



# Two Marana Water Treatment Campuses Come to Fruition

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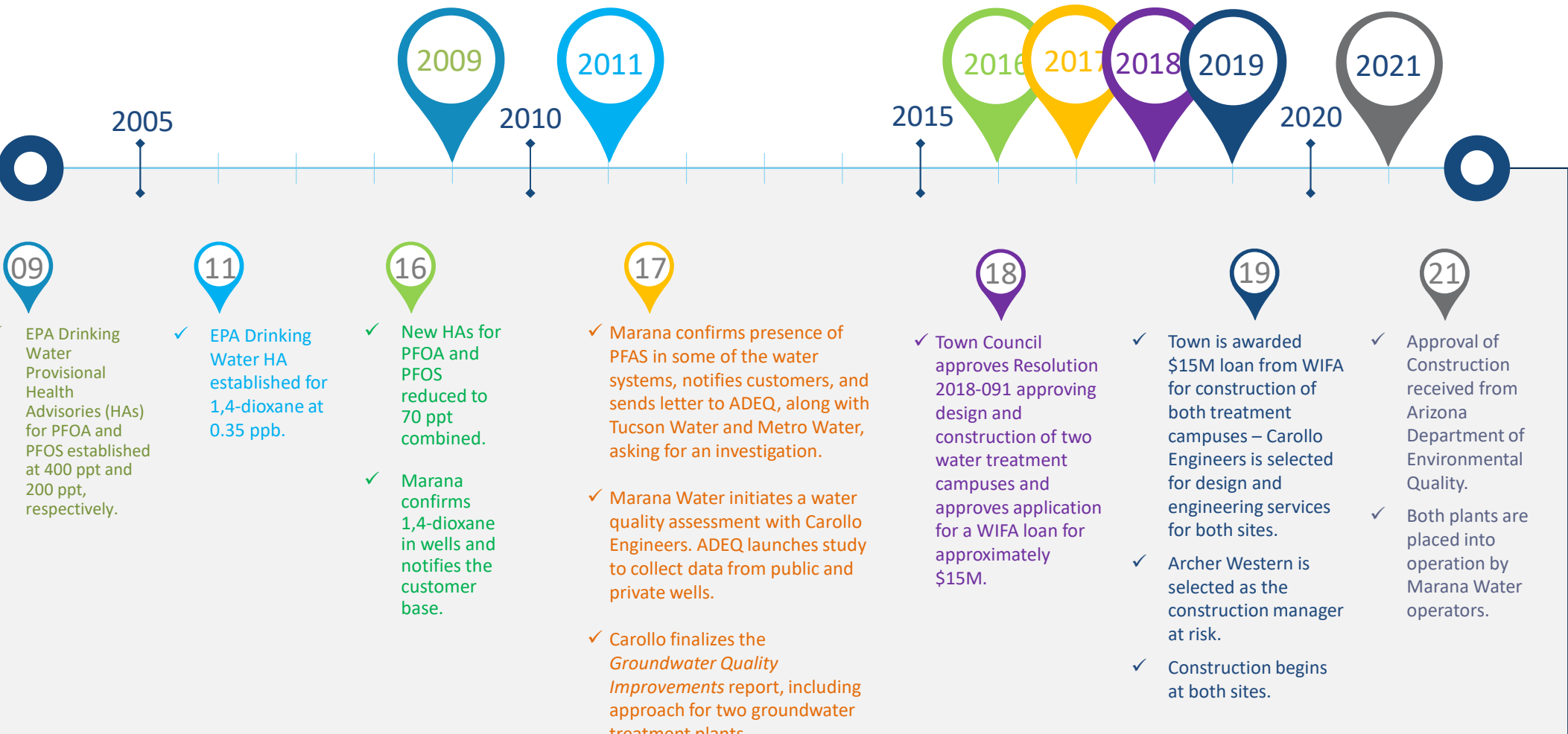
# Topics

- Marana's unregulated compound background
- Water Treatment Campuses overview
- Commissioning and startup
- Operations

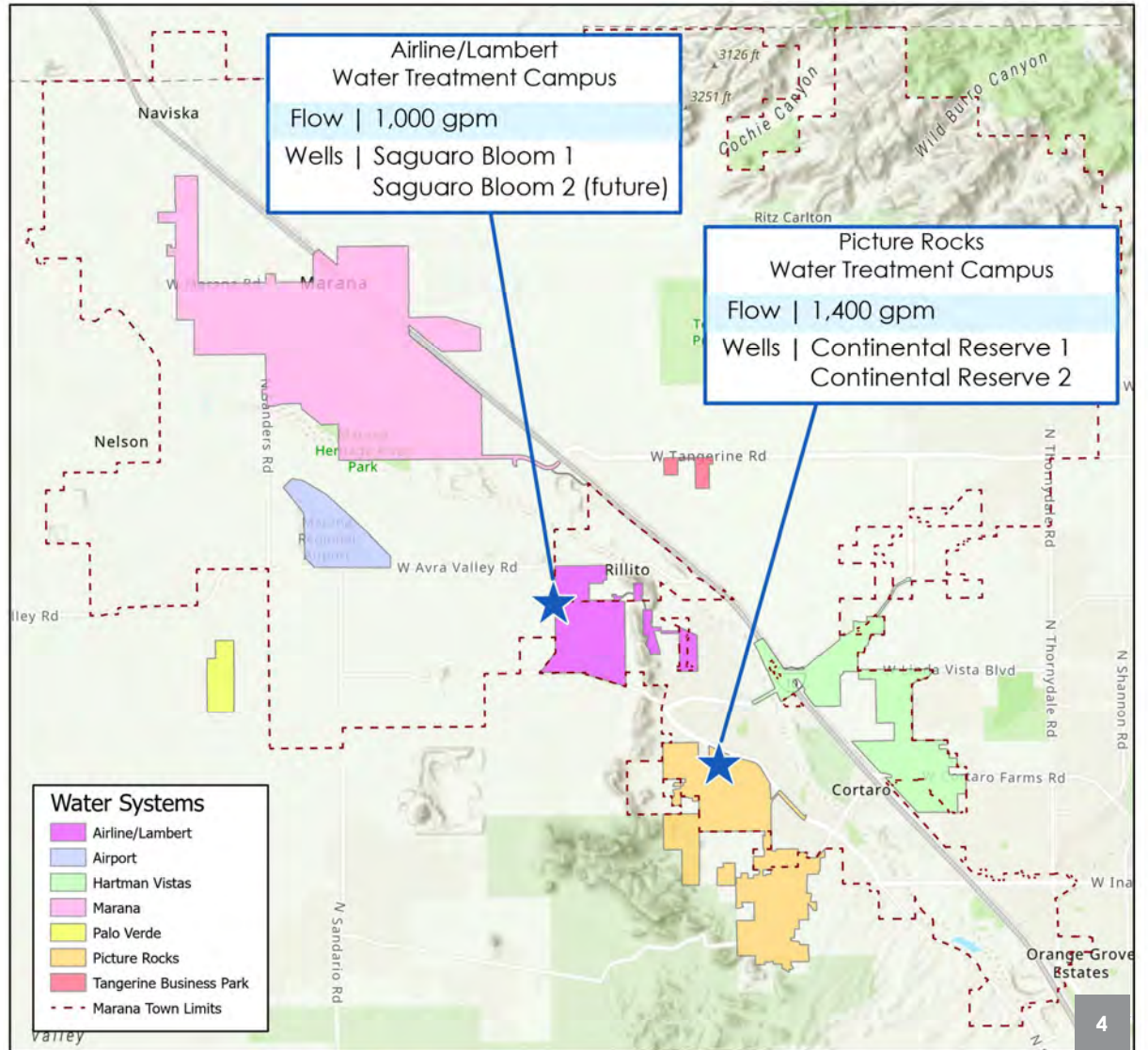




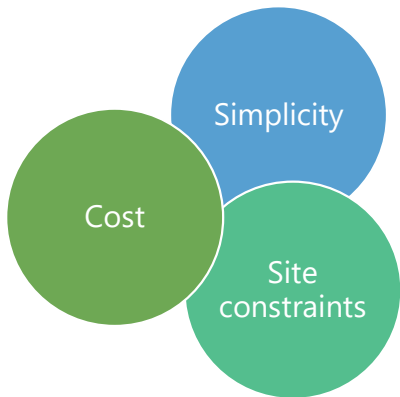
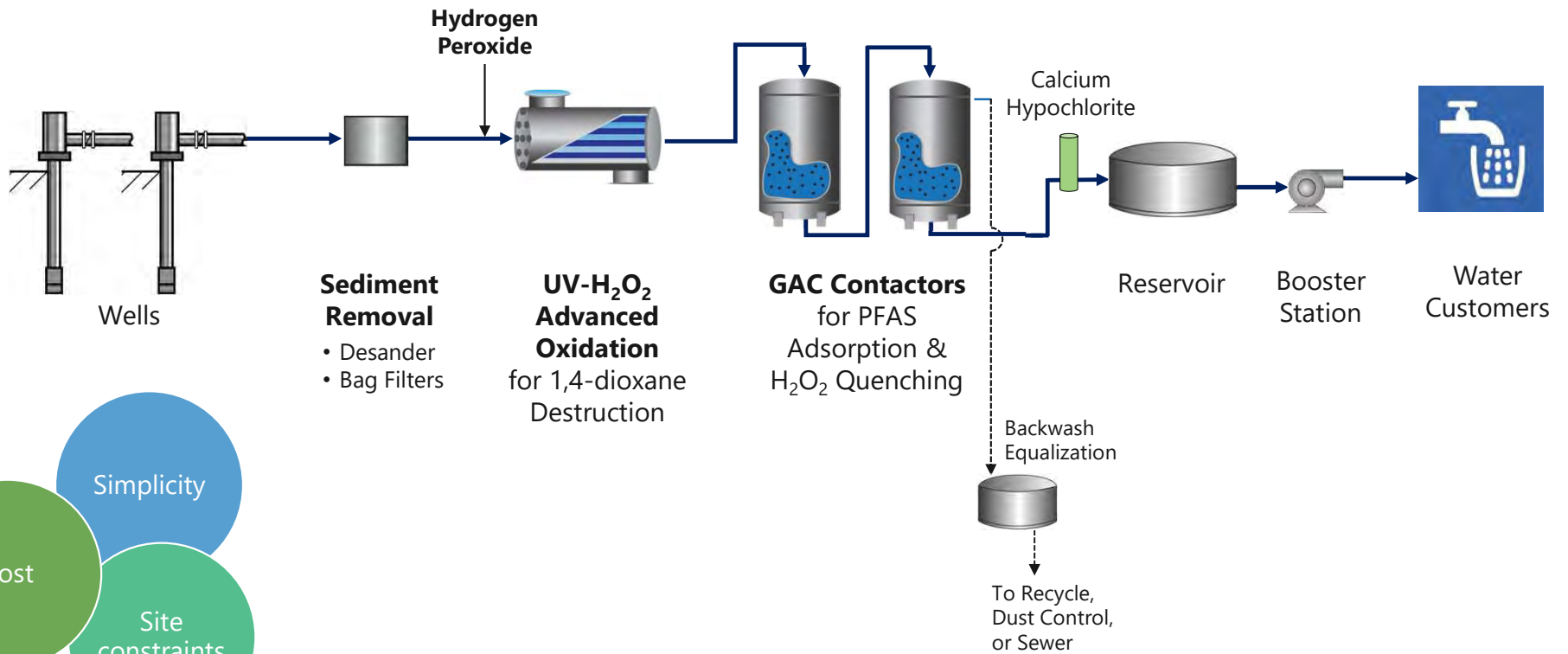
# Marana Water's Unregulated Compound Background



# Marana's Water Systems



# UV AOP and GAC Selected for Full-Scale Treatment



# UV AOP Design Criteria

$$\text{Log Reduction Value (LRV)} = \log_{10}\left(\frac{\text{Influent Concentration}}{\text{Effluent Concentration}}\right)$$

Parameter	Units	Picture Rocks	Airline/Lambert
Flow	gpm (mgd)	1,400 (2.0)	1,000 (1.4)
UV AOP			
1,4-dioxane Log Reduction Value	--	1.25	1.25
UV Transmittance	%	97	97
Number of Duty Trains	No.	1	1
Peroxide Dose	mg/L	11-20	5-8

Same dual-reactor, single UV AOP chamber at each site

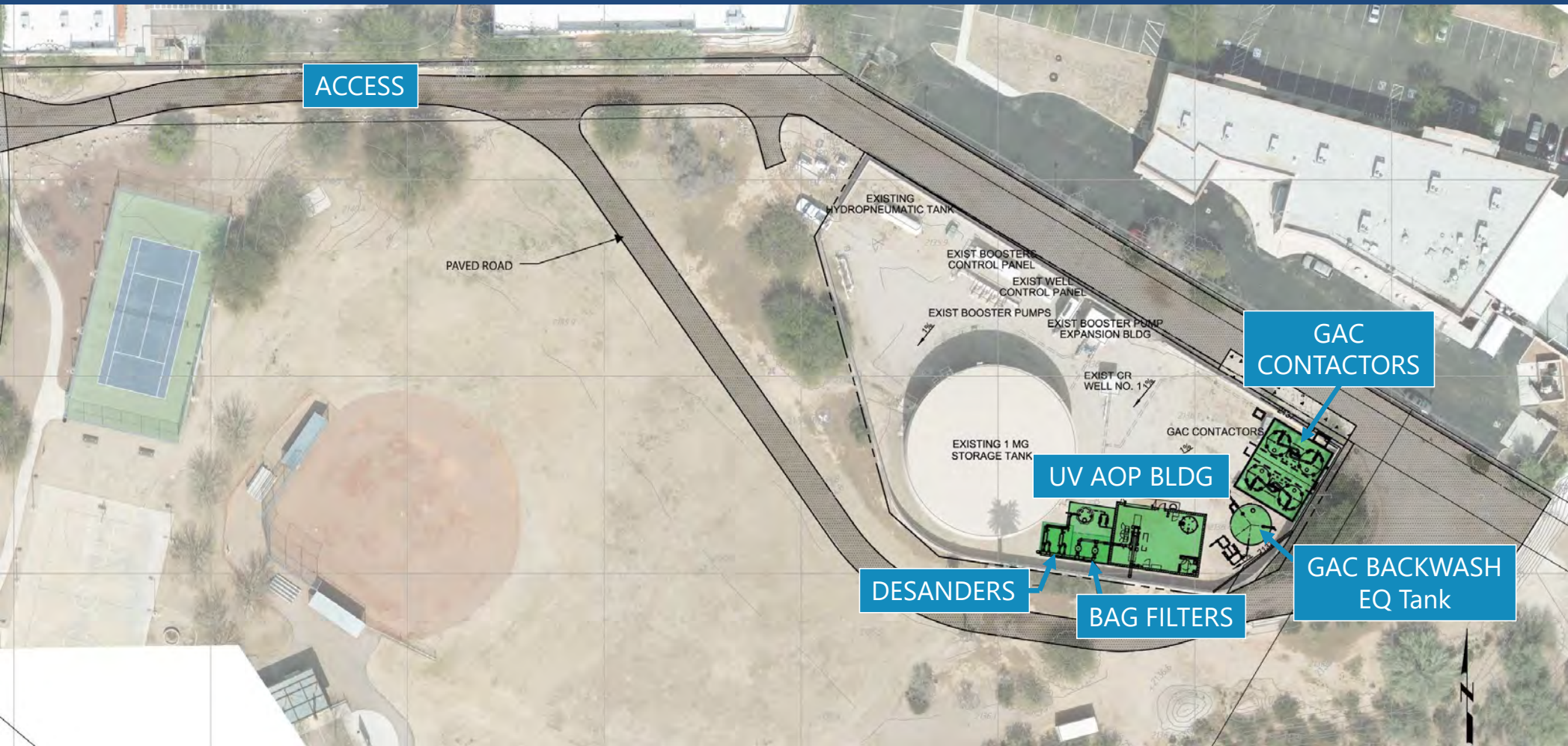
# GAC Design Criteria

Parameter	Units	Picture Rocks	Airline/Lambert
Flow	gpm (mgd)	1,400 (2.0)	1,000 (1.4)
GAC			
Media Type	--	Re-agg. bit. coal-derived	Re-agg. bit. coal-derived
Number of Trains	No.	2	2
Number of Contactors per Train	No.	2	2
Total Number of Contactors	No.	4	4
Contactor Diameter	ft	12	12
Liquid Loading Rate	gpm/ft <sup>2</sup>	6.2	4.4
Total EBCT per Train	min	12.6	17.8

Same two trains of lead/lag  
GAC contactors at each site

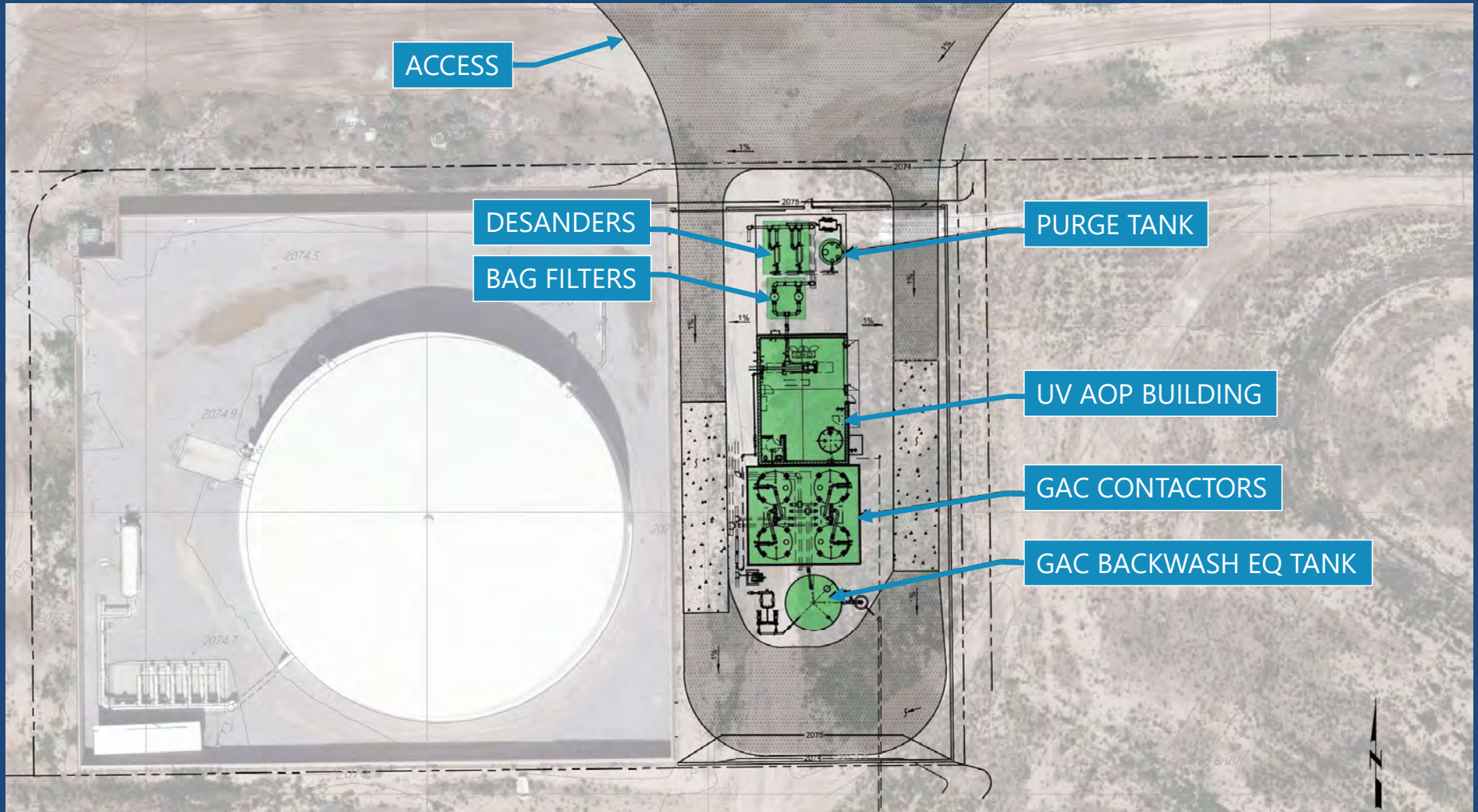


# Picture Rocks WTC Site Layout





# Airline/Lambert WTC Site Layout





April 2020





# Substantial Completion March 12, 2021

Merline/Lambert Water Treatment Campus



Picture Rocks Water Treatment Campus





# Commissioning and Start-up

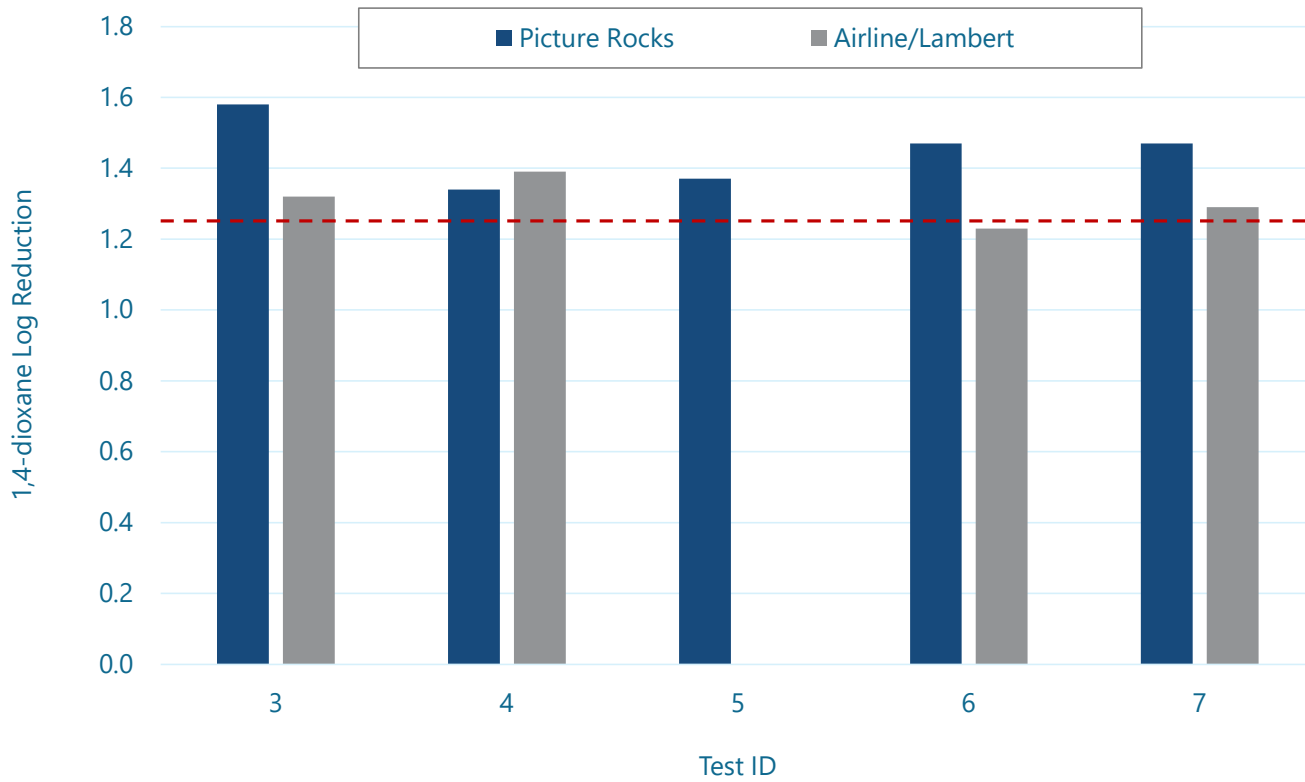
- Performance tests were conducted in January 2021.
- Approval of Construction for the plants was received from ADEQ in February/March 2021
- Start-up for WTC initiated in the mid-March



## UV AOP Specified Treatment Criteria

Criteria	Picture Rocks	Airline/Lambert
Design Flow, gpm	1,400	1,000
Minimum UV Transmittance at 254 nm, %	97	97
1,4-dioxane Log Reduction Value	$\geq 1.25$	$\geq 1.25$
Maximum H <sub>2</sub> O <sub>2</sub> Dose, mg/L	20.0	8.0
Nitrate, mg/L as NO <sub>3</sub> <sup>-</sup>	18.9	16.4
Hydroxyl Radical Scavenging Demand, s <sup>-1</sup>	53,800	47,800

# Testing Results



Target Log Reduction Value of 1.25 consistently achieved



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# Commissioning and Startup Activities

- ADEQ Approval-of-Construction received in late February and early March 2021
- Substantial completion achieved on March 12, 2021
- Airline/Lambert WTC commissioned on March 12, 2021
- Picture Rocks WTC commissioned on March 29, 2021



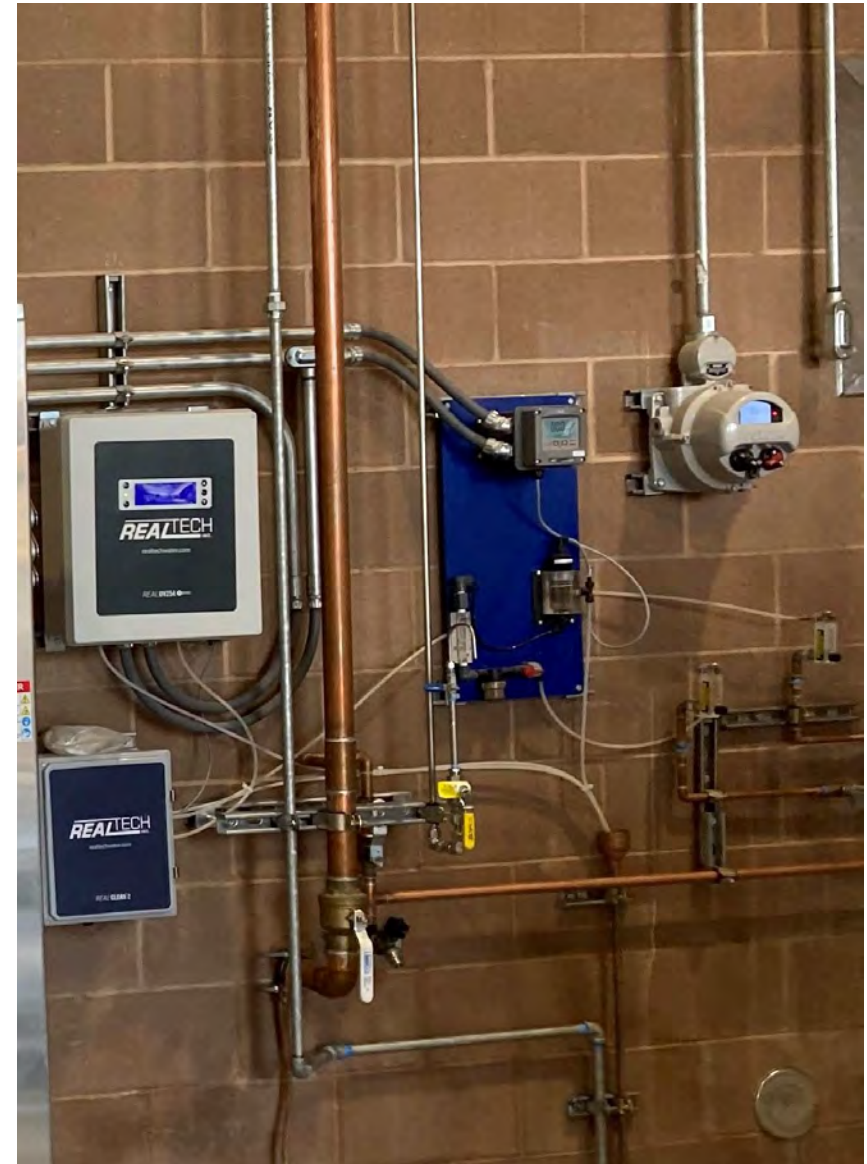
# Operations

- *TWO PLANTS BORN AT THE SAME TIME!*
  - Picture Rocks WTC
  - Airline/Lambert WTC
- Monthly results indicate that operational treatment targets for both 1,4-dioxane and PFAS meet or exceed operational targets.
- Initial Operational Challenges
  - On-line analyzer limitations
  - Bag filters
  - Trojan UV AOP system



# On-Line Analyzer Limitations

- Hydrogen peroxide and UV transmittance on-line analyzers were provided for the UV AOP systems
- Both parameters are verified using chemistry checks
- Intermittent plant operation, time needed to achieve analyzer stability, and calibration issues combine to create challenges
- Stability of groundwater quality allows monitoring of UVT and hydrogen peroxide rather than control loop dependence on the analyzer signals





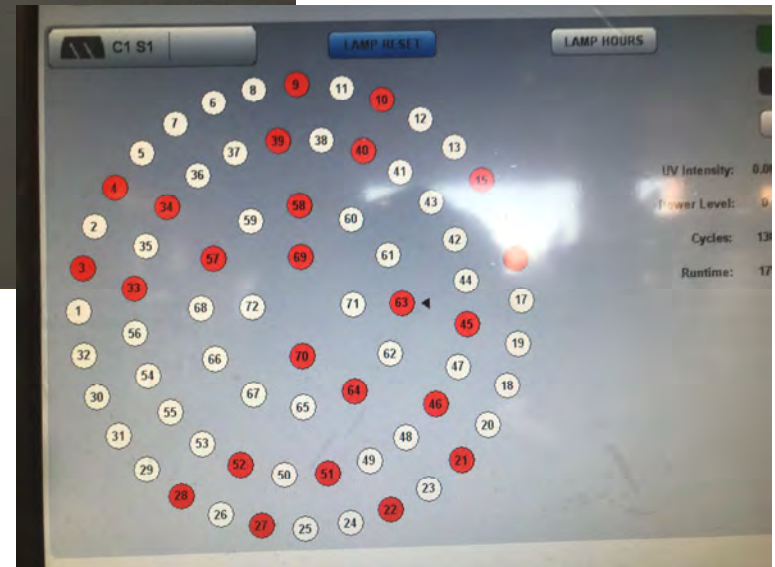
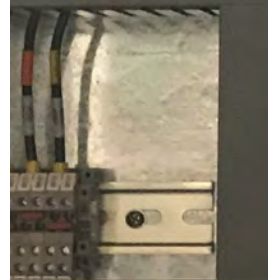
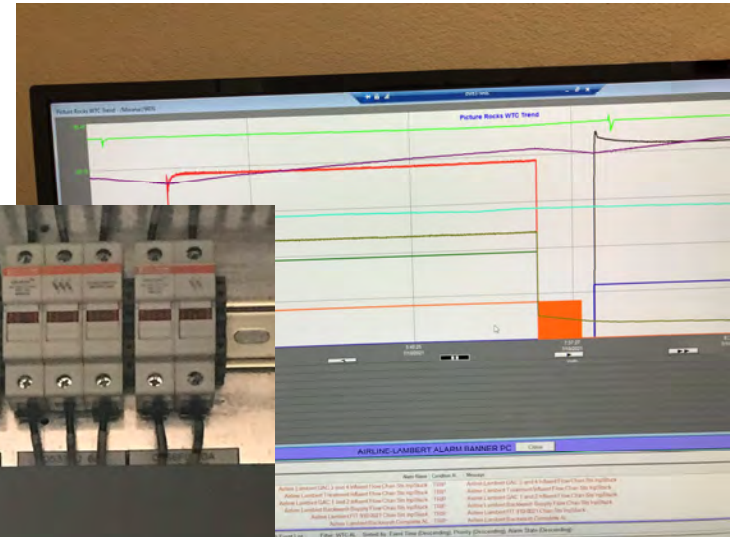
# Bag Filter Issues

- Bag Filters
  - Blow outs
  - Clogs
  - Change outs



# Trojan UV AOP System

- Monthly results indicate that operational treatment target for both 1,4-Dioxane and PFAS exceed operational target
- Operational Challenges
  - One-time HMI failure
  - Periodic UV AOP power distribution center cabinet fuse failures
  - Troubleshooting and working through issues



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# Conclusions

- UV AOP and GAC have demonstrated that they are effective treatment technologies to reduce concentrations of 1,4-dioxane and PFAS, respectively, and reliably meet Marana Water's goals.
- Marana Water continues to monitor source water wells and treated water.
- Marana Water is refining the operations of the treatment plants.







# Questions?

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