

# Constructing the Nation's Largest Ion Exchange PFAS Water Treatment Plant

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**Yorba Linda  
Water District**

**AqueoUS**VETS<sup>®</sup>

# Outline

- Introduction to OCWD
- Overall PFAS Program
- Yorba Linda Water District PFAS Treatment Plant



# **Introduction to OCWD and their PFAS Treatment Program**

# Orange County Water District



- OCWD was formed in 1933 to
  - Manage the OC Groundwater Basin
  - Protect rights to Santa Ana River water
- Provide groundwater to
  - 19 municipal and special water districts
  - 2.5 million residents
- Basin provides 77% of the water supply for north & central OC



# Extent of PFAS Impact in OCWD Service Area

## Current California DDW NL/RLs:

### Notification Levels:

PFOA = 5.1 ng/L

PFOS = 6.5 ng/L

PFBS = 500 ng/L

### Response Levels:

PFOA = 10 ng/L

PFOS = 40 ng/L

PFBS = 5,000 ng/L

### DRAFT Federal MCL:

PFOA: 4 ng/L

PFOS: 4 ng/L

Hazardous Index Calculation

- **11 water retailers (i.e., groundwater “Producers”)** and **over 60 wells** in the OCWD service area impacted by 10 ng/L PFOA Response Level
- **Up to ~ 1/3 of groundwater basin** production (100,000 afy) unable to be served
- **~ >\$50 million/year** additional alternative water supply cost for treated *imported* surface water



# Actions Taken

- **2019 - Planning Study for 10 impacted Producers**
- 2019 - pilot testing of IX and GAC, phase I done, started phase II
- Late 2019, OCWD adopted a PFAS policy to design/construct
- Early 2020, pre-purchase of 55 vessel systems between two vendors and awarded 6 on-call consultants for design





SINCE 1933



Orange County Water District  
PFAS Treatment Systems Planning Study

## Producer Report YORBA LINDA WATER DISTRICT

FINAL | August 2020



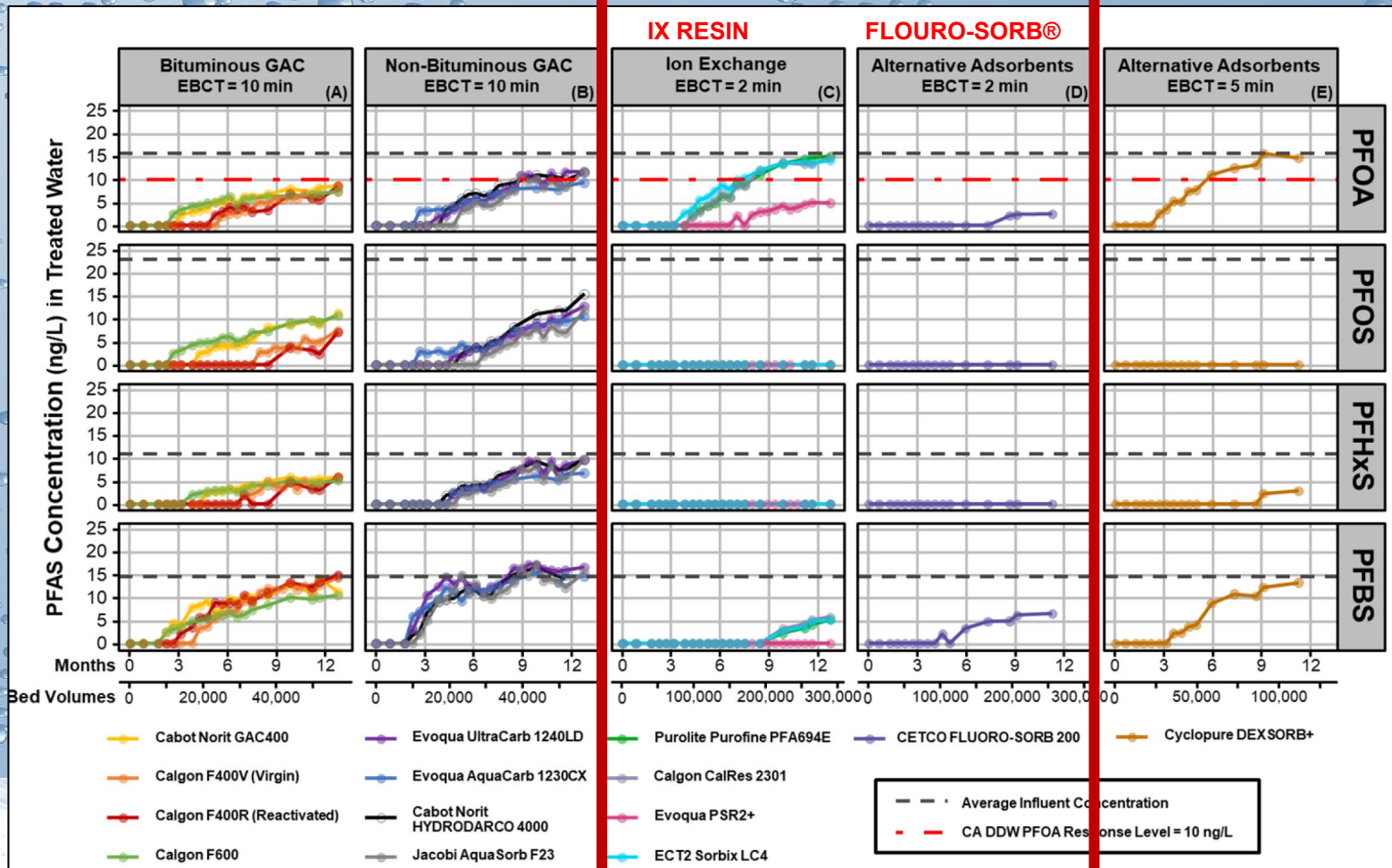
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# Media Design Criteria Differences

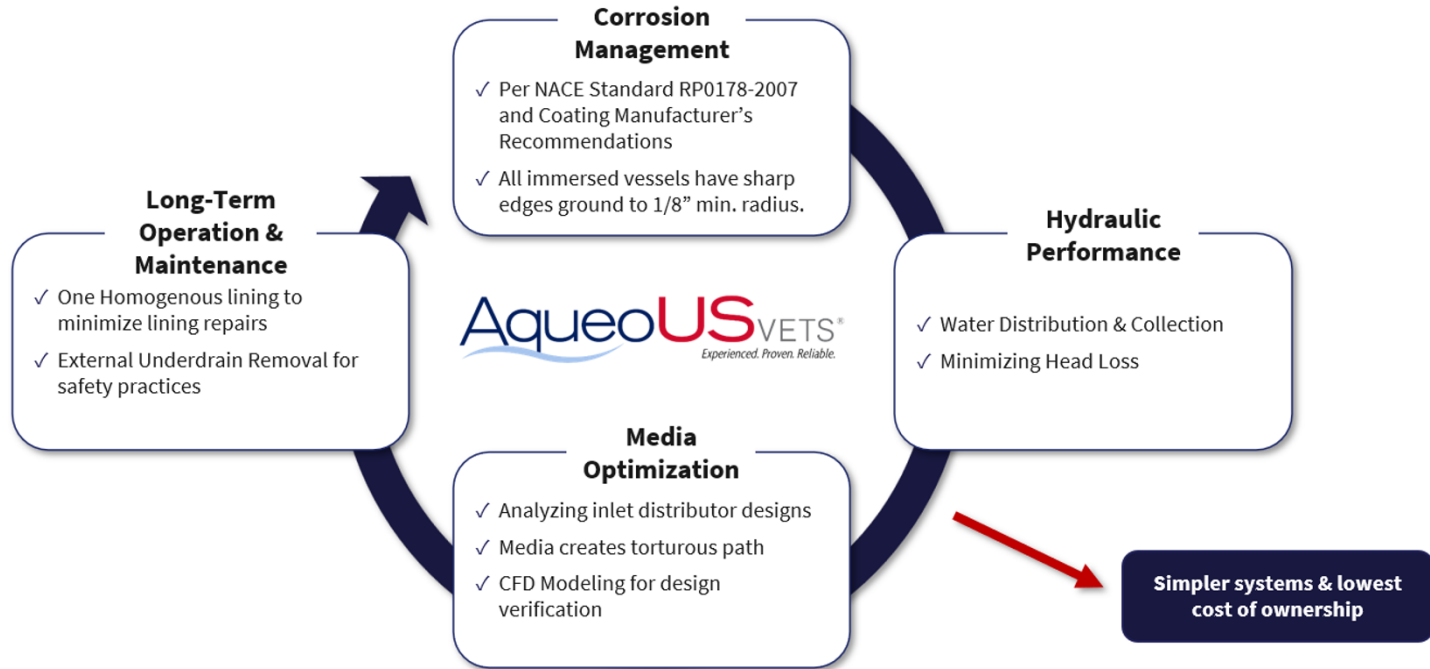
Each media is designed to difference Empty Bed Contact Times (EBCT) and Hydraulic Loading Rates.

Media Type	GAC	Ion Exchange Resin	CETCO Flouro-sorb
EBCT (minimum)	10 minutes	2 minutes	2 minutes
Hydraulic Loading Rate	$2 < X < 10$ gpm/ft <sup>3</sup>	$6 < X < 18$ gpm/ft <sup>3</sup>	$3 < X < 14$ gpm/ft <sup>3</sup> (Max. still unknown)
Start Up	Backwash	Pre-rinse *On or Off Site	Backwash

## EXAMPLE: 25 MGD (17,361 gpm) Facility

Media Type	GAC	Ion Exchange Resin	CETCO Flouro-sorb
Number and Size of Lead-Lag System	17 – 12 ft. diameter	11 – 12 ft. diameter	11 – 12 ft. diameter
Side Shell Height	12 ft.	4 ft.	4 ft.
Volume per vessel	1,365 ft <sup>3</sup>	420 ft <sup>3</sup> (min. bed depth)	420 ft <sup>3</sup>

## Four Tenets of Pressure Vessel Design



**CapEx + Opex (media and energy) + Long Term Maintenance = Total Cost of Ownership**

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# Yorba Linda Water District PFAS Treatment Plant





## District History

- Established in 1909
- 25,000 service accounts
- 9 groundwater wells
- 14 reservoirs
- 12 booster pump stations
- 4 imported water connections
- 25 MGD PFAS Water Treatment Plant



# PFAS Treatment Plant Tours



Granulated Activated  
Carbon  
(GAC)



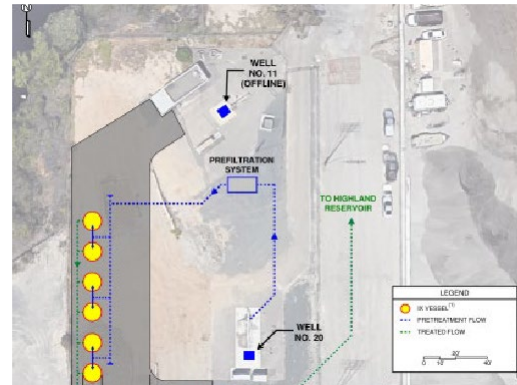
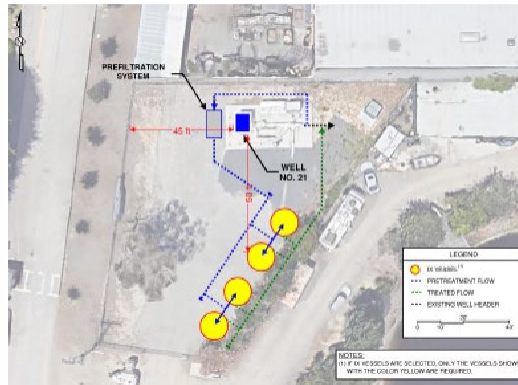
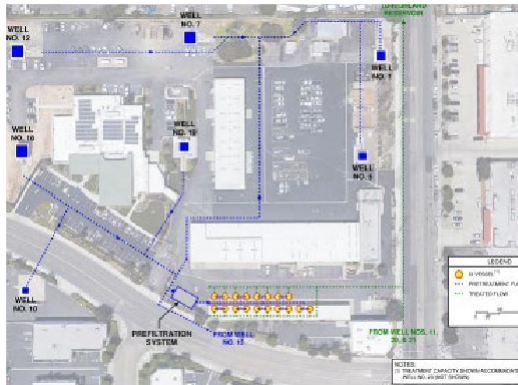
Membrane  
(Reverse Osmosis or  
Nanofiltration)



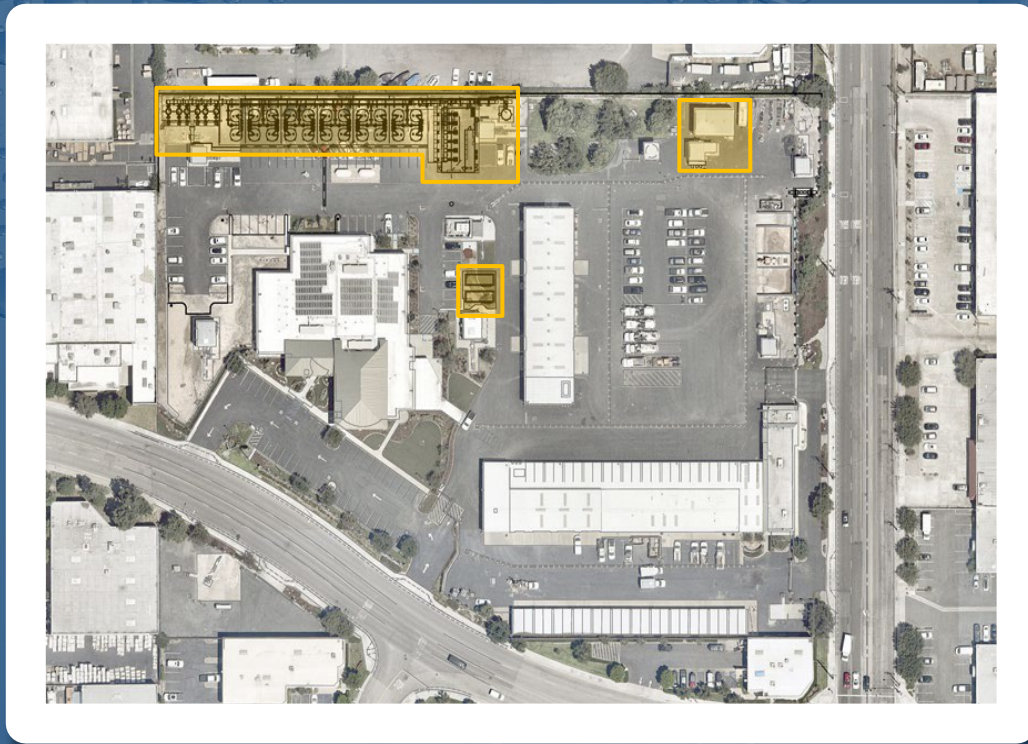
Ion Exchange  
(IX)



# Option 1 – 3 PFAS Water Treatment Plants

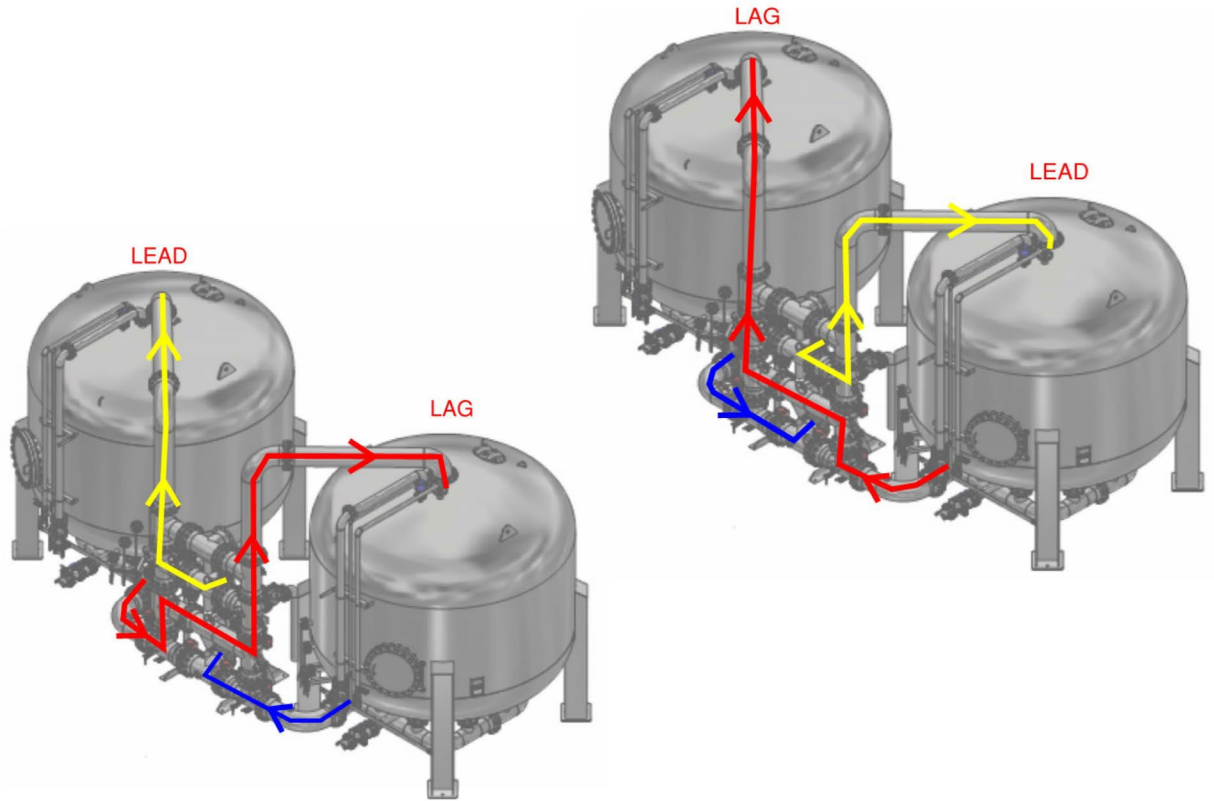


## Option 2 - Centralized Plant at YLWD Headquarters





# Vessel Train Configuration (Lead/Lag)



# PFAS Water Treatment Plant Schedule & Budget

Description	Dates
Design	May 2020 – February 2021
Construction	February 2021 – February 2022
Regulatory Approval	November 2021 (est.)
Resin Delivery (Staged)	December 2021 – February 2022
Substantial Completion (Serve Water)	December 2021
Project Completion	February 2022
Ribbon Cutting Celebration	Spring 2022 (est.)

**Total Capital Budget  
\$27 million**

**Annual O&M Budget  
\$150/Acre-ft**







**Yorba Linda  
Water District**

## **Flyover of the PFAS Water Treatment Plant**

Equipment	Details	Capacity
6 Pre-filters	Diameter: 6 ft Height: 8 ft-8 in	5 MGD ea. 40 Bag filters ea.(240 total)
11 IX Trains	22 Vessels Diameter: 12 ft Height: 14 ft 10 <sup>3</sup> / <sub>8</sub> in	1.4 to 2.3 MGD each Train (14,000 gallons each vessel)
Resin for 22 Vessels	2 Minute EBCT per vessel	424 CF ea.
6 Vertical Turbine Booster Pumps, VFDs	100 Hp	5 MGD ea.
4 Surge Tanks -HQ -Well 20 -Well 21 -Future Well 22	<u>Headquarters</u> Diameter: 10 ft, Height: 19 ft  <u>Wells</u> Diameter: 5 ft, Height: 13 ft-6 in	8,000 Gallons  1,000 Gallons ea.
2 (Level 2 Sound Attenuated) Generators	Length: 27 ft-6 in, Height: 11ft-6 in	1000 kW ea.
Chlorination Facilities Brine Tank 2 Hypochlorite Tanks 6 Water Softeners, 3 OSHG Trains	<u>Brine Tank</u> Diameter: 12 ft, Height: 15 ft - check <u>Hypochlorite Tanks</u> Diameter: 12 ft, Height 15 ft - check	12,690 Gallons - check ???? Gallons
Perimeter Wall	Length: 780 ft, Height: 8 ft	n/a



# Construction Challenges

- Covid:
  - Labor shortage
  - Supply chain issues
    - Early submittals or equipment pre-purchase are essential
  - Increased construction costs
  - Long lead time for power and gas agency reviews
- Schedules – Delays cost \$
  - Frequent updates/ critical path items
- Conflicts with infrastructure
  - As-builts not accurate
- Geotechnical Investigation - Soils!
- Potholing
- Impact on Operations
  - Loss of gas/ electricity/ communications
  - Parking
  - Deliveries/ equipment
  - Staging area
- Operations impact on construction
- Vendors, contractors, consultants





# Special Thanks to Our Team!

OCWD

Tetra Tech

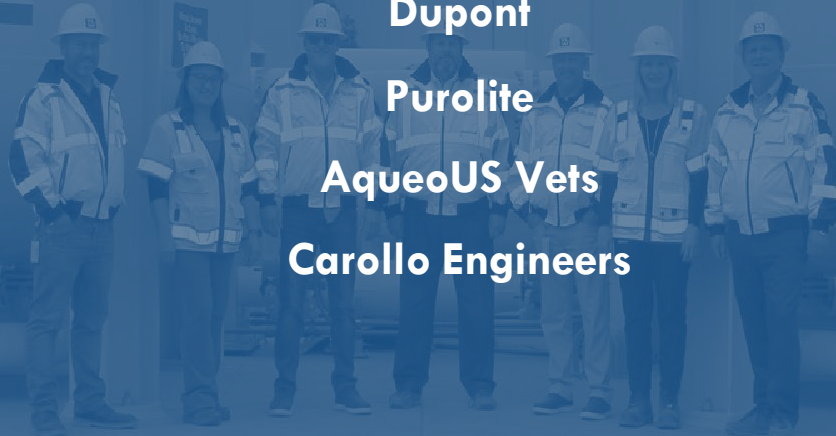
Pacific Hydrotech

Dupont

Purolite

AqueoUS Vets

Carollo Engineers



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# Questions?

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