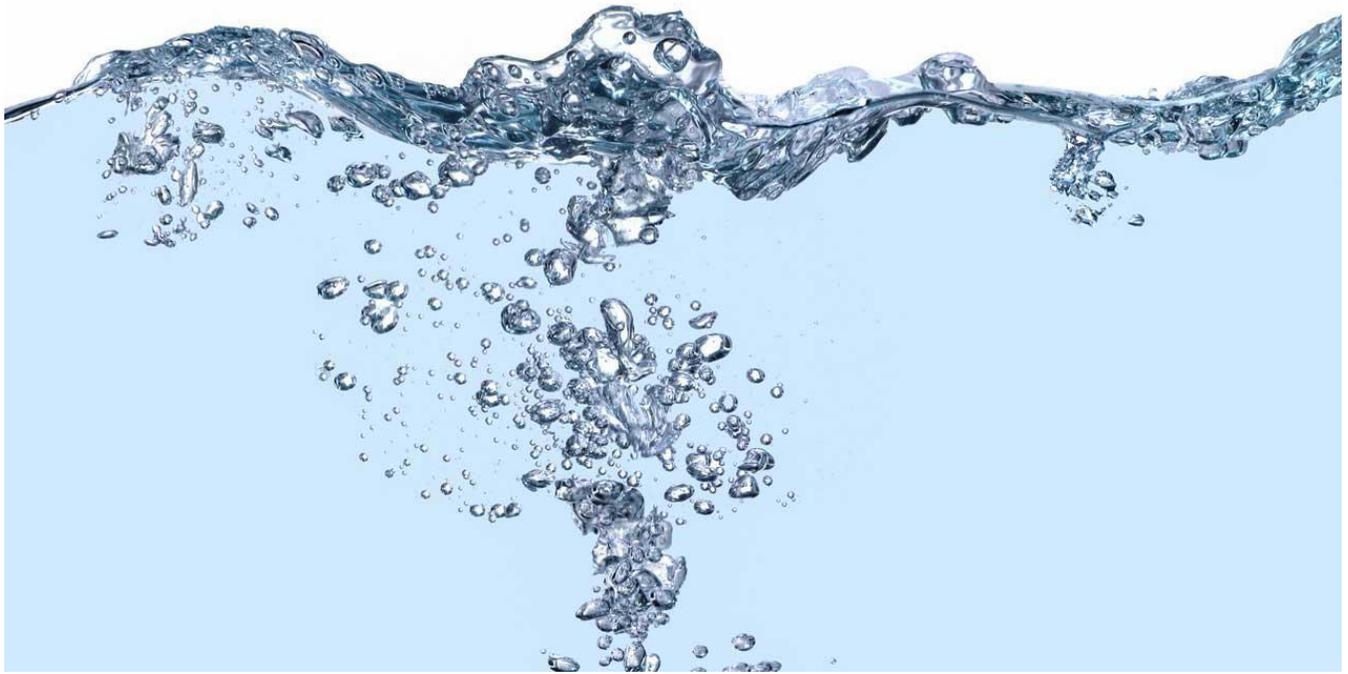


# CONTAMINANTS OF EMERGING CONCERN SENTRY PROGRAM



JANUARY 30, 2020  
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## 2018 RESULTS SUMMARY

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# CONTAMINANTS OF EMERGING CONCERN SENTRY PROGRAM

## 2018 RESULTS SUMMARY

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## 1.0 EXECUTIVE SUMMARY

Recent scientific research has indicated that exposure to contaminants of emerging concern (CECs) 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 2018 Sentry Program are summarized in this report and are largely consistent with historical CECs data.

Tucson Water is expanding its Sentry Program to keep its water supplies safe and protect public health. The following Sentry Program enhancements are currently being implemented:

- Expand the CECs investigation by increasing the number of both potable and non-potable sampling locations.
- Accelerate CECs data collection by increasing the sampling frequency from an annual to a semi-annual basis.
- Lead in efforts to collaborate with other local water utilities, stakeholders, and partners to set priorities, direct resource uses, and develop projects, programs, and policies concerning CECs issues.
- Engage in timely, responsive, effective and open information sharing to improve our Sentry Program and maintain our reputation as a trusted source of drinking water.

## 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 116 CECs analyzed under the 2018 Sentry Program is provided (**Table 1**).

### 3.0 SAMPLING SITES

As part of the 2018 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 2018 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), 1,4-dioxane, and PFAS 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 2018 (**Table 2**). Within active wells serving Tucson Water customers, all 2018 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. Within inactive wells not serving Tucson Water customers, TA-030A, Y-001B, Y-004A, and Z-013A were above the HA of 0.35 part per billion (ppb) for 1,4-dioxane. Out of a total of 116 CECs analyzed, the following number of detects are noted in **Table 2**.

### Drinking Water Served or Active Wells

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

### Drinking Water Not Served or Inactive Wells

- EPDS 116 (Z-013A) had 21 CECs detections
- EPDS 160 (Y-004A) had 20 CECs detections
- EPDS 166 (Y-001B) had 19 CECs detections
- Influent to TARP/AOP Plant TA-030A had nine CECs detections

The types of CECs and concentrations detected in the 2018 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

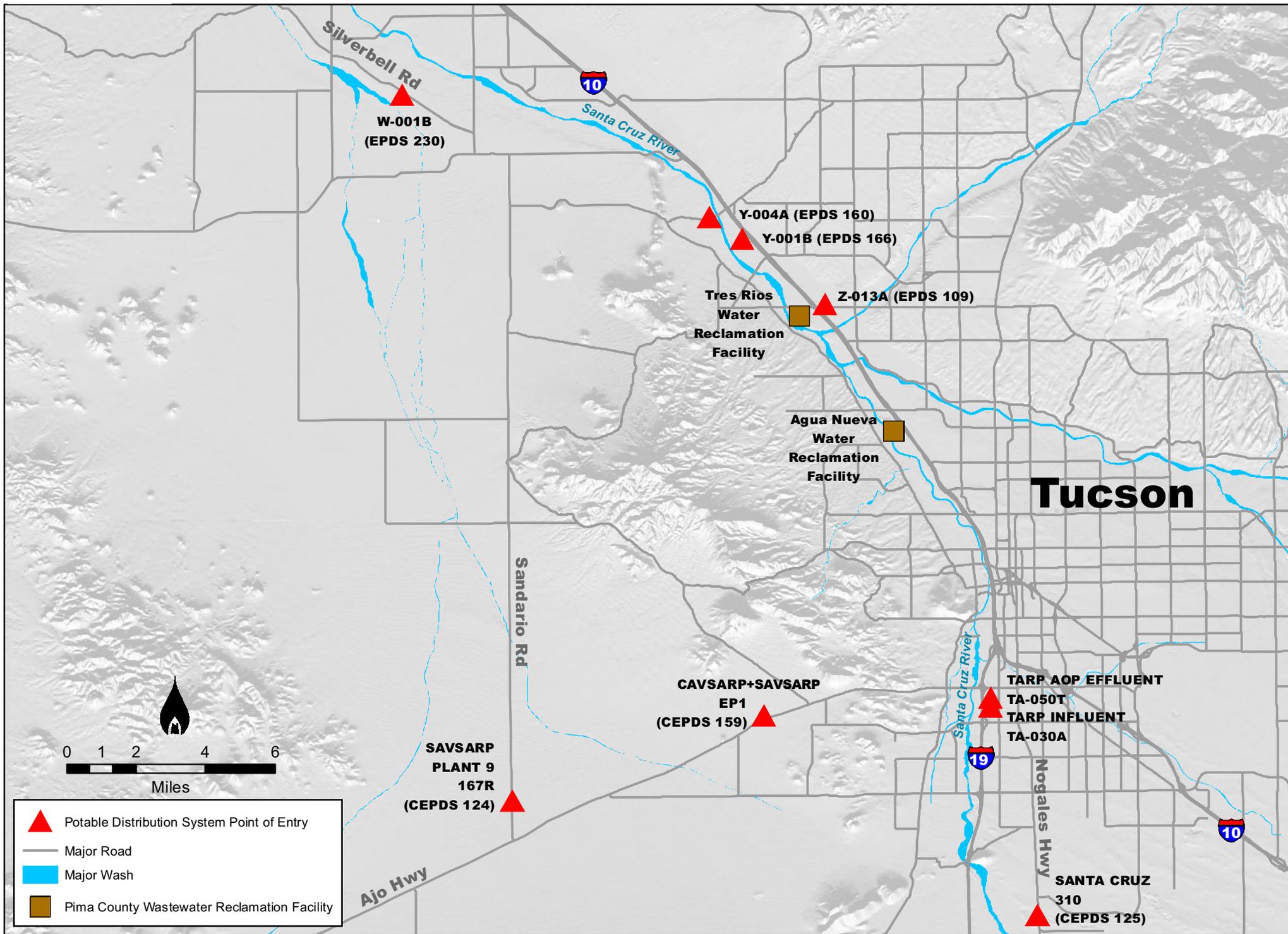
- May warrant regulation under the SDWA

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. On February 14, 2019, EPA announced a Nationwide PFAS Action Plan and stated plans to move ahead with establishing an MCL for PFOS and PFOA, two of the most well-known and prevalent PFAS chemicals.

## 6.0 CONTINUED ACTION PLAN

As previously stated, Tucson Water will continue to enhance the Sentry Program. The CECs monitoring frequency will be increased from an annual basis to a semi-annual basis and a number of sampling locations will be added to the sampling plan. The semi-annual sampling events will be conducted in the months of June 2019 and December 2019. Both potable and non-potable sample locations will be added in 2019. In addition, Tucson Water plans to actively engage local utilities and other key partners in investigation 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. 2018 SENTRY PROGRAM - CECs ANALYZED**

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

**TABLE 1. 2018 SENTRY PROGRAM - CECs ANALYZED**

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

**TABLE 1. 2018 SENTRY PROGRAM - CECs ANALYZED**

No.	Contaminant of Emerging Concern Name	General Category
89	METFORMIN	
90	METHYLPARABEN	
91	NAPROXEN	
92	NIFEDIPINE	
93	NORETHISTERONE	
94	OXOLINIC ACID	
95	PENTOXIFYLLINE	
96	PHENAZONE	
97	PRIMIDONE	
98	PROGESTERONE	
99	SALICYLIC ACID	
100	SULFACHLOROPYRIDAZINE	
101	SULFADIAZINE	
102	SULFADIMETHOXINE	
103	SULFAMERAZINE	
104	SULFAMETHAZINE	
105	SULFAMETHIZOLE	
106	SULFAMETHOXAZOLE	
107	SULFATHIAZOLE	
108	TESTOSTERONE	
109	THEOBROMINE	
110	THEOPHYLLINE	
111	TRICLOCARBAN	
112	TRIMETHOPRIM	
113	WARFARIN	
114	1,7-DIMETHYLYXANTHINE	Pharmaceutical (Metabolite of Caffeine)
115	COTININE	Pharmaceutical (Metabolite of Nicotine)
116	DEHYDRONIFEDIPINE	Pharmaceutical (Metabolite of Nifedipene)

Acronym/Abbreviations:

PFAS = Perfluorinated alkylated substances

**TABLE 2. 2018 SENTRY PROGRAM - CECs DETECTED**

Sample Point	Sample Date	CECs Name	WQ Standard	Sample Result	MRL	Units
310	7/19/2018	ACESULFAME-K		52	20	ppt
310	7/19/2018	CHROMIUM, HEXA VALENT	<sup>1</sup> MCL 100	1.5	0.02	ppb
310	7/19/2018	LIDOCAINE		10	5	ppt
310	7/19/2018	MECLOFENAMIC ACID		17	5	ppt
310	7/19/2018	QUINOLINE		5.5	5	ppt
167R	7/19/2018	ACESULFAME-K		390	20	ppt
167R	7/19/2018	CAFFEINE		19	10	ppt
167R	7/19/2018	CHROMIUM, HEXA VALENT	<sup>1</sup> MCL 100	0.81	0.02	ppb
167R	7/19/2018	DEA		11	5	ppt
167R	7/19/2018	MECLOFENAMIC ACID		21	5	ppt
167R	7/19/2018	METFORMIN		9.8	5	ppt
167R	7/19/2018	QUINOLINE		7	5	ppt
167R	7/19/2018	SUCRALOSE		210	100	ppt
EP1	7/17/2018	ACESULFAME-K		240	20	ppt
EP1	7/17/2018	CAFFEINE		10	10	ppt
EP1	7/17/2018	CHROMIUM, HEXA VALENT	<sup>1</sup> MCL 100	0.34	0.02	ppb
EP1	7/17/2018	DEA		9.4	5	ppt
EP1	7/17/2018	METFORMIN		11	5	ppt
W-001B	7/17/2018	1,4-DIOXANE	HA 0.35	0.12	0.10	ppb
W-001B	7/17/2018	2,4-D	MCL 70,000	7.2	5	ppt
W-001B	7/17/2018	ACESULFAME-K		87	20	ppt
W-001B	7/17/2018	CAFFEINE		12	10	ppt
W-001B	7/17/2018	CHROMIUM, HEXA VALENT	<sup>1</sup> MCL 100	0.12	0.02	ppb
W-001B	7/17/2018	DACT		140	50	ppt
W-001B	7/17/2018	DIA		10	5	ppt
W-001B	7/17/2018	METFORMIN		6	5	ppt
W-001B	7/17/2018	SIMAZINE	MCL 4,000	12	5	ppt
TA-050T	7/17/2018	CAFFEINE		16	10	ppt
TA-050T	7/17/2018	CHROMIUM, HEXA VALENT	<sup>1</sup> MCL 100	4.0	0.02	ppb
TA-050T	7/17/2018	METFORMIN		8.1	5	ppt
TA-050T	7/17/2018	METHYL PARABEN		33	20	ppt
TA-050T	7/17/2018	PERFLUORO OCTANESULFONIC ACID - PFOS	<sup>2</sup> HA 70	<sup>3</sup> 28	3.7	ppt
TA-050T	7/17/2018	PERFLUORO OCTANOIC ACID - PFOA	<sup>2</sup> HA 70	<sup>3</sup> 5.2	4	ppt
TA-050T	7/17/2018	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		15	3.5	ppt
TA-050T	7/17/2018	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		70	7.3	ppt
TA-050T	7/17/2018	PERFLUORO-N-HEXANOIC ACID		19	4	ppt
TA-030A	7/17/2018	1,4-DIOXANE	HA 0.35	<b>1.41</b>	0.10	ppb
TA-030A	7/17/2018	CHROMIUM, HEXA VALENT	<sup>1</sup> MCL 100		0.02	ppb
TA-030A	7/17/2018	DEA			5	ppt
TA-030A	7/17/2018	METFORMIN		7	5	ppt
TA-030A	7/17/2018	PERFLUORO OCTANESULFONIC ACID - PFOS	<sup>2</sup> HA 70	27	3.7	ppt

**TABLE 2. 2018 SENTRY PROGRAM - CECs DETECTED**

Sample Point	Sample Date	CECs Name	WQ Standard	Sample Result	MRL	Units
TA-030A	7/17/2018	PERFLUORO OCTANOIC ACID - PFOA	<sup>2</sup> HA 70	5.4	4	ppt
TA-030A	7/17/2018	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		9.8	3.5	ppt
TA-030A	7/17/2018	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		78	3.6	ppt
TA-030A	7/17/2018	PERFLUORO-N-HEXANOIC ACID		15	4	ppt
Y-001B	7/17/2018	1,4-DIOXANE	HA 0.35	<b>0.70</b>	0.10	ppb
Y-001B	7/17/2018	ACESULFAME-K		100	20	ppt
Y-001B	7/17/2018	ATRAZINE	MCL 3,000	8.5	5	ppt
Y-001B	7/17/2018	CAFFEINE		16	10	ppt
Y-001B	7/17/2018	CARBAMAZEPINE		140	5	ppt
Y-001B	7/17/2018	CHROMIUM, HEXAVALENT	<sup>1</sup> MCL 100	0.042	0.02	ppb
Y-001B	7/17/2018	DEA		9.4	5	ppt
Y-001B	7/17/2018	METFORMIN		7.6	5	ppt
Y-001B	7/17/2018	METHYLPARABEN		37	20	ppt
Y-001B	7/17/2018	PERFLUORO BUTANOIC ACID - PFBA		20	10	ppt
Y-001B	7/17/2018	PERFLUORO OCTANESULFONIC ACID - PFOS	<sup>2</sup> HA 70	<b>58</b>	5	ppt
Y-001B	7/17/2018	PERFLUORO OCTANOIC ACID - PFOA	<sup>2</sup> HA 70	<b>16</b>	5	ppt
Y-001B	7/17/2018	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		5.1	5	ppt
Y-001B	7/17/2018	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		56	5	ppt
Y-001B	7/17/2018	PERFLUOROHEPTANOIC ACID - PFHpA		6.1	5	ppt
Y-001B	7/17/2018	PERFLUORO-N-HEXANOIC ACID		11	5	ppt
Y-001B	7/17/2018	SIMAZINE	MCL 4,000	9	5	ppt
Y-001B	7/17/2018	SULFAMETHOXAZOLE		10	5	ppt
Y-001B	7/17/2018	THIABENDAZOLE		5.9	5	ppt
Y-004A	7/17/2018	1,4-DIOXANE	HA 0.35	<b>0.68</b>	0.10	ppb
Y-004A	7/17/2018	ACESULFAME-K		380	20	ppt
Y-004A	7/17/2018	ATRAZINE	MCL 3,000	5.3	5	ppt
Y-004A	7/17/2018	CARBAMAZEPINE		200	5	ppt
Y-004A	7/17/2018	CHROMIUM, HEXAVALENT	<sup>1</sup> MCL 100	0.13	0.02	ppb
Y-004A	7/17/2018	DEA		5.3	5	ppb
Y-004A	7/17/2018	DIA		7.4	5	ppt
Y-004A	7/17/2018	METFORMIN		7.4	5	ppt
Y-004A	7/17/2018	PERFLUORO BUTANOIC ACID - PFBA		28	10	ppt
Y-004A	7/17/2018	PERFLUORO OCTANESULFONIC ACID - PFOS	<sup>2</sup> HA 70	36	5	ppt
Y-004A	7/17/2018	PERFLUORO OCTANOIC ACID - PFOA	<sup>2</sup> HA 70	18	5	ppt
Y-004A	7/17/2018	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		7.2	5	ppt
Y-004A	7/17/2018	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		38	5	ppt
Y-004A	7/17/2018	PERFLUOROHEPTANOIC ACID - PFHpA		5.4	5	ppt
Y-004A	7/17/2018	PERFLUORO-N-HEXANOIC ACID		15	5	ppt
Y-004A	7/17/2018	PERFLUOROPENTANOIC ACID		8	5	ppt
Y-004A	7/17/2018	PRIMIDONE		450	50	ppt
Y-004A	7/17/2018	SIMAZINE	MCL 4,000	31	5	ppt

**TABLE 2. 2018 SENTRY PROGRAM - CECs DETECTED**

Sample Point	Sample Date	CECs Name	WQ Standard	Sample Result	MRL	Units
Y-004A	7/17/2018	SUCRALOSE		3200	100	ppt
Y-004A	7/17/2018	SULFAMETHOXAZOLE		25	5	ppt
Z-013A	7/17/2018	1,4-DIOXANE	HA 0.35	<b>1.41</b>	0.10	ppb
Z-013A	7/17/2018	4-NONYLPHENOL		8500	100	ppt
Z-013A	7/17/2018	ACESULFAME-K		5000	100	ppt
Z-013A	7/17/2018	ATRAZINE	MCL 3,000	11	5	ppt
Z-013A	7/17/2018	CAFFEINE		13	10	ppt
Z-013A	7/17/2018	CARBAMAZEPINE		170	5	ppt
Z-013A	7/17/2018	CARISOPRODOL		61	5	ppt
Z-013A	7/17/2018	DEA		17	5	ppt
Z-013A	7/17/2018	DILANTIN		56	20	ppt
Z-013A	7/17/2018	MEPROBAMATE		150	5	ppt
Z-013A	7/17/2018	METFORMIN		7.4	5	ppt
Z-013A	7/17/2018	PERFLUORO BUTANOIC ACID - PFBA		22	10	ppt
Z-013A	7/17/2018	PERFLUORO OCTANESULFONIC ACID - PFOS	<sup>2</sup> HA 70	<b>72</b>	5	ppt
Z-013A	7/17/2018	PERFLUORO OCTANOIC ACID - PFOA	<sup>2</sup> HA 70	<b>26</b>	5	ppt
Z-013A	7/17/2018	PERFLUORO-1-BUTANESULFONIC ACID - PFBS		7.5	5	ppt
Z-013A	7/17/2018	PERFLUORO-1-HEXANESULFONIC ACID - PFHxS		66	5	ppt
Z-013A	7/17/2018	PERFLUOROHEPTANOIC ACID - PFHpA		7.5	5	ppt
Z-013A	7/17/2018	PERFLUORO-N-HEXANOIC ACID		13	5	ppt
Z-013A	7/17/2018	PERFLUOROPENTANOIC ACID		5.4	5	ppt
Z-013A	7/17/2018	PRIMIDONE		52	50	ppt
Z-013A	7/17/2018	SULFAMETHOXAZOLE		76	5	ppt

Footnotes, Acronyms, and Abbreviations:

<sup>1</sup>Total Chromium MCL =100 ppb; There is no MCL for Hexavalent Chromium

<sup>2</sup>HA 70 ppt combined PFOS + PFOA

<sup>3</sup>As of 1/24/2019 PFOS + PFOA levels have dropped below method reporting limits due to Granular Activated Carbon (GAC) treatment

**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