



## **Marana Water Unregulated Compound Case Study**

Scott Schladweiler, P.E.  
Director

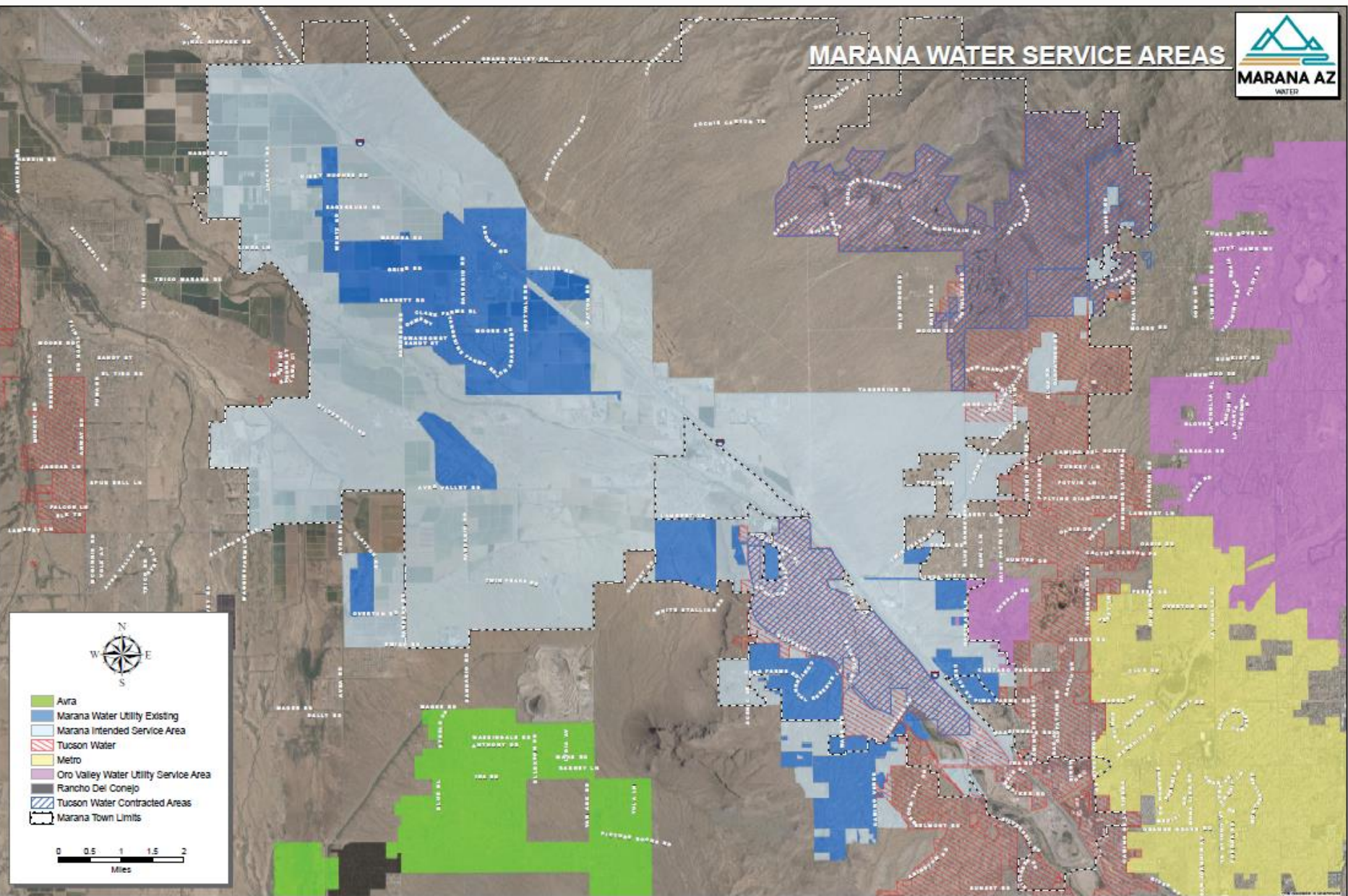
October 24, 2019



## Agenda

- Marana Water overview
- Discovery of PFAS and 1,4-dioxane
- Public outreach
- Alternatives evaluation
- Treatment design
- Project funding

# MARANA WATER SERVICE AREAS

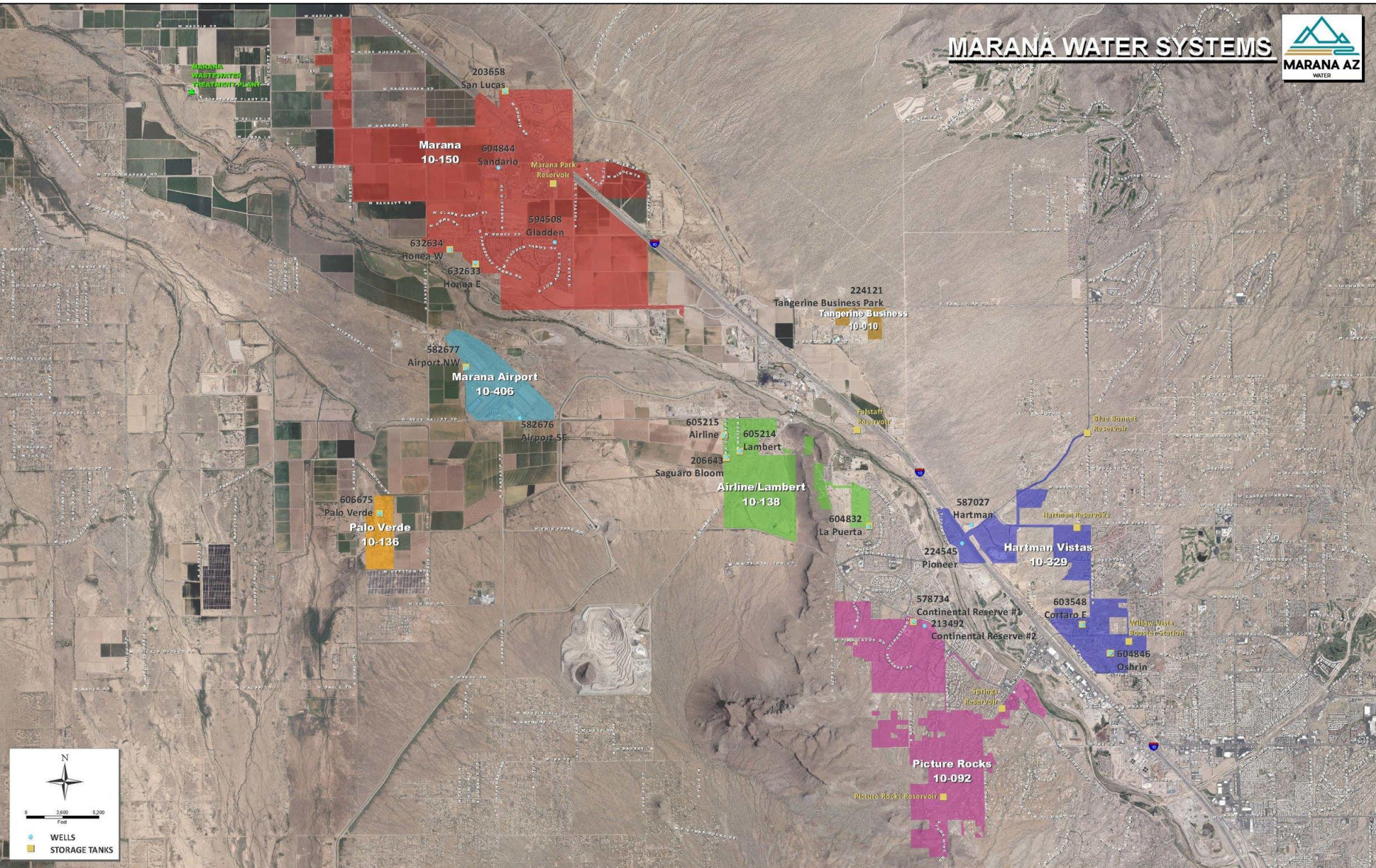


- Avra
- Marana Water Utility Existing
- Marana Intended Service Area
- Tucson Water
- Metro
- Oro Valley Water Utility Service Area
- Rancho Del Conejo
- Tucson Water Contracted Areas
- Marana Town Limits

0 0.5 1 1.5 2  
Miles

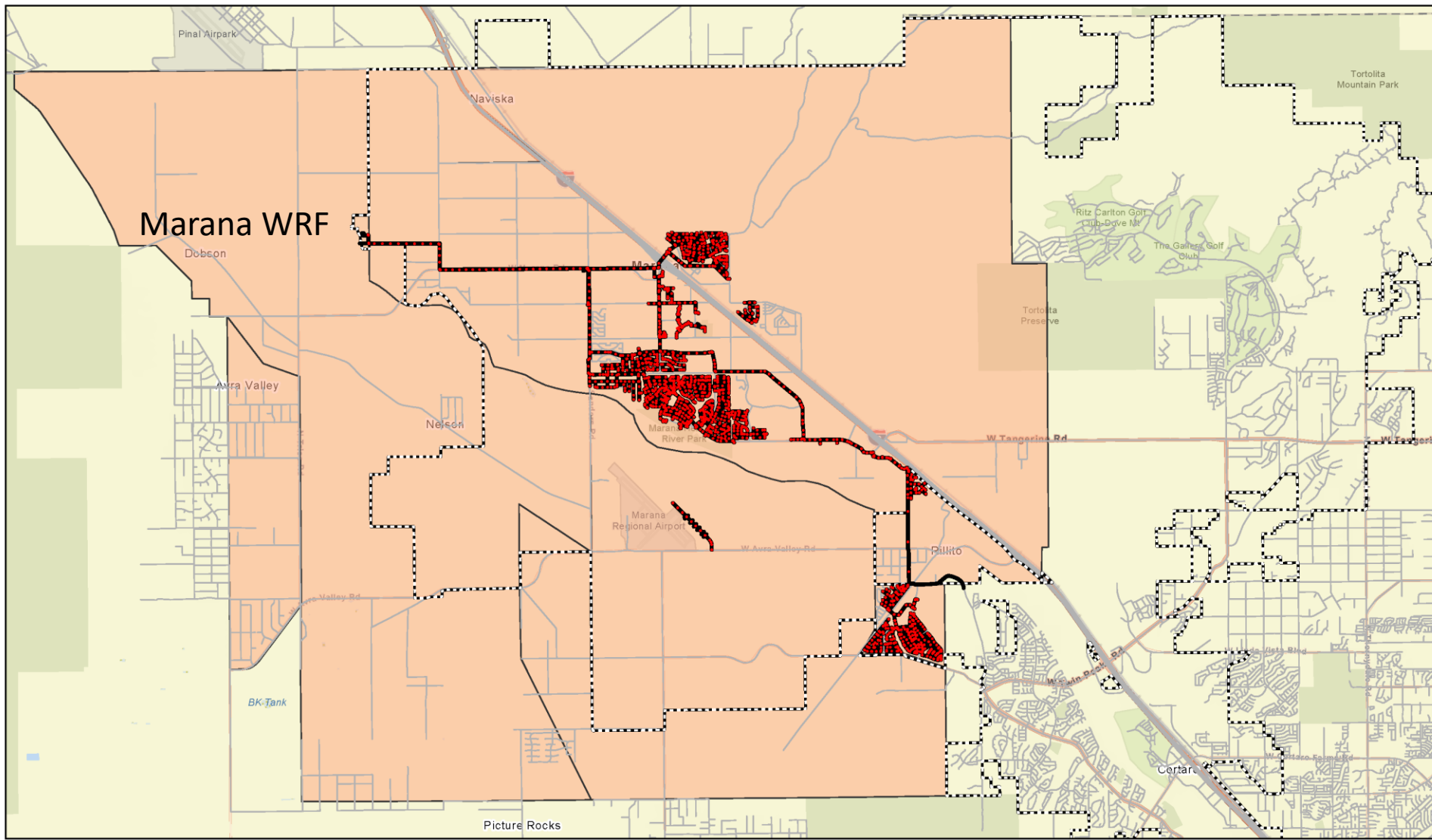


# MARANA WATER SYSTEMS





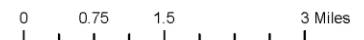
# Water Reclamation Service Area



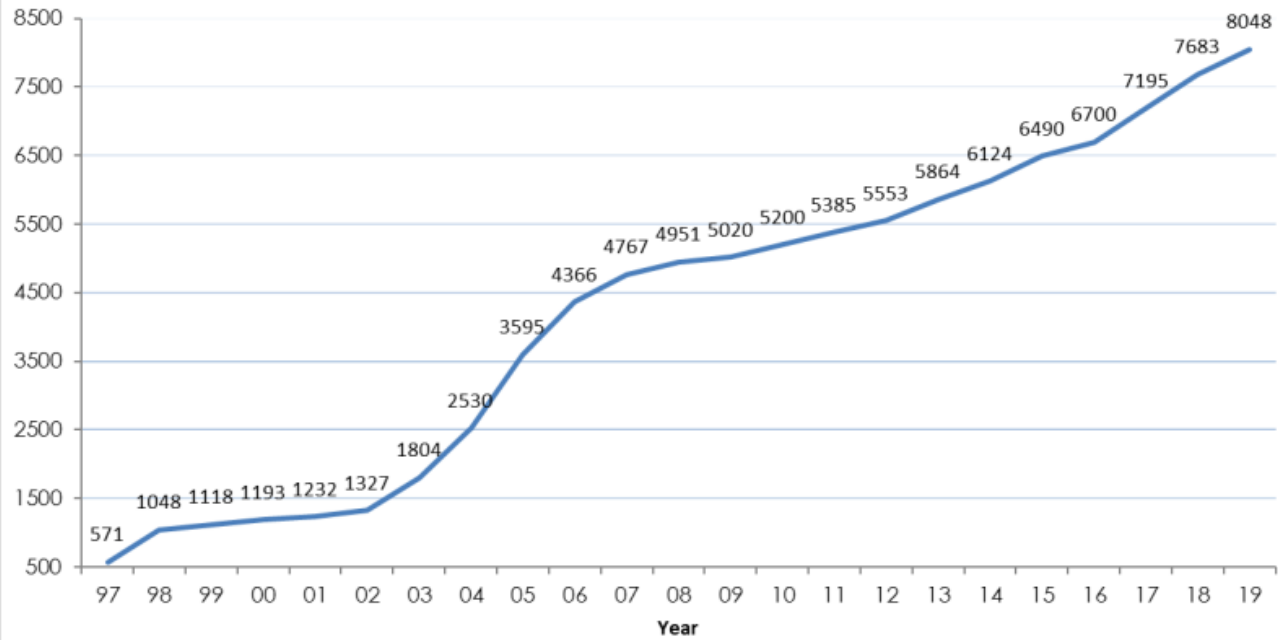
 Designated Management Area   
  Sewerlines

■■■■ Marana Boundary

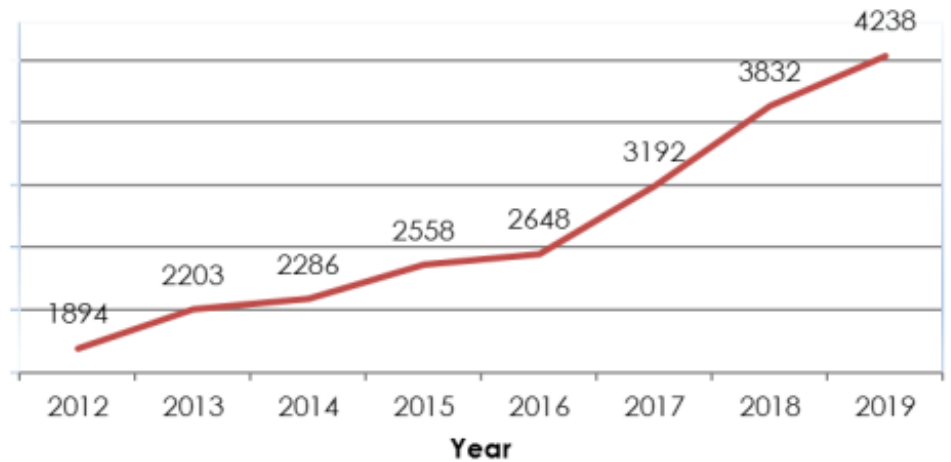
- Manholes



### Average Customers



### Average Customers



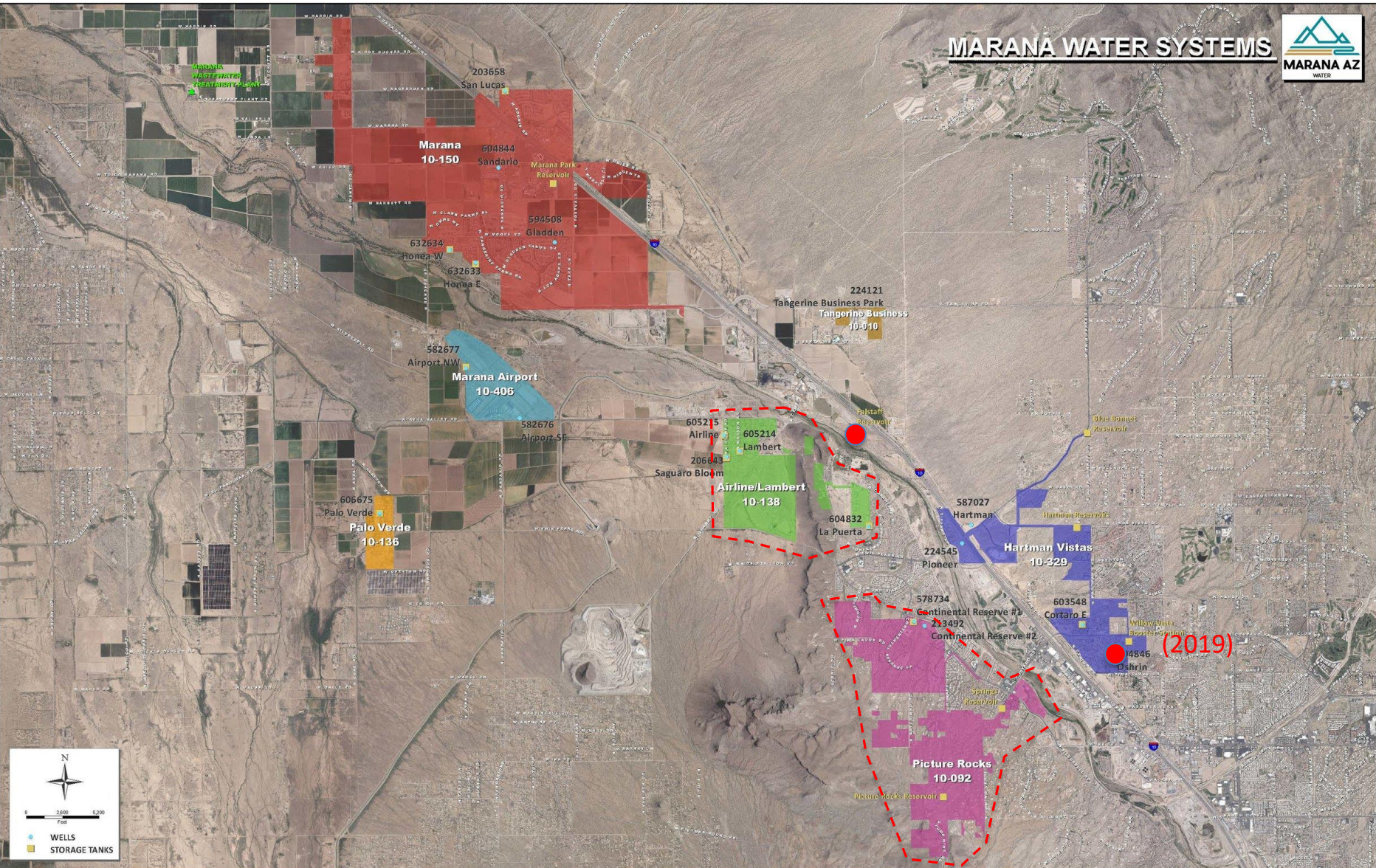


## Timeline

- |                   |   |
|-------------------|---|
| <b>2016</b>       | EPA Health Advisory for certain PFAs (PFOA and PFOS) reduced from 400 ppt and 200 ppt, respectively to 70 ppt combined  |
| <b>Late 2016</b>  | Tucson Water notifies Marana Water and Metro Water that they are finding 1,4-Dioxane and PFAs above the current HAs on the northwest side of Tucson (Marana). Marana confirms 1,4-dioxane in wells and notifies the customer base. Tucson Water and Metro Water turn their affected groundwater sources off |
| <b>Early 2017</b> | Marana confirms the presence of PFAs in some of the water systems and notifies the customer base; Marana sends letter to ADEQ on behalf of Tucson Water and Metro Water asking for an investigation   |
| <b>2017</b>       | Marana Water initiates a water quality assessment study to identify potential solutions to the issues; ADEQ launches study to collect data from public and private groundwater sources  |



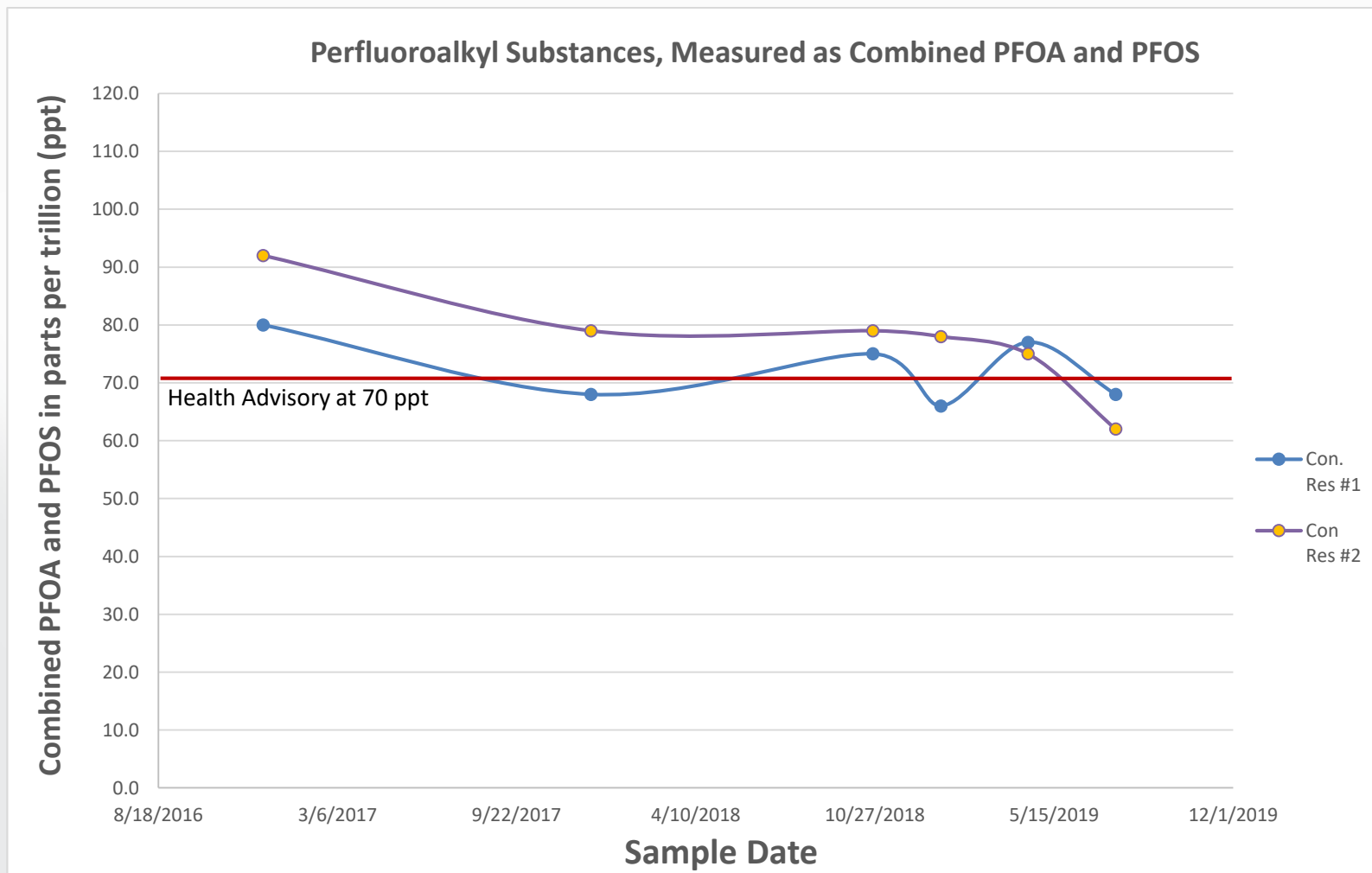
# MARANA WATER SYSTEMS







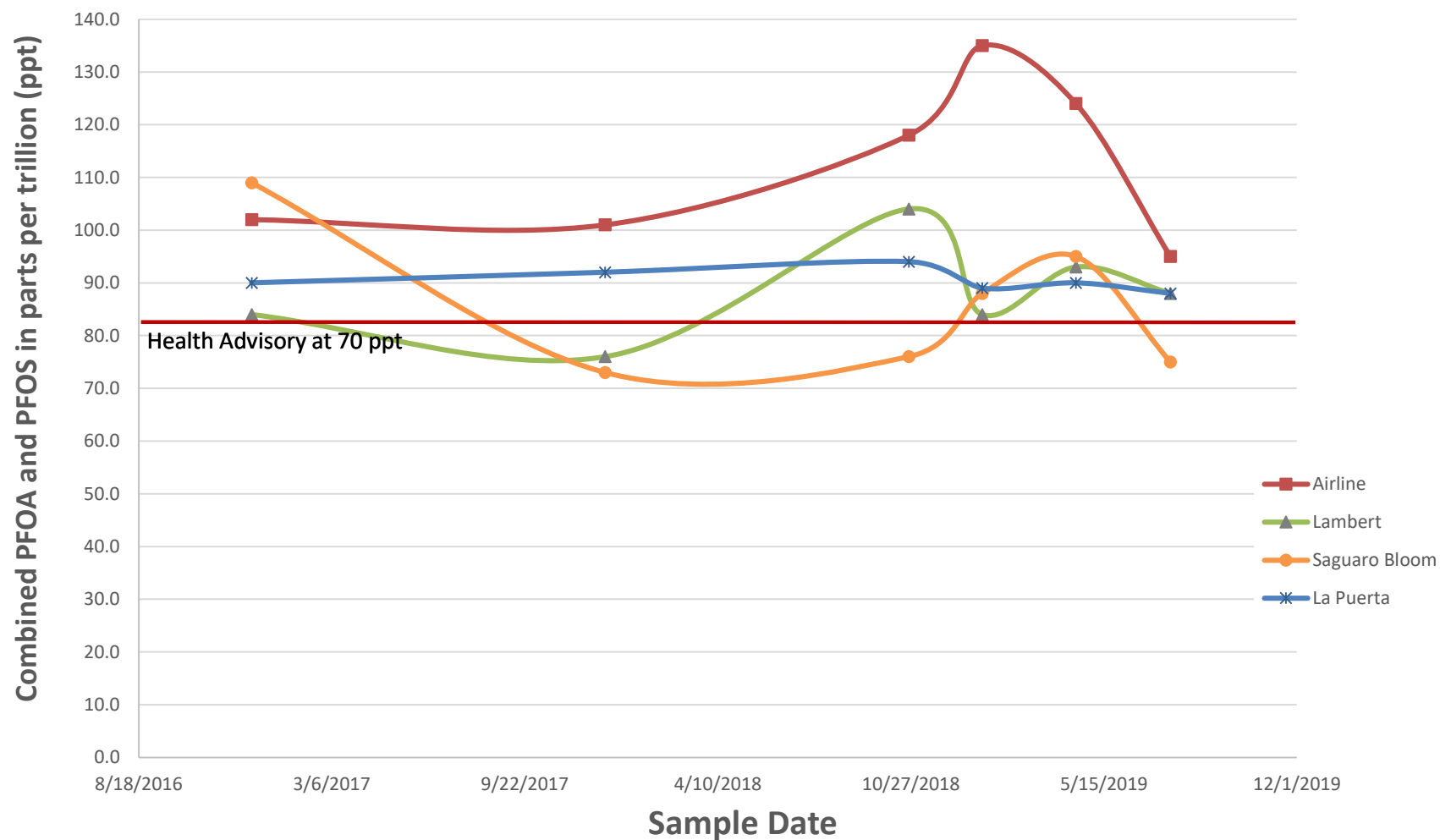
# Picture Rocks Water System





# Airline/Lambert Water System

Perfluoroalkyl Substances, Measured as Combined PFOA and PFOS





#### NOTICE:

Water quality information for Marana Water systems.

**Marana Water has recently detected unregulated compounds called PFOA and PFOS within the water systems #10-092 (Picture Rocks) and #10-138 (Arlene/Lambert) at concentration above the lifetime health advisory level. Other Marana Water systems have detections below the lifetime health advisory level or have no detections of these compounds.**

#### WHAT IS PFOA AND PFOS? HOW IS IT USED?

PFOA and PFOS are chemicals that were widely used in commercial products. They have a strong ability to repel other compounds so they were commonly used as stain protection on fabrics and clothing, non-stick cookware, furniture protection, paper packaging protection, as well as in firefighting foams. Most of the companies that use these compounds have phased out their use over the last ten years. However, because the compounds are highly stable and resistant to breakdown, they are commonly found in the environment.

#### WHAT IS AN UNREGULATED COMPOUND?

An unregulated compound means that the compound is not part of the mandatory water quality testing that the Marana Water Department is required to do per state and federal rules. The USEPA is currently examining PFOA and PFOS as potential drinking water contaminants, but has not created a maximum contaminant level regulation at this time. These compounds have been found across the nation and have the ability to remain in the environment for a long time. While PFOA and PFOS are being actively studied by the USEPA, they have issued a lifetime health advisory for drinking water systems to use as a benchmark. The current health advisory value set in 2016 for both compounds is **70 parts per trillion**. Some of the Marana Water wells tested show concentrations that are above this lifetime health based advisory level. To give an idea of what a part per trillion means, it is like one second in 32,000 years or one square inch within 250 square miles.

#### IS THE QUALITY OF MY WATER OK?

All Marana Water systems meet the current required federal and state water quality standards for drinking water. However, as your local water professionals, we also know that not every chemical compound or microbiological risk is regulated. By staying aware of our local environment and the environment of our nation, we can conduct additional, voluntary water quality sampling to help us understand and identify potential issues before they become a drinking water regulated item. Activities like this sampling program will allow us to effectively plan for possible additional infrastructure and treatment options in a proactive, not reactive, manner.

#### HOW CAN PFOA AND PFOS IN THE WATER AFFECT MY HEALTH?

The USEPA is continually testing and researching the likelihood that these compounds can be harmful in drinking water. While the research

continues, the USEPA has established a lifetime health advisory of 70 parts per trillion for both compounds. This advisory was established to provide a level of protection for all Americans throughout their lifetime from any adverse health effects resulting from exposure to PFOA and PFOS in drinking water. The health advisory is designed to protect the most sensitive populations: fetuses during pregnancy and breastfeeding infants. If you live in a water system that has shown PFOA and PFOS levels greater than the health advisory, you may want to take steps to limit or avoid consumption of water directly from the tap. While this department works on the next steps to address this issue, you may be able to treat water at home to reduce the levels of these compounds.

#### CAN I TREAT THE WATER AT HOME?

With respect to PFOA and PFOS, there are two types of treatment that have shown to be effective in reducing or eliminating these compounds from the water. These treatments are activated carbon and reverse osmosis. Activated carbon filters are relatively common and can be found at most grocery stores and home improvement stores. Examples of these devices are filtering water pitchers and in-line refrigerator filters. Use of these devices has shown a positive effect in reducing or eliminating PFOA and PFOS compounds, as well as others. To read a study using University of Arizona research showing the effectiveness of a few of these devices, visit [GoodHousekeeping.com/health-products/g684/water-filters](http://GoodHousekeeping.com/health-products/g684/water-filters)

#### WHAT ARE THE NEXT STEPS?

Marana Water will be scheduling additional sampling of our well and delivery systems over the course of the year. Having more information on what is present in our environment will allow us to determine why this compound is present in our region and what steps we may want to explore to mitigate any occurrence of this in the future. Some of these future steps may include building additional infrastructure to blend water from other sources or using advanced treatment processes at the water source. This research is ongoing. We plan to work with the other water and wastewater utilities in the area to combine as much of our research data to develop a complete picture. As the department gathers additional information, we will provide regular updates to the community through the Marana Water website at [MaranaAZ.gov/water-quality](http://MaranaAZ.gov/water-quality)

#### PFOA/PFOS RESULTS BY WATER SYSTEM

WATER SYSTEMS	WELL NAME	RESULT (PPT)	SAMPLE DATE
Picture Rocks 10-092	Continental Reserve #1	80	12/13/16
	Continental Reserve #2	92	12/13/16
	Saguaro Bloom	109	12/13/16
	Arlene	102	12/13/16
	Lambert	84	12/13/16
Arlene/Lambert 10-138	La Puerta	90	12/13/16
	Gladden Farms	20.4	12/15/16
	Sandaria	7.4	12/15/16
	Honea East	11.9	12/15/16
	Honea West	8.5	12/15/16
North Marana 10-150	San Lucas	<2.0	12/15/16
	Hartman Vistas 10-329	<2.0	12/15/16
	Carlato Ranch	<2.0	12/15/16
	Hartman	<2.0	12/15/16
	Oshrin	9.9	12/15/16
Airport 10-406	Airport NW	<2.0	12/13/16
	Airport SE	<2.0	12/13/16
Palo Verde 10-136	Palo Verde	<2.0	12/13/16
Fabstaff	Fabstaff	87	12/13/16



# UNREGULATED COMPOUNDS

To continue providing high quality service and product to our customers, in 2016 Marana Water began a voluntary water sampling program to test for the unregulated compounds 1,4-dioxane and PFAs.

HAVE A QUESTION? [CLICK HERE TO ASK.](#)

FREQUENTLY ASKED QUESTIONS

We have been sampling our water systems for 1,4-dioxane and PFAs since 2016. Below you can see the results in your water system overtime. To start, type your address into the search box below, be sure to include the directional (N, S, E, W), and select your address. Be sure to hit the x in the search bar between searches to clear the chart.

A chart will appear showing the results of our sampling program for unregulated compounds in your area. You can switch between 1,4-dioxane and PFAs by clicking on the buttons on the top of the chart. Each of the lines on the chart are one of the wells in your neighborhood. The solid red line on the chart shows the health advisory limits. If there is no data on the chart, 1,4-dioxane and PFAs were not detected in your water system.

11555 W CIVIC CENTER DR

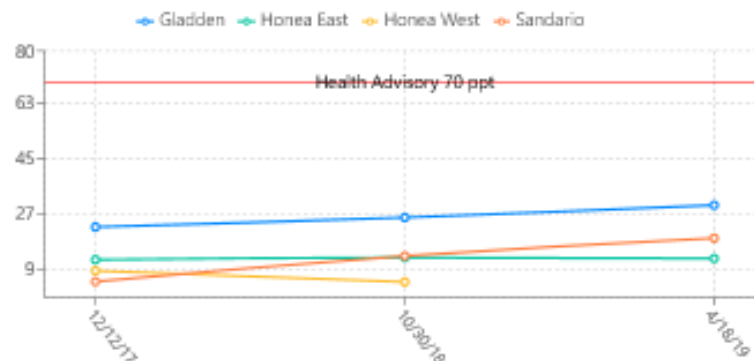
This address is in the Marana Water System



1,4-Dioxane

PFAs

Perfluoroalkyl Substances, Measured as Combined PFOA and PFOS Levels



This water system has 5 well(s), 4 of which were found to have perfluoroalkyl substances and 1,4-dioxane. These charts show testing results for these wells since samples were first taken in 2016.







# Groundwater Quality Improvements Plan

- Evaluated Blending Alternatives
  - Not enough water available
  - 82% non detect water required
  - Uncertainty of water quality
- Additional well capacity
  - Uncertainty of water quality
- Interconnects with other systems
  - Tucson Water interconnect
  - NWRDRS Project
- Treatment alternatives
  - Most feasible, predictable option



Marana Water

## Groundwater Quality Improvements

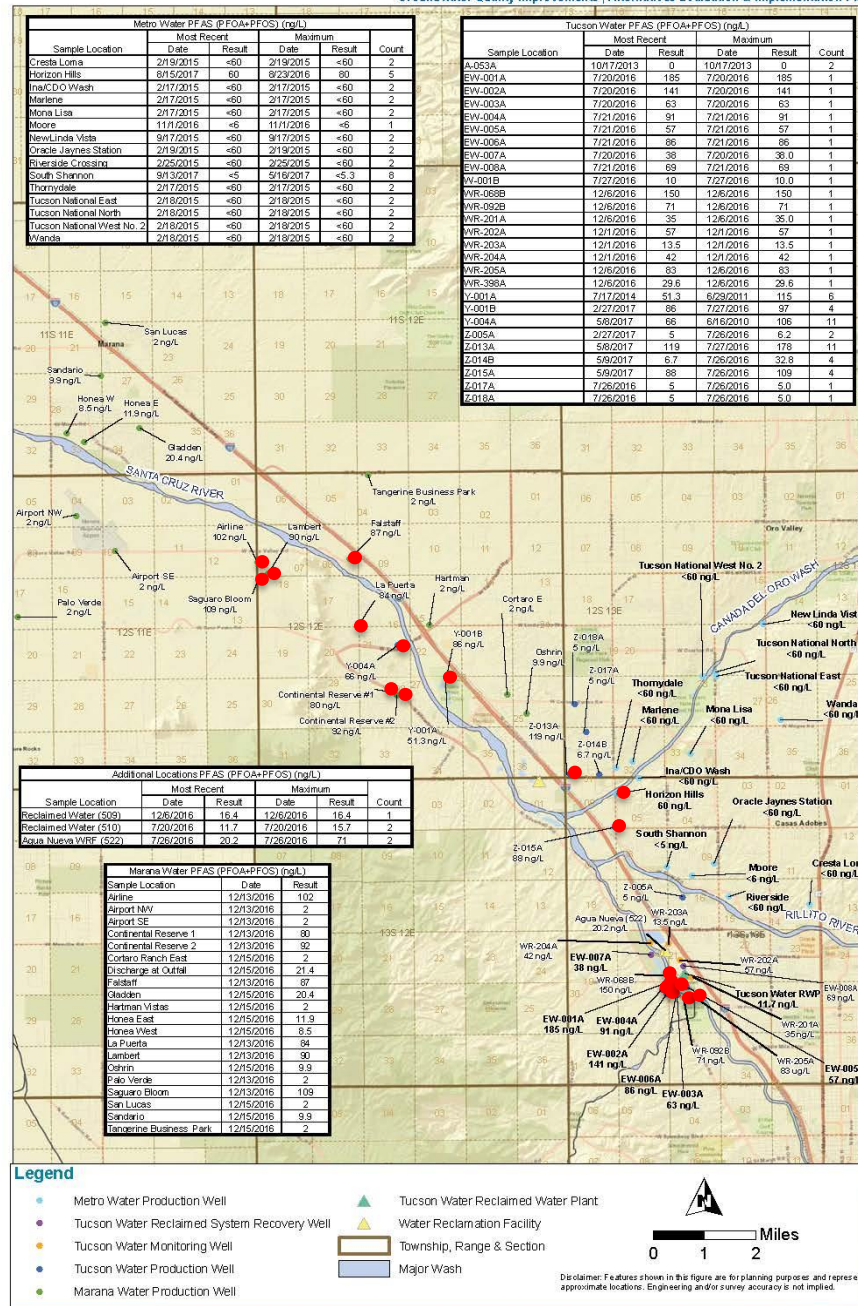
Alternatives Evaluation and Implementation Plan

December 2017



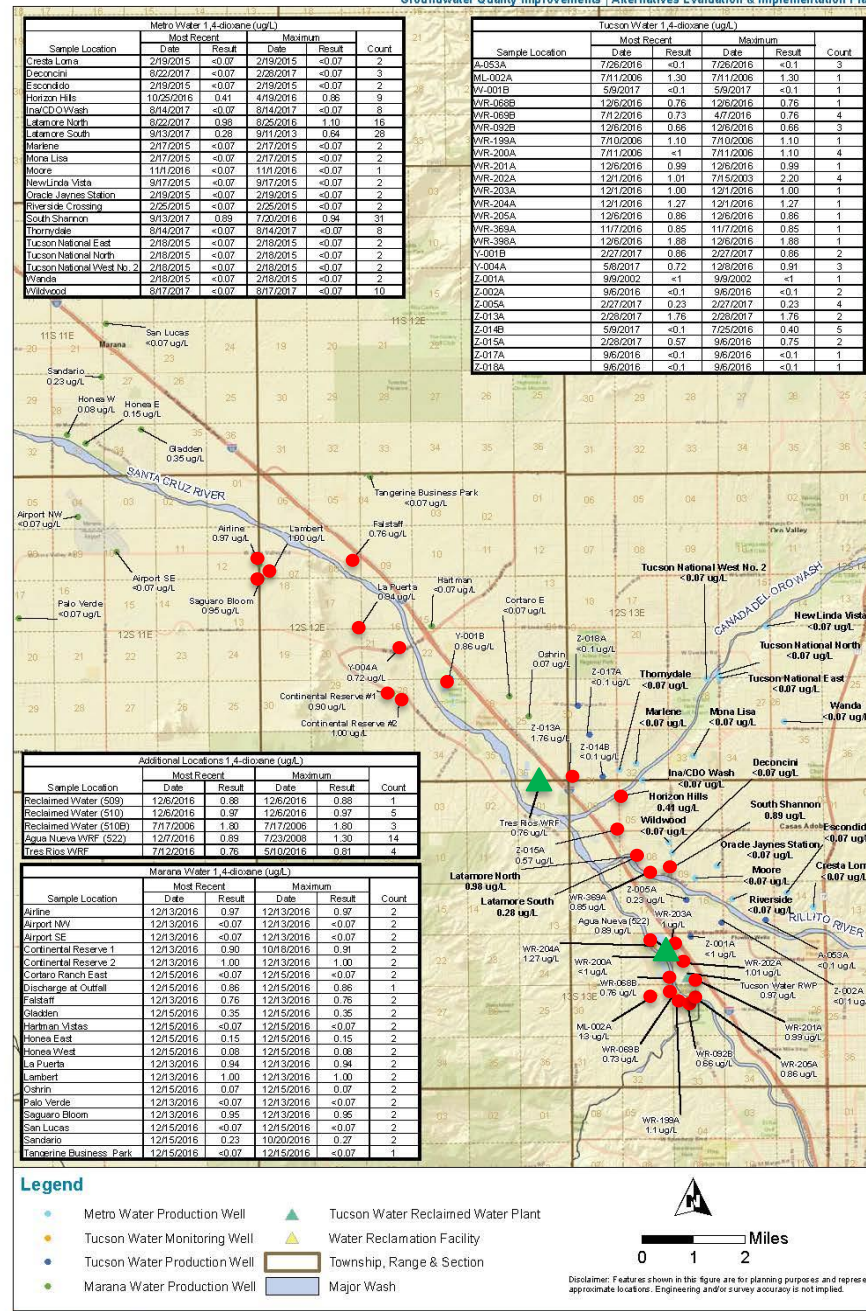
Parameter	EPA Health Advisory	Preliminary Treatment/ Blending Goal
1,4-dioxane	0.35 µg/L	0.175 µg/L
PFOS + PFOA	70 ng/L	35 ng/L

# PFAS Concentrations



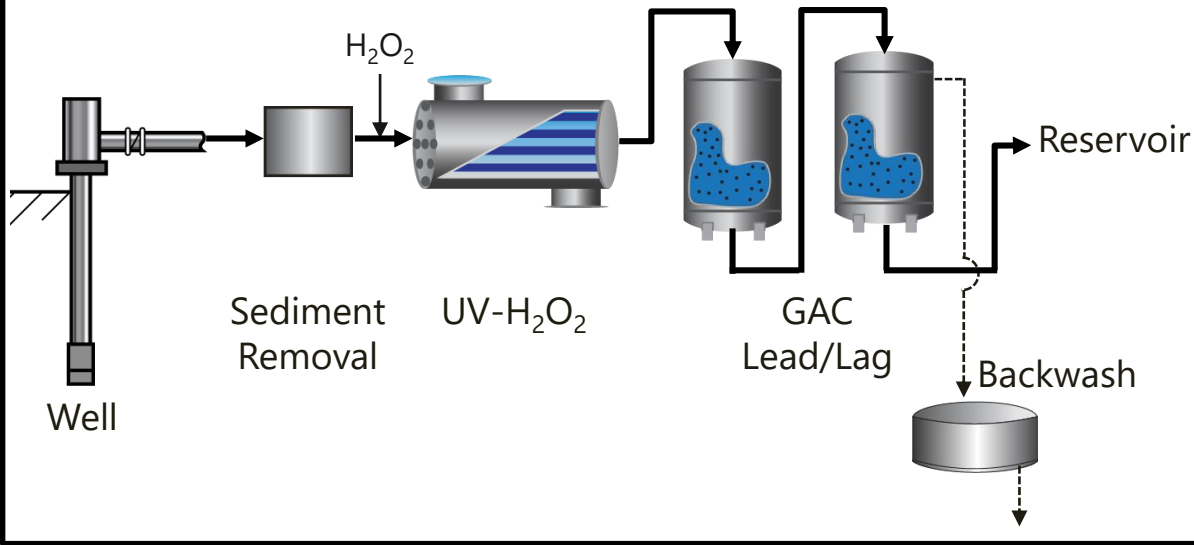


# 1,4-Dioxane Concentrations



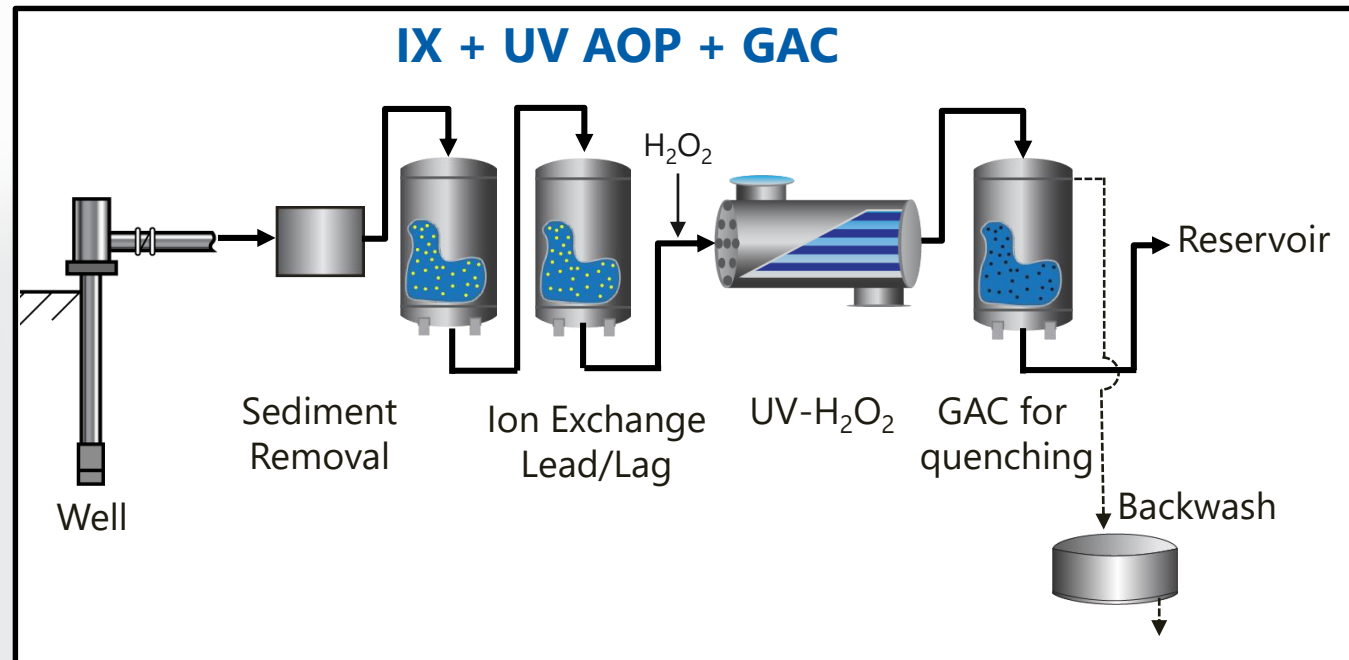
## Treatment Options

### UV AOP + GAC



Estimated Cost:  
**\$15M**

### IX + UV AOP + GAC







## Project Funding

Source	Viable funding source?	Considerations
Excise Tax Revenue Obligations	Yes	Counts against overall pledged revenue coverage requirements. Must remain within legal/financial capacity. May limit other projects.
Water Infrastructure Financing Authority Loan	Yes	Insufficient utility system revenues; requires non-utility system revenue source. Requires project to become federalized.
Utility Revenue Obligations	No	Insufficient utility system revenues
Grants or other contributions	No	Not likely to generate sufficient cash flow
Internal loans from unrestricted sources	No	Insufficient balance to fund project and not violate minimum reserve requirement. Use limits other investments
Capital Improvement Plan project money reallocation	No	Not likely to generate sufficient cash flow; would impact other projects



## Project Schedule

- August 2018: Town Council directed staff to pursue treatment for affected systems
- December 2018: WIFA Board approved \$15M loan
- January 2019: WIFA loan closed; Marana Water hires Carollo to begin design
- May 2019: Hired Archer Western as CMAR



## 1,4-Dioxane Operational Target

	Units	1,4-dioxane
2011 Health Advisory ( $1 \times 10^{-6}$ excess estimated lifetime cancer risk)	ppb	0.35
<b>Marana Treated Water Quality Operational Target</b>	<b>ppb</b>	<b>0.1</b>

1. Treated water goal is set at current method reporting limit for 1,4-dioxane. Design includes an engineering safety factor for consistency of operational performance.



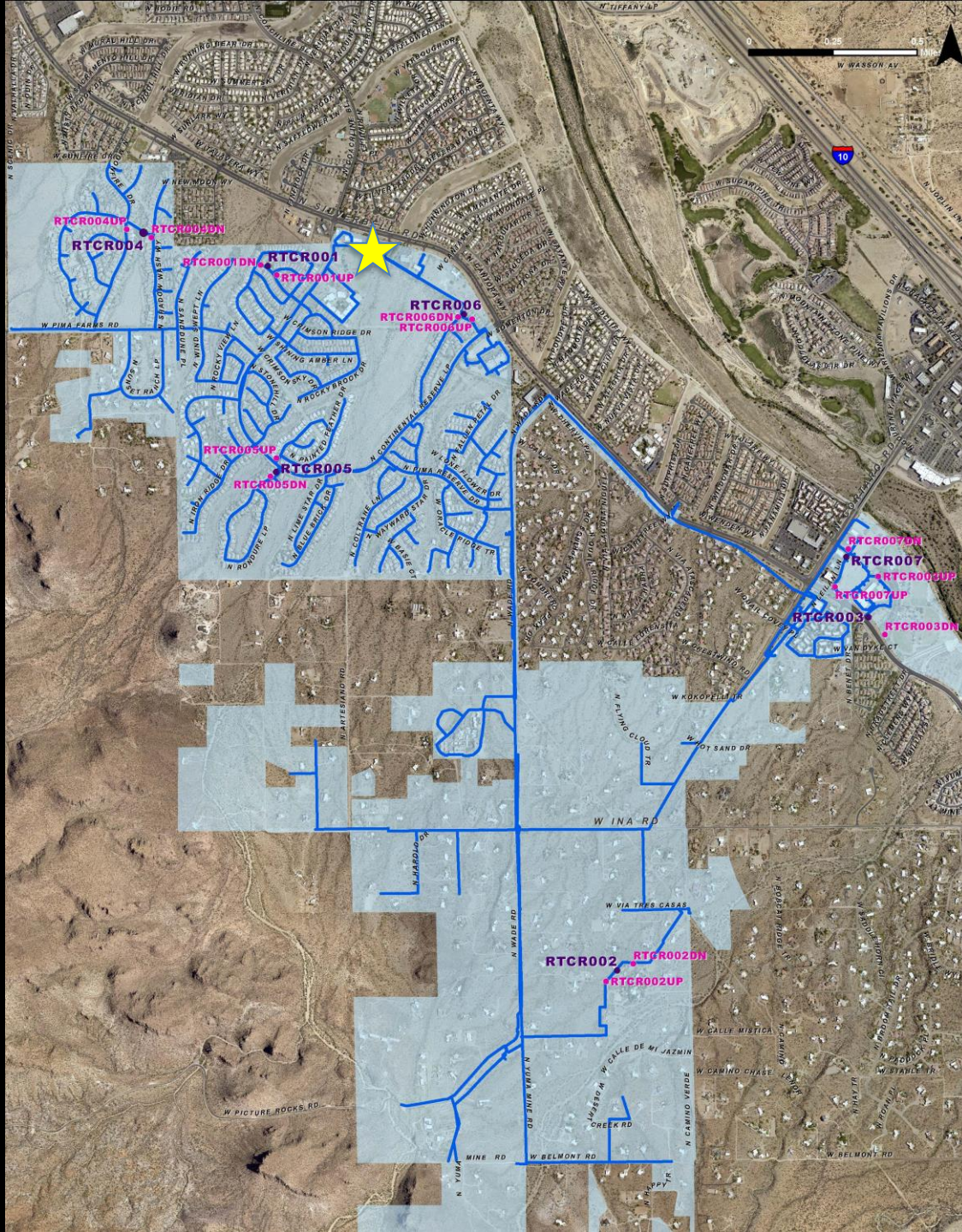


## PFAS Operational Target

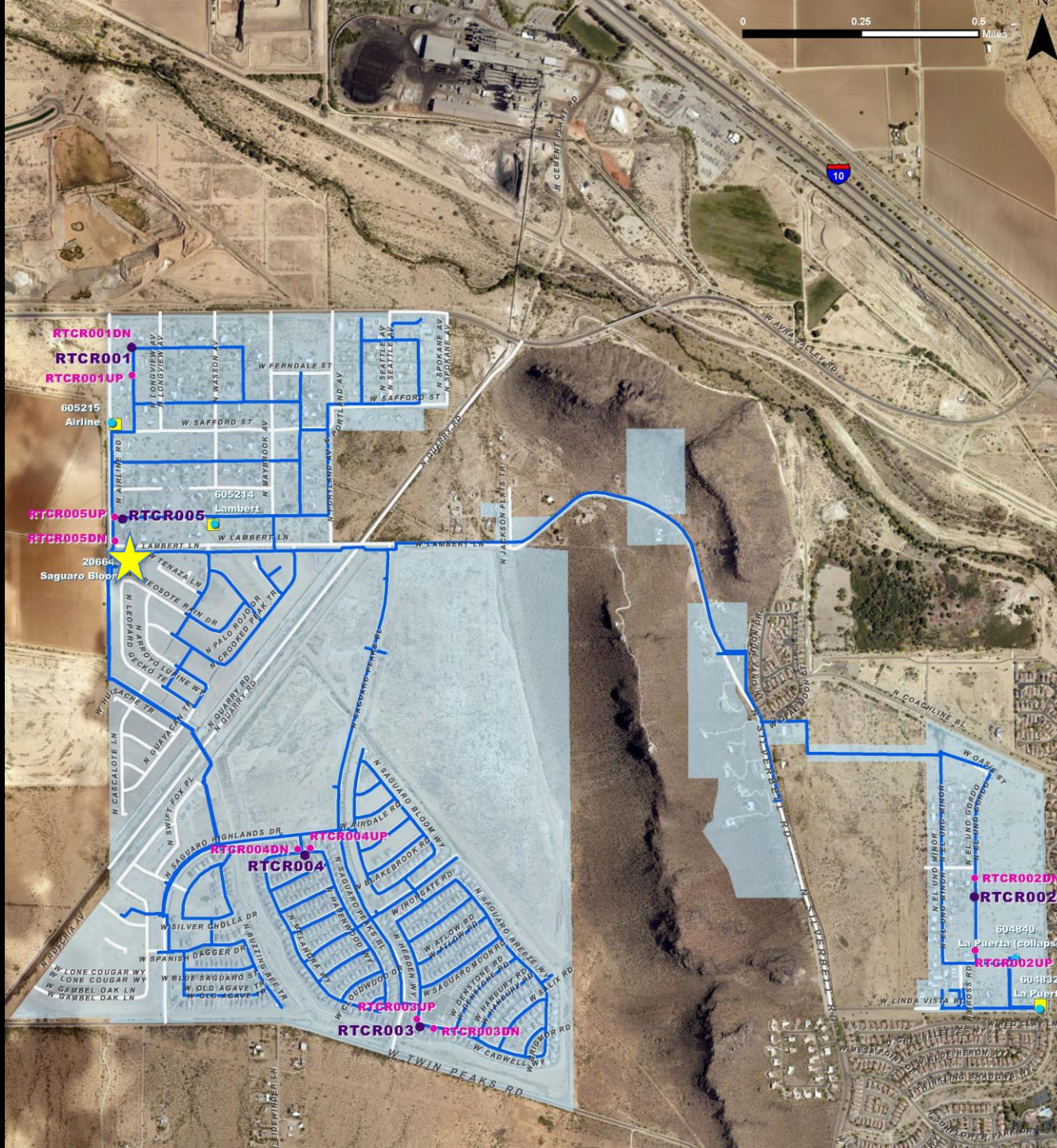
	Units	PFOA	PFOS	PFHxS	PFNA
2009 USEPA Provisional Health Advisory	ppt	400	200		
2016 USEPA Health Advisory <sup>(1)</sup>	ppt	70 (combined)		--	--
2018 Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Level (MRL)	mg/kg/day	$3 \times 10^{-6}$	$2 \times 10^{-6}$	$2 \times 10^{-5}$	$3 \times 10^{-6}$
Equivalent Value based on ATSDR MRL <sup>(2)</sup>	ppt	11	7	74	11
<b>Marana Treated Water Quality Operational Target<sup>(3)</sup></b>	<b>ppt</b>	<b>17.5 (combined)</b>			

1. When both PFOA and PFOS are present in drinking water, combined levels are not to exceed 70 ppt.
2. Equivalent values calculated using the ATSDR MRLs and the same methodology that was used to determine the 2016 Health Advisory levels for PFOA and PFOS.
3. When both PFOA and PFOS are present in drinking water, combined levels are not to exceed 17.5 ppt. Operational target is set at 25% of the current health advisory for PFOA and PFOS.

# Picture Rocks Water System





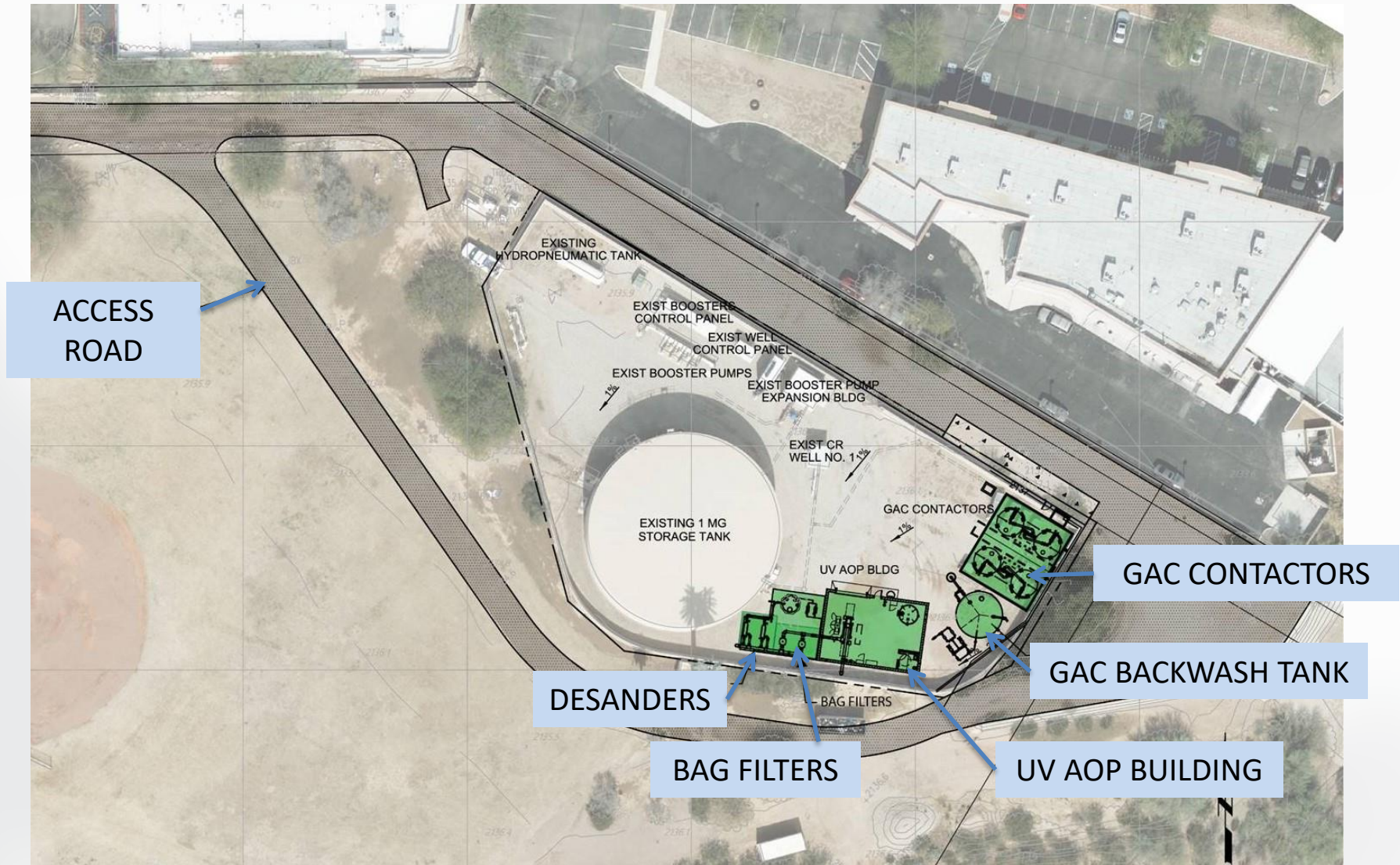


# Airline/Lambert Water System





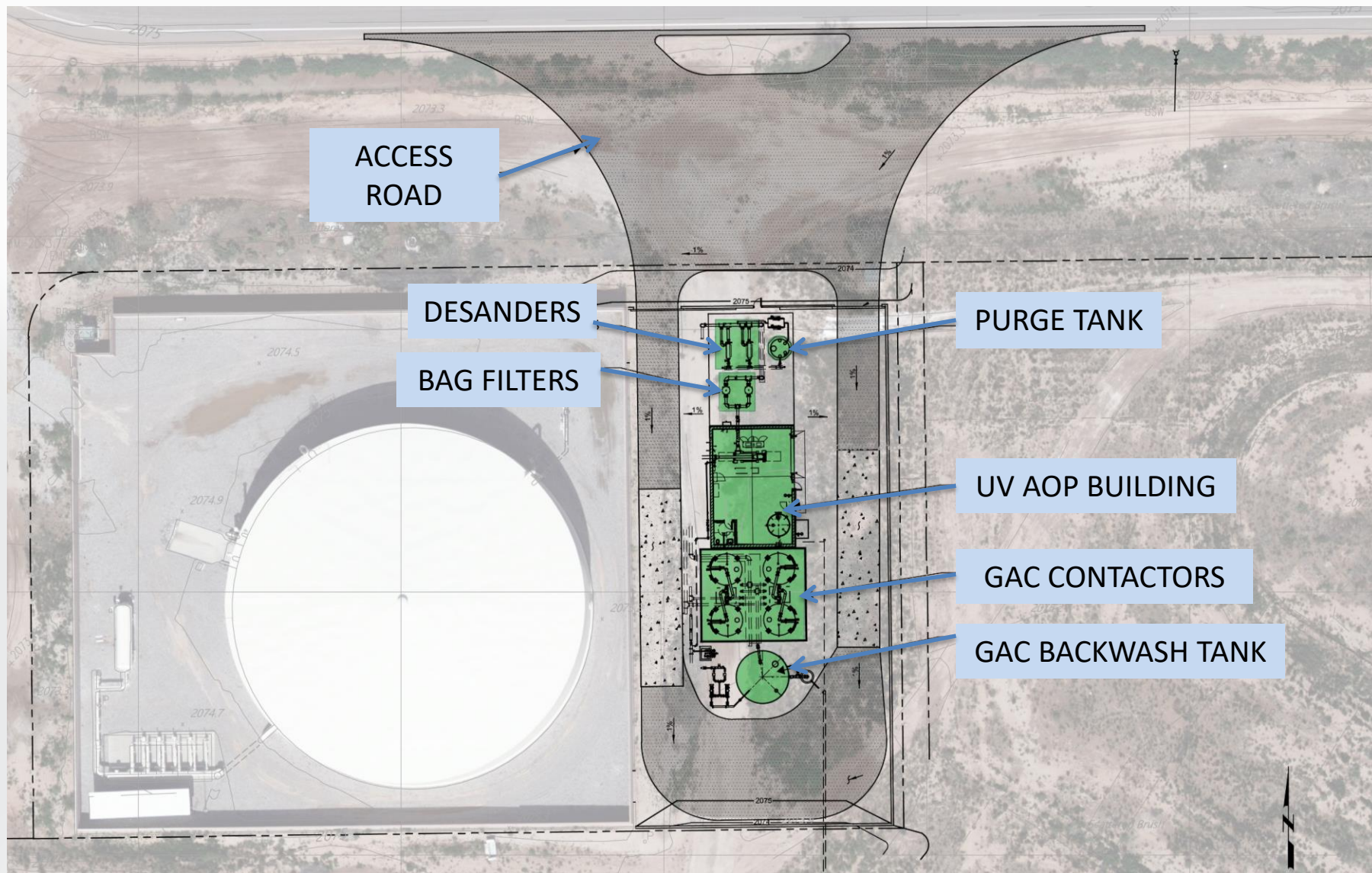
# Picture Rocks Water Treatment Campus







# Airline/Lambert Water Treatment Campus



# WATER QUALITY

CONTACT US | 5100 W INA RD. | (520) 382-2570  
MARANAWATER@MARANAAZ.GOV

The information on this page will give our customers information on the water quality, required reporting and testing, water hardness, and other frequently asked questions. If you have any questions relating to water quality, please call the office at (520) 382-2570. Click the button below to ask your questions to Marana Water.

Water provided to Marana customers is pumped from groundwater wells located throughout seven water systems owned and operated by the Town of Marana. Marana Water employees sample wells and the distribution systems to ensure we continually meet drinking water regulations established by the US Environmental Protection Agency (EPA). For more information about water quality and the EPA click [here](#).

HAVE A QUESTION? CLICK HERE TO ASK!



## PROJECT WATER

Town Council approved Resolution No. 2018-091 on Tuesday, September 25 authorizing the creation of the Picture Rocks water treatment campus capital project and the Airline/Lambert water treatment campus capital projects.

LEARN MORE



## CONSUMER CONFIDENCE REPORTS

Each year Marana Water tests for, creates and mails a Consumer Confidence Report (CCR) for each of our water systems. These reports show the historic water quality results and how we meet the drinking water standards. Click below to access electronic versions of the 2018 reports.

2018 REPORTS



## UNREGULATED COMPOUNDS

To continue providing high quality service and product for our customers, we began a voluntary sampling program for unregulated compounds. Click below to learn more.

LEARN MORE



## FREQUENTLY ASKED QUESTIONS

Check out our FAQ page to learn more about water quality and other facets of our department.

LEARN MORE

## LEAD AND COPPER RULE

In 1991, the Environmental Protection Agency enacted guidelines for municipal water providers to test the lead and copper levels in residential properties. Click the button below to learn how we test for these minerals.

LEARN MORE



## PROJECT WATER

Town Council approved Resolution No. 2018-091 on Tuesday, September 25 authorizing the creation of the Picture Rocks water treatment campus capital project and the Airline/Lambert water treatment campus capital projects. [View the proposed project timeline here](#).

[Learn more about unregulated compounds.](#)

## RESIDENTIAL SERVICES SEARCH

### LEARN WHO PROVIDES WATER/WASTEWATER TO YOUR ADDRESS

Use the search bar below to determine which water provider serves your home. When searching for an address be sure to include the directional (N, S, E, W), for example 5100 W Ina Road, not 5100 Ina road.

Start typing an address

## UPDATES

April/May 2019

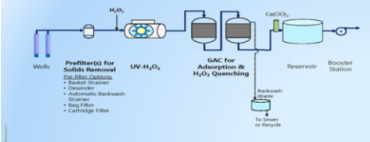
### CONSTRUCTION PROCESS

During the past two months, our engineering consultant, Carollo Engineering, completed a draft preliminary design report (PDR). This report includes proposed site layouts, preliminary equipment sizing, and treatment process selection. The Marana Water team has reviewed the PDR and the overall project is moving toward 60% completed design. Additionally, as planned, in April interviews were conducted to select the construction manager for the project. After the competitive process, Archer Western Construction was selected as the most responsive and capable firm. Archer Western is a large construction firm with offices located throughout North America, and our team will be working out of the Phoenix office. They have completed several water treatment projects in the Tucson and Phoenix areas, and have experience working with Carollo Engineering. Finally, the contract for preconstruction services, which includes constructability review, value engineering, and cost modeling, is nearing completion. Constructability reviews allow the contractor to evaluate step-by-step construction methods necessary to build a facility alongside the design engineer, providing the opportunity for reduced costs. Value engineering is a term used to improve a product's value, or the ratio of its function to its cost. Some examples would be a substitution of materials that meet the specific requirements, but are available at a reduced cost, or the use of a different type of pump that operates at a higher efficiency, which could in turn generate operational savings over its lifetime. Archer Western has begun working with Carollo and Marana Water to keep the project on schedule. Once the cost model is complete, it will be used to create the Guaranteed Maximum Price (GMP) process to get equipment that could take a long time to order and be delivered, ensuring these items are available for installation.

### TREATMENT PROCESS

To the right is an example of the recommended treatment process that we will use at the water treatment campuses. You can click on the image to enlarge it. First, water is pumped from wells through a series of filtration units to remove sediment or solids that are sometimes found in groundwater. Next, the unregulated compounds treatment process begins with an ultraviolet advanced oxidation process using hydrogen peroxide (UV AOP - H<sub>2</sub>O<sub>2</sub>). This means that hydrogen peroxide goes into the water ahead of a UV light. Once this water mixed with hydrogen peroxide passes through the UV light, hydroxyl radicals are generated. These radicals react with and break down the 1,4-dioxane to create harmless molecules of carbon dioxide and hydrogen. After the UV AOP process, the water moves to vessels filled with granular activated carbon (GAC). These GAC filters will absorb the PFAs and any remaining hydrogen peroxide from the UV AOP process. Finally, the water will be disinfected using chlorine and pumped into the reservoir and then the main distribution system for our customers. These two processes together are the most common and proven technologies

#### UV-H<sub>2</sub>O<sub>2</sub> + GAC Simplified Process Flow Schematic



Here is a detailed outline of the recommended treatment process for our water treatment campuses from start to finish. These two options are the most common and proven technologies for treatment of 1,4-dioxane and PFAs.





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# Questions?

