B	7/18/2017	4-NONYLPHENOL- (SEMI-QUANT)		260	100	ppt
Y-001B	7/18/2017	ATRAZINE	MCL 3,000	6.2	5	ppt
Y-001B	7/18/2017	CARBAMAZEPINE		90	5	ppt
Y-001B	7/18/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	0.088	0.02	ppb
Y-001B	7/18/2017	PERFLUORO BUTANOIC ACID - PFBA		10	10	ppt
Y-001B	7/18/2017	PERFLUORO OCTANESULFONIC ACID - PFOS	² HA 70	100	25	ppt
Y-001B	7/18/2017	PERFLUORO OCTANOIC ACID - PFOA	² HA 70	24	5	ppt
Y-001B	7/18/2017	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		7.5	5	ppt
Y-001B	7/18/2017	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		63	5	ppt
Y-001B	7/18/2017	PERFLUOROHEPTANOIC ACID - PFHpA		5.7	5	ppt
Y-001B	7/18/2017	PERFLUORO-N-HEXANOIC ACID		13	5	ppt
Y-001B	7/18/2017	PROPYLPARABEN		6.3	5	ppt
Y-001B	7/18/2017	SIMAZINE	MCL 4,000	9.3	5	ppt
Y-001B	7/18/2017	SUCRALOSE		480	100	ppt
Y-004A	7/18/2017	4-NONYLPHENOL- (SEMI-QUANT)		230	100	ppt
Y-004A	7/18/2017	ACESULFAME-K		38	20	ppt
Y-004A	7/18/2017	CARBAMAZEPINE		140	5	ppt
Y-004A	7/18/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	0.11	0.02	ppb
Y-004A	7/18/2017	DILTIAZEM		39	5	ppt
Y-004A	7/18/2017	IOHEXAL		12	10	ppt
Y-004A	7/18/2017	PERFLUORO BUTANOIC ACID - PFBA		12	10	ppt

TABLE 2. 2017 SENTRY PROGRAM - CECs DETECTED

Y-004A	7/18/2017	PERFLUORO OCTANESULFONIC ACID - PFOS	² HA 70	76	5	ppt
Y-004A	7/18/2017	PERFLUORO OCTANOIC ACID - PFOA	² HA 70	24	5	ppt
Y-004A	7/18/2017	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		8.3	5	ppt
Y-004A	7/18/2017	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		37	5	ppt
Y-004A	7/18/2017	PERFLUOROHEPTANOIC ACID - PFHpA		5.9	5	ppt
Y-004A	7/18/2017	PERFLUORO-N-HEXANOIC ACID		13	5	ppt
Y-004A	7/18/2017	PRIMIDONE		67	5	ppt
Y-004A	7/18/2017	SIMAZINE	MCL 4,000	20	5	ppt
Y-004A	7/18/2017	SUCRALOSE		5600	100	ppt
Z-013A	7/18/2017	4-NONYLPHENOL- (SEMI-QUANT)		4000	100	ppt
Z-013A	7/18/2017	4-TERT-OCTYLPHENOL		60	50	ppt
Z-013A	7/18/2017	ACESULFAME-K		1500	20	ppt
Z-013A	7/18/2017	ATRAZINE	MCL 3,000	8.0	5	ppt
Z-013A	7/18/2017	CARBAMAZEPINE		100	5	ppt
Z-013A	7/18/2017	CHROMIUM, HEXAVALENT/DISSOLVED	¹ MCL 100	0.032	0.02	ppb
Z-013A	7/18/2017	DEET		12	10	ppt
Z-013A	7/18/2017	PERFLUORO BUTANOIC ACID - PFBA		11	10	ppt
Z-013A	7/18/2017	PERFLUORO OCTANESULFONIC ACID - PFOS	² HA 70	150	25	ppt
Z-013A	7/18/2017	PERFLUORO OCTANOIC ACID - PFOA	² HA 70	30	5	ppt
Z-013A	7/18/2017	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		9.7	5	ppt
Z-013A	7/18/2017	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		61	5	ppt
Z-013A	7/18/2017	PERFLUOROHEPTANOIC ACID - PFHpA		8.3	5	ppt
Z-013A	7/18/2017	PERFLUORO-N-HEXANOIC ACID		14	5	ppt
Z-013A	7/18/2017	PRIMIDONE		43	5	ppt

Footnotes, Acronyms, and Abbreviations:

¹Total Chromium MCL =100 ppb; There is no MCL for Hexavalent Chromium

²HA 70 ppt combined PFOS + PFOA

Bold Font indicates the sample result exceeds the HA

Drinking water being served to Tucson Water customers; Active well

Drinking water NOT being served to Tucson Water customers; Inactive well

Z-013A Out of Service Date 9/9/2016

Y-001B Out of Service Date 9/22/2016

Y-004A Stand By Emergency Use Only

HA = Health Advisory

MCL = Maximum Contaminant Level

MRL = Method Reporting Limit

ppb = parts per billion

ppt = parts per trillion

WQ = Water Quality