

Thank you to our Patrons

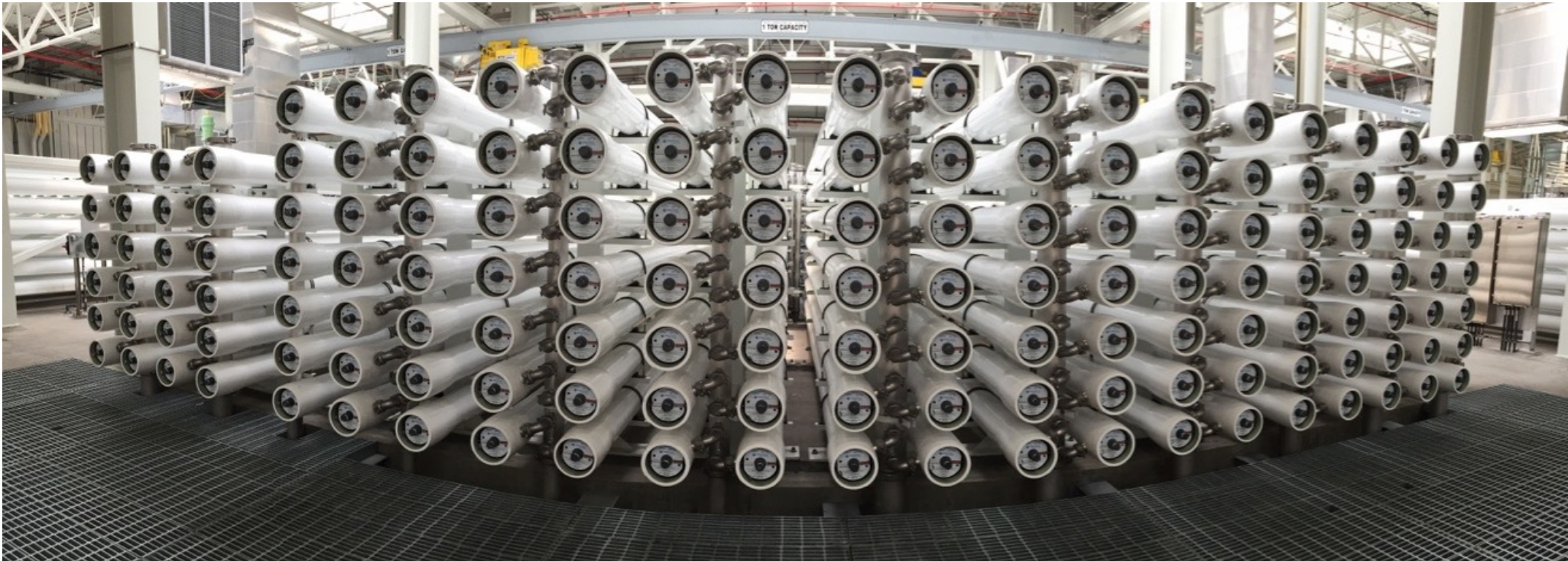


We will begin our presentation in a few minutes...



Leadership and Excellence in Environmental Engineering and Science

Potable Reuse in California: Past, Present and Future



R. Shane Trussell, Ph.D., P.E., BCEE

February 8, 2023

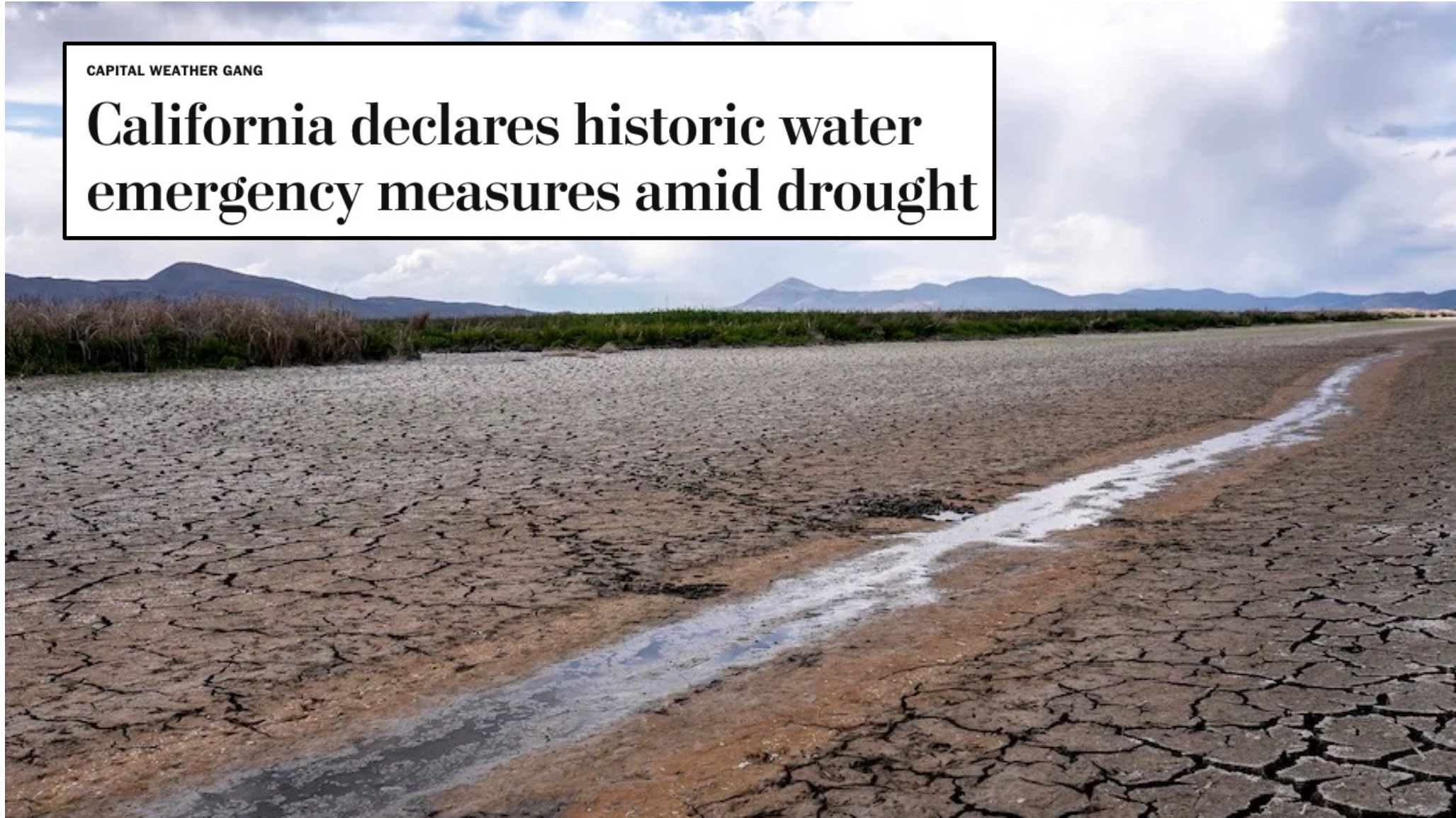


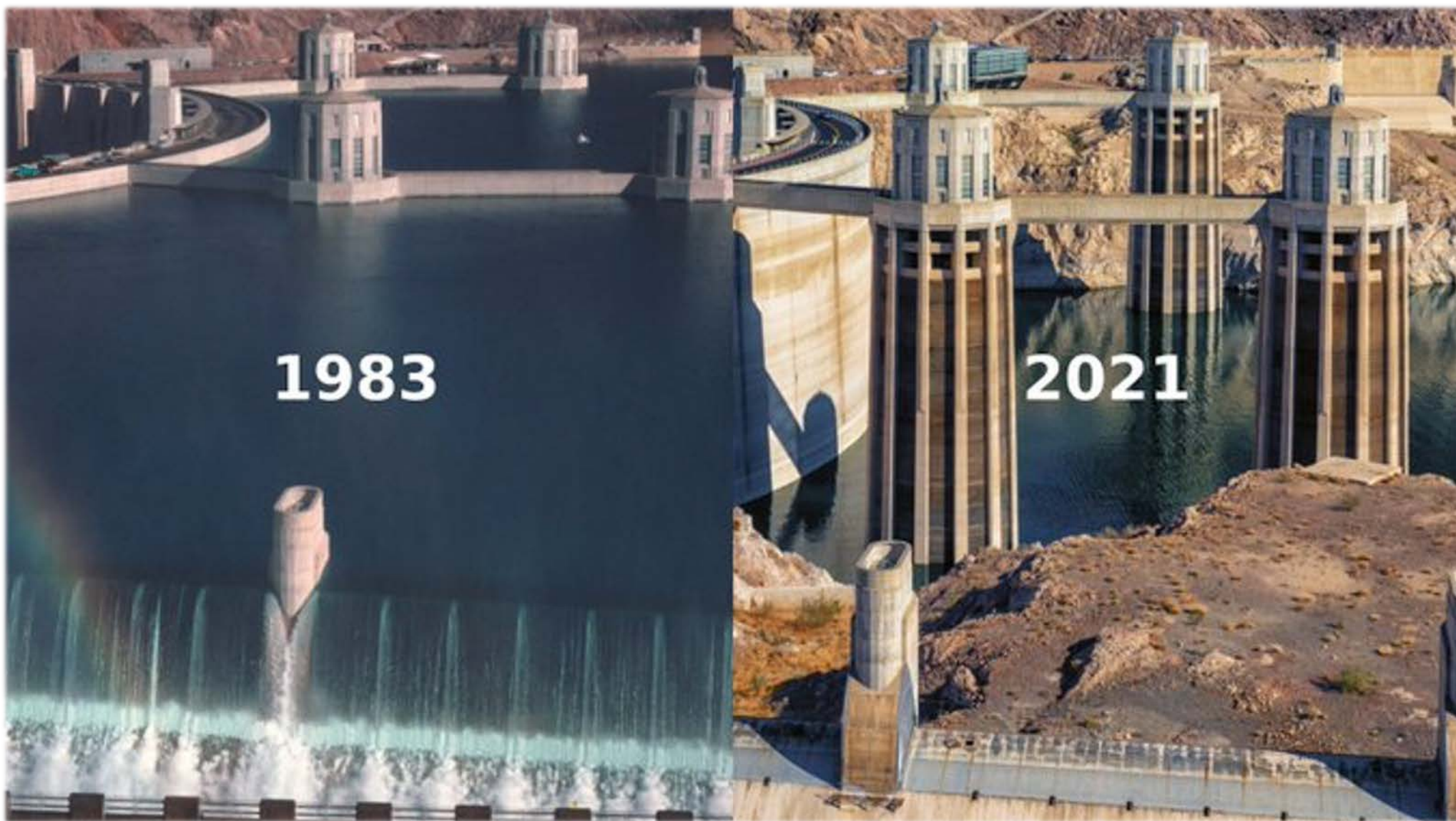




CAPITAL WEATHER GANG

California declares historic water emergency measures amid drought





California Needs to Develop More Local Water Supplies

- Climate Change Adaptation
- Local Sustainability
- Water Supply Certainty
- Ecosystem Pressure
- Cost Control

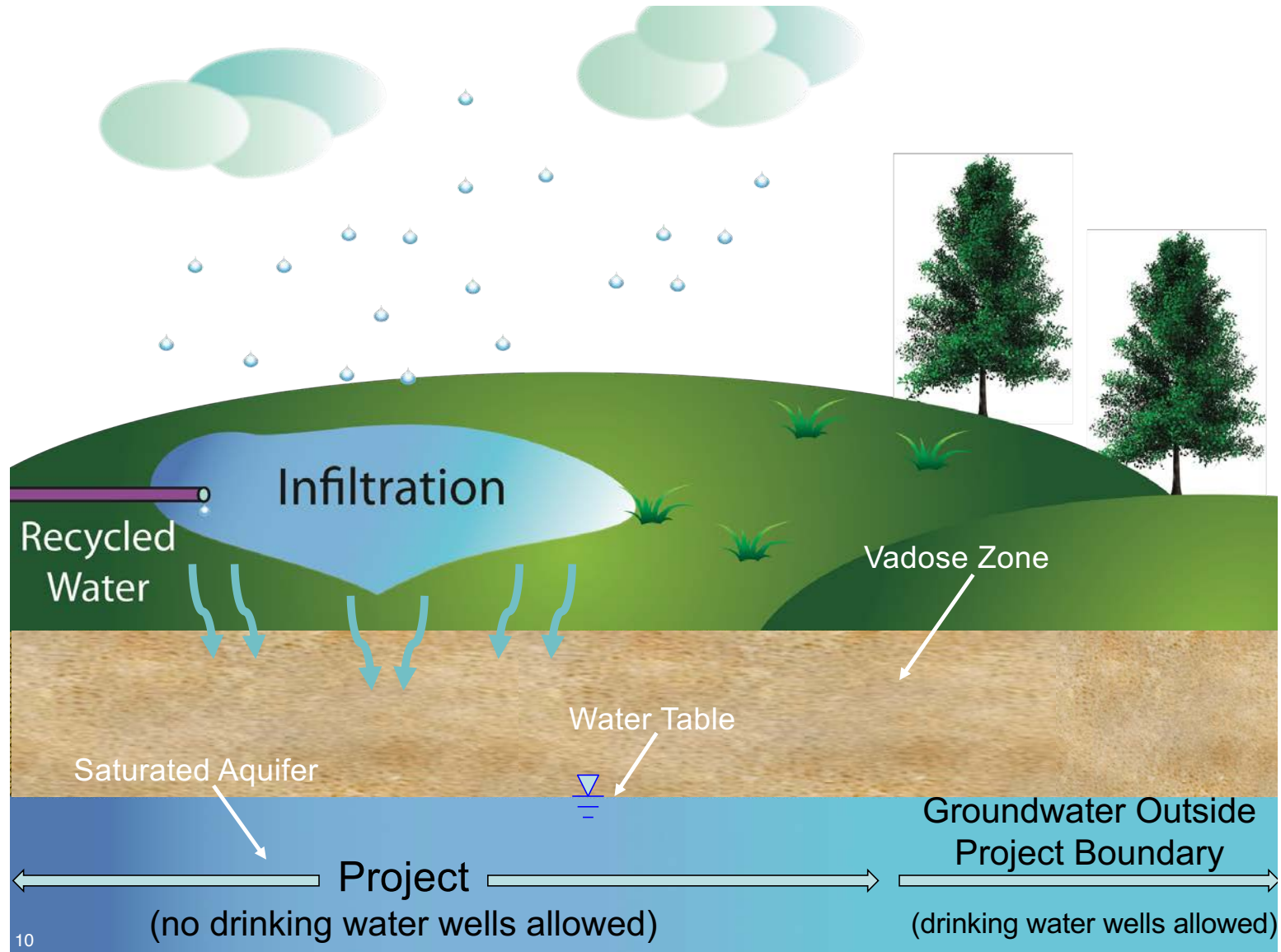


California Has Deep Roots in Potable Reuse

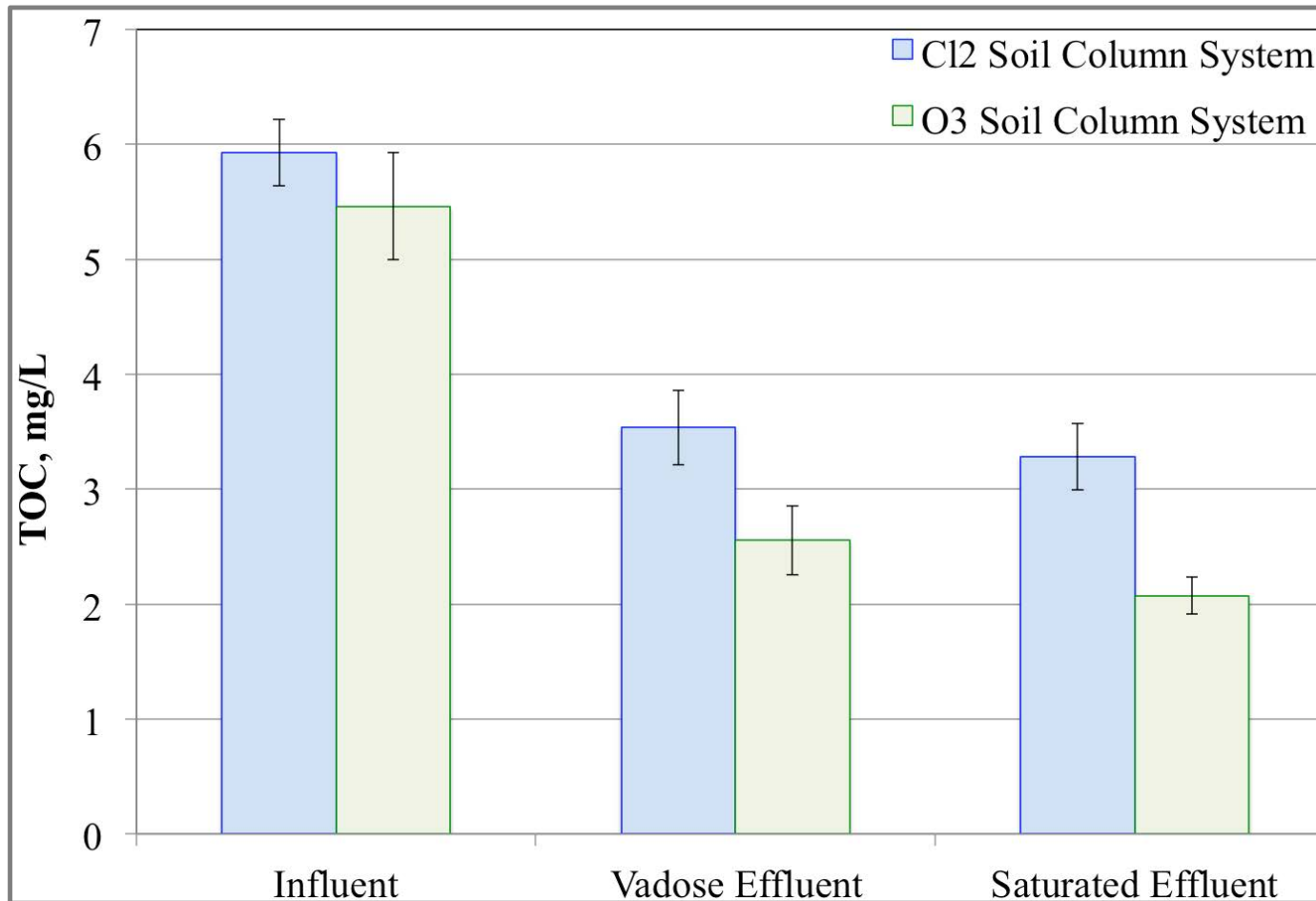


Spreading Projects Play an Important Role and Offer a Non- RO Solution

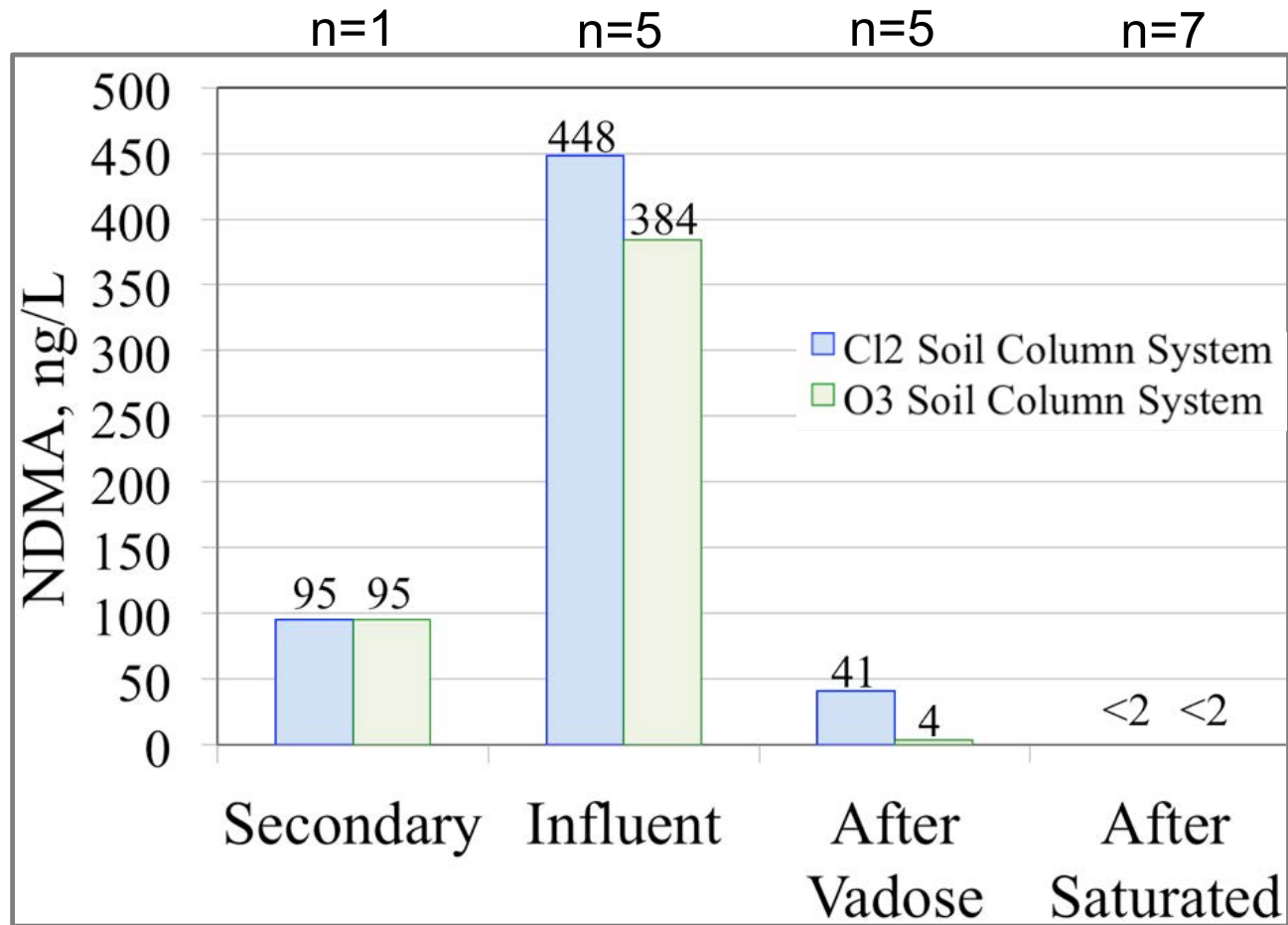
Average recharge
of 215 ML/day



Total Organic Carbon Removal

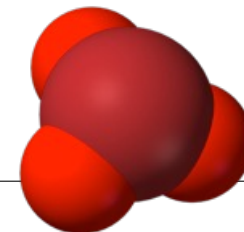


NDMA



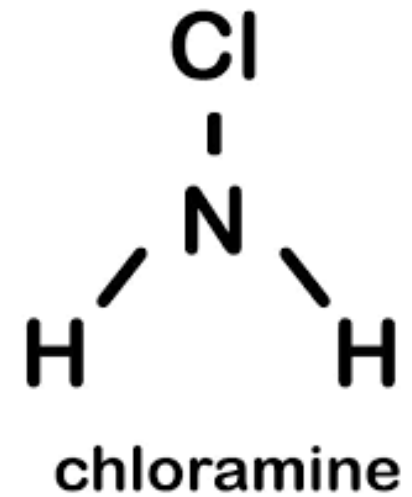


DBP Attenuation



			Event 3	Event 4	Event 5	Average
Cl ₂ Soil Column System	HHAs	Influent	30	36	15	27
		Saturated	<1.0	<1.0	<1.0	<1.0
	TTHMs	Influent	34.7	24.3	15.1	24.7
		Saturated	<0.50	<0.50	<0.50	<0.50
O ₃ Soil Column System	Bromate	Influent	5.5	<0.50	1.4	2.5
		Saturated	<0.50	<0.50	<0.50	<0.50

Advent of Integrated Membrane Systems in the Late 90s



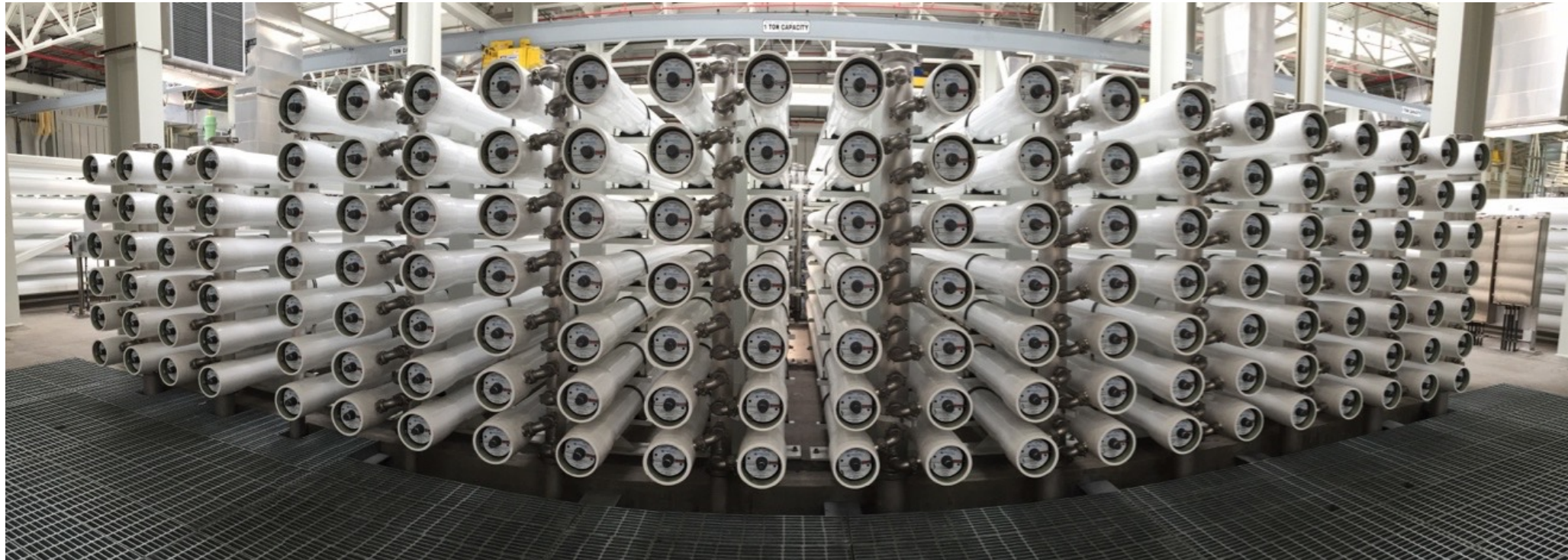
West Basin Municipal Water District Commissions First Full-Scale Microfiltration Reverse Osmosis Facility in 1999



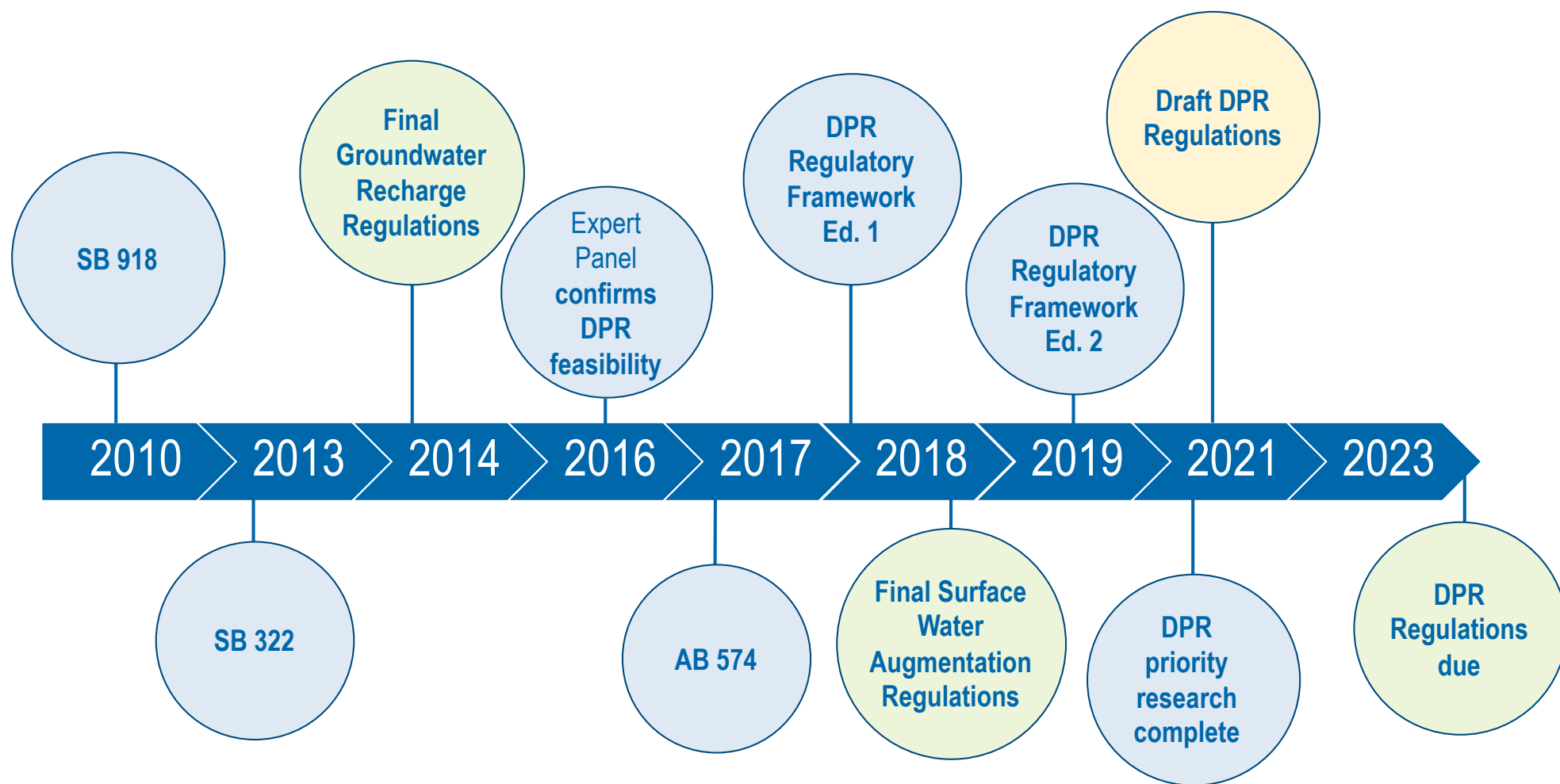
Terminal Island Begins Full-Scale Operation of MF/RO in 2003



Orange County Water District Commissions the Groundwater Replenishment System in 2008



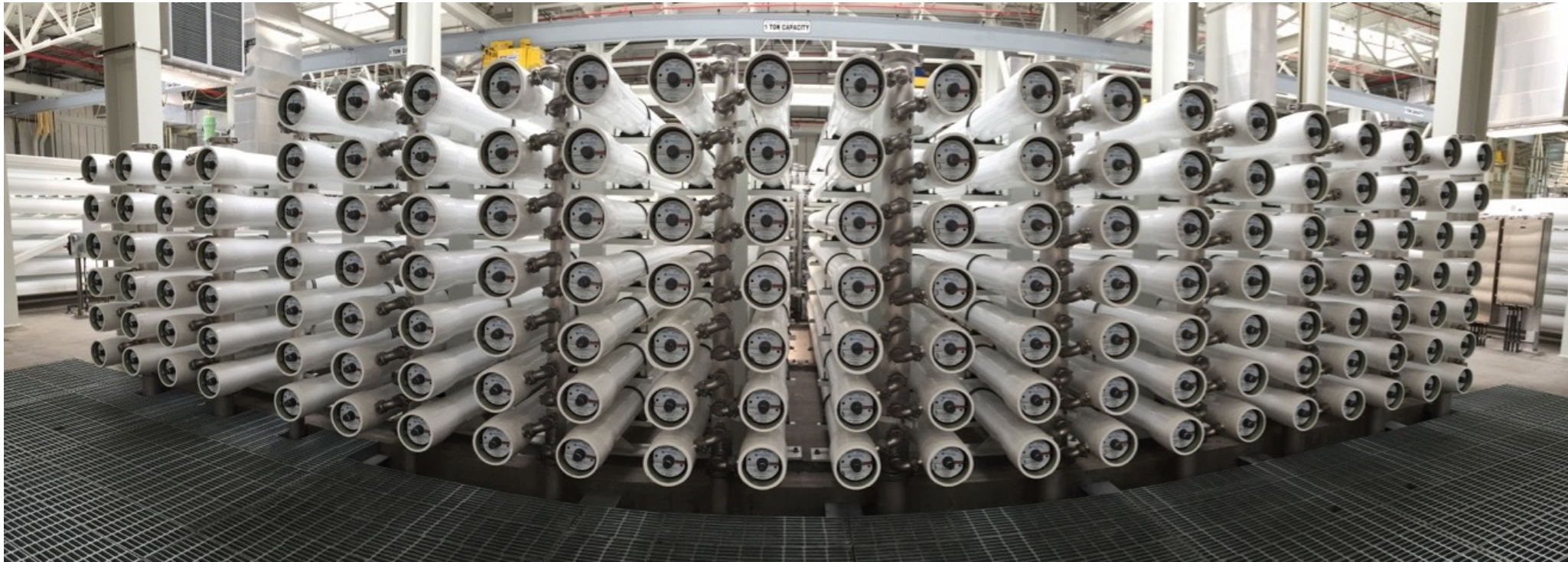
Rapid Development of Potable Reuse Regulations



Terminal Island Expansion (12 MGD) and UV-HOCI



Groundwater Replenishment System (130 MGD)



Albert Robles Center (14 MGD)



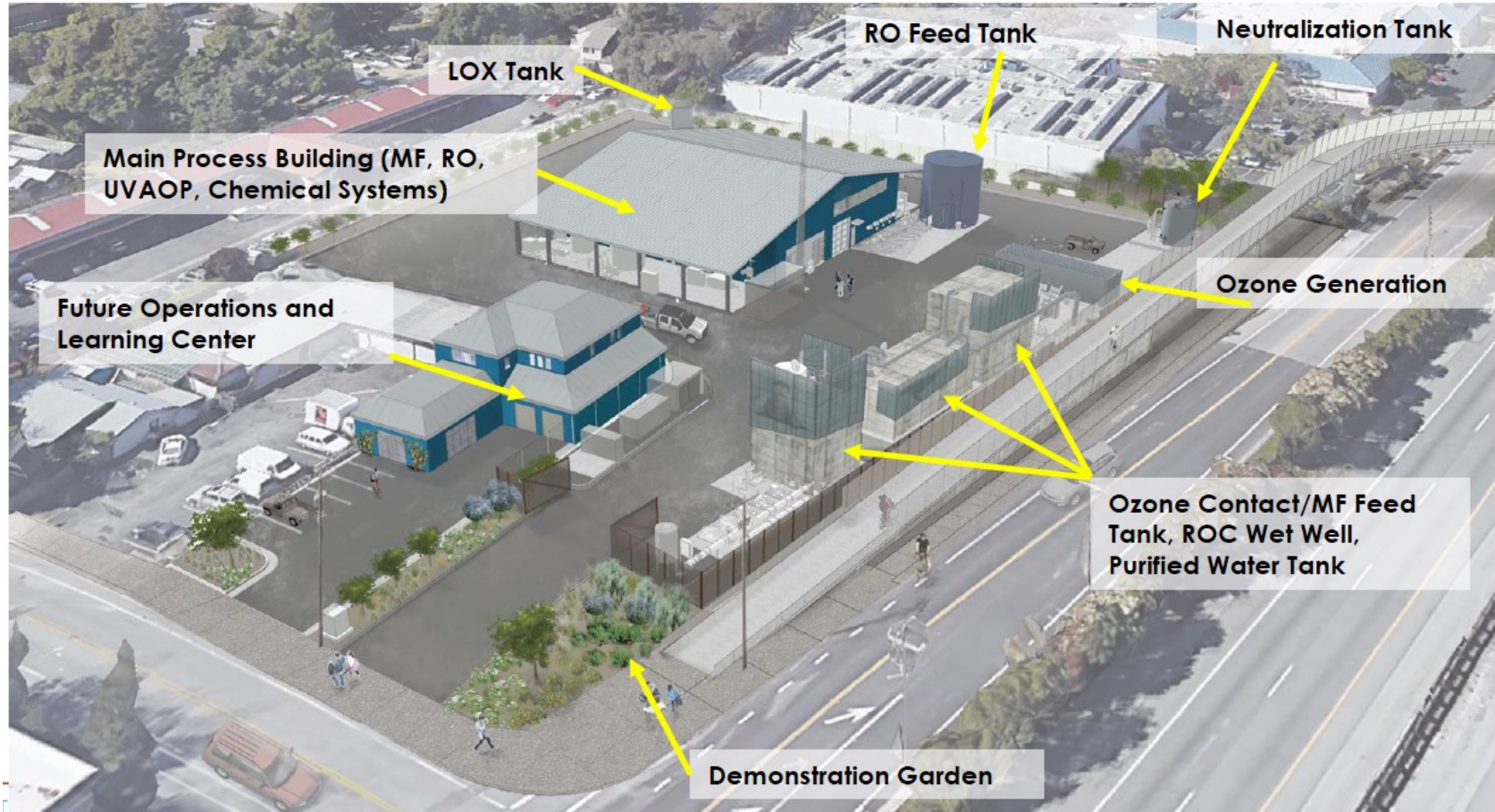
Pure Water Monterey (5.5 MGD)



Pure Water Oceanside (4.5 MGD)



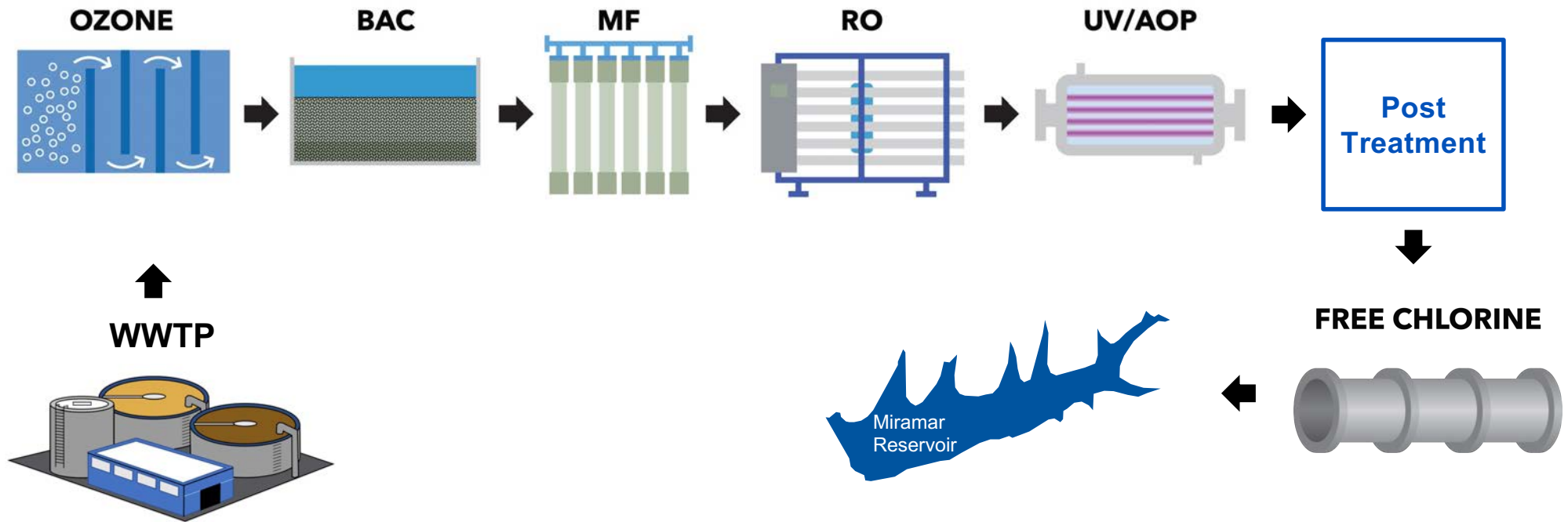
Pure Water Soquel (1.25 MGD)



The Next Frontier for Potable Reuse in California



San Diego North City Pure Water Treatment Train (34 MGD)



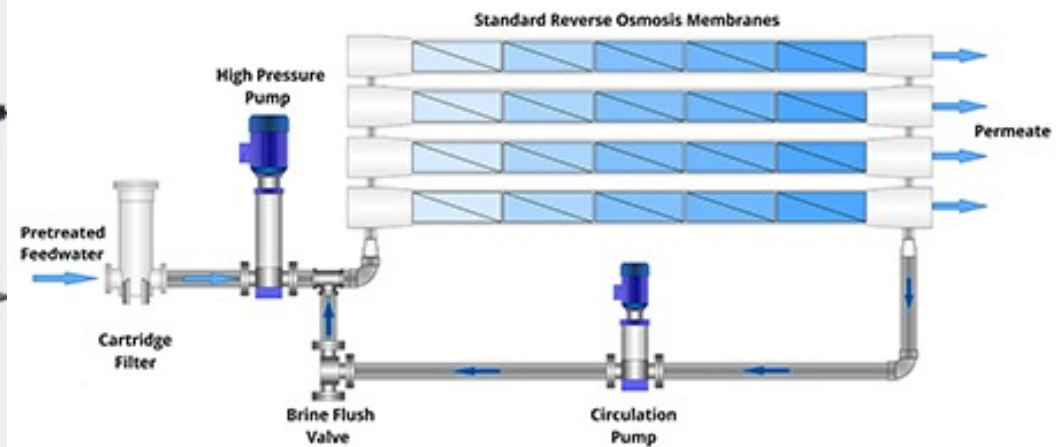
Phase 1 Pure Water San Diego (34 MGD)



East County AWWPF (12.5 MGD)



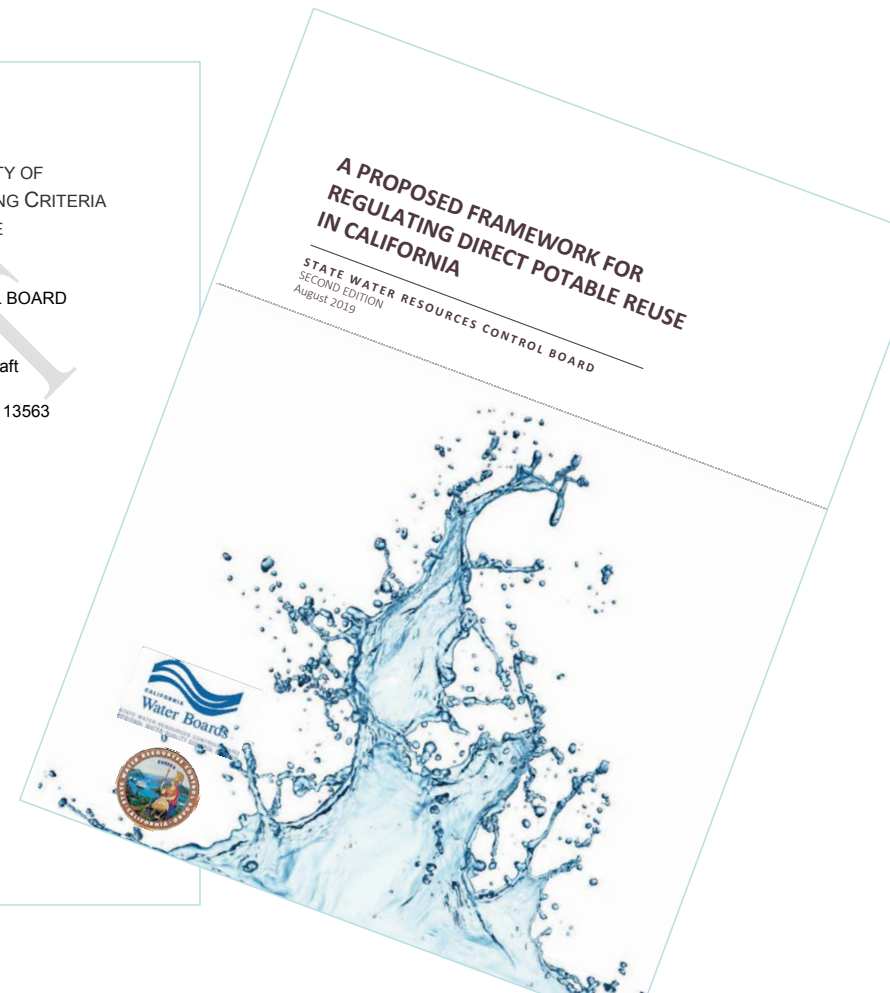
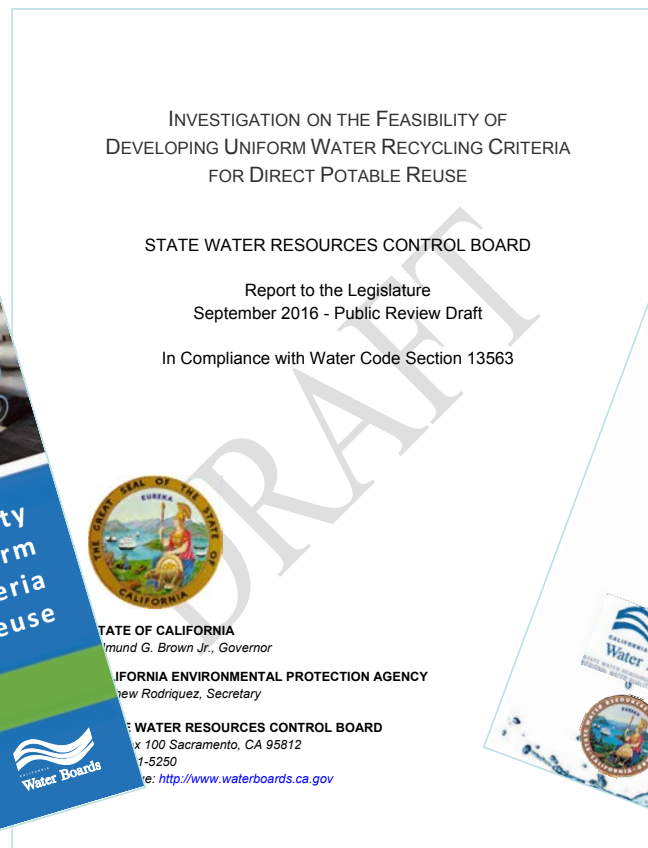
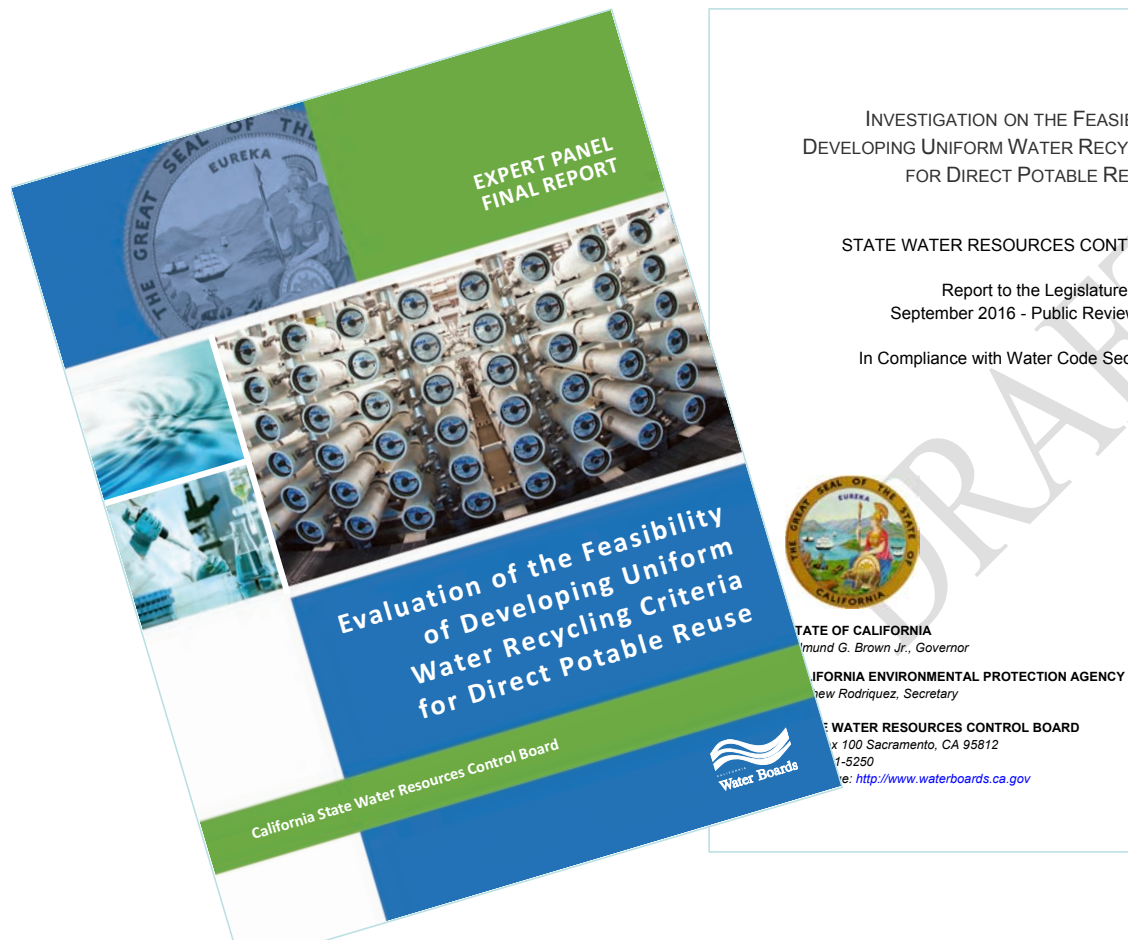
First Potable Reuse Facility with 95% RO Recovery



Las Virgenes MWD (6 MGD)



Draft Direct Potable Reuse Criteria Released



>\$10M in Research to Support DPR Regulations

PROJECTS TO INFORM THE DEVELOPMENT OF DPR REGULATIONS

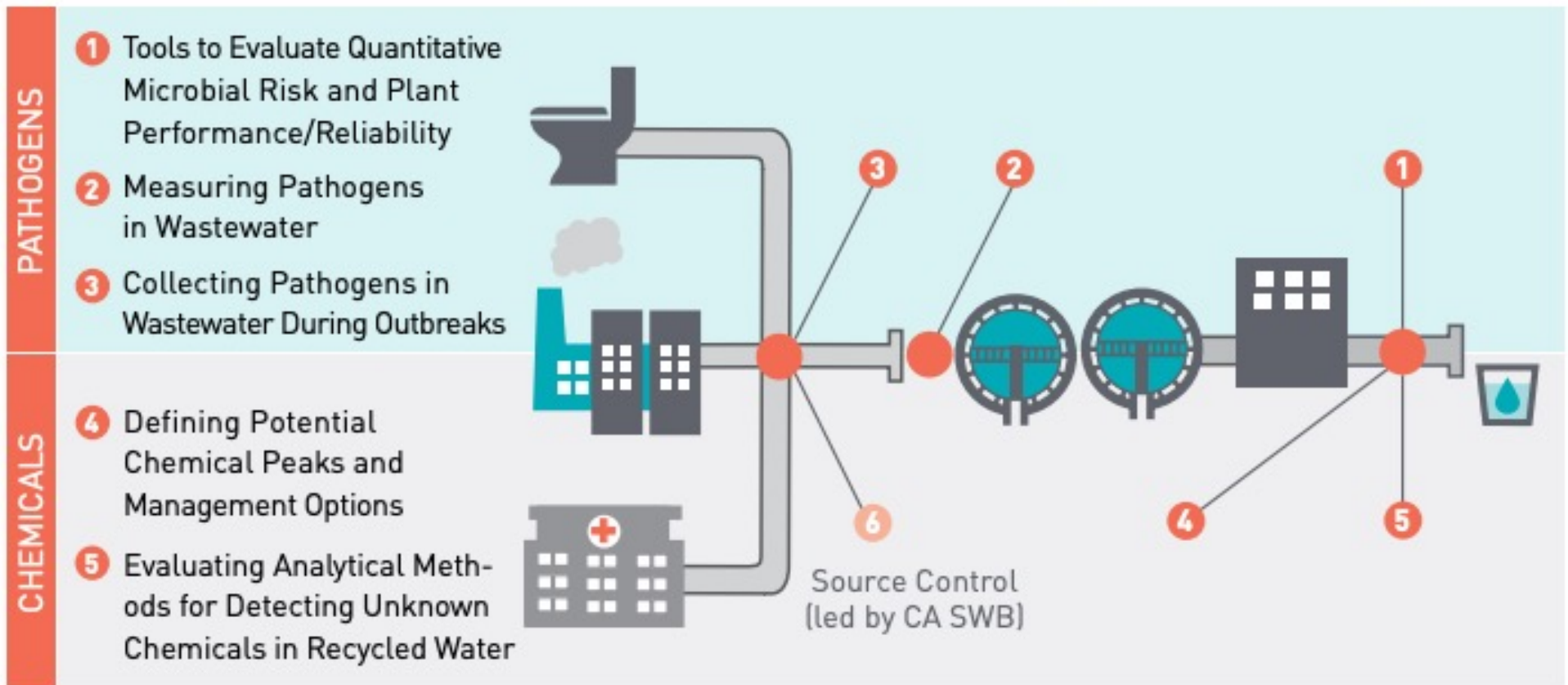
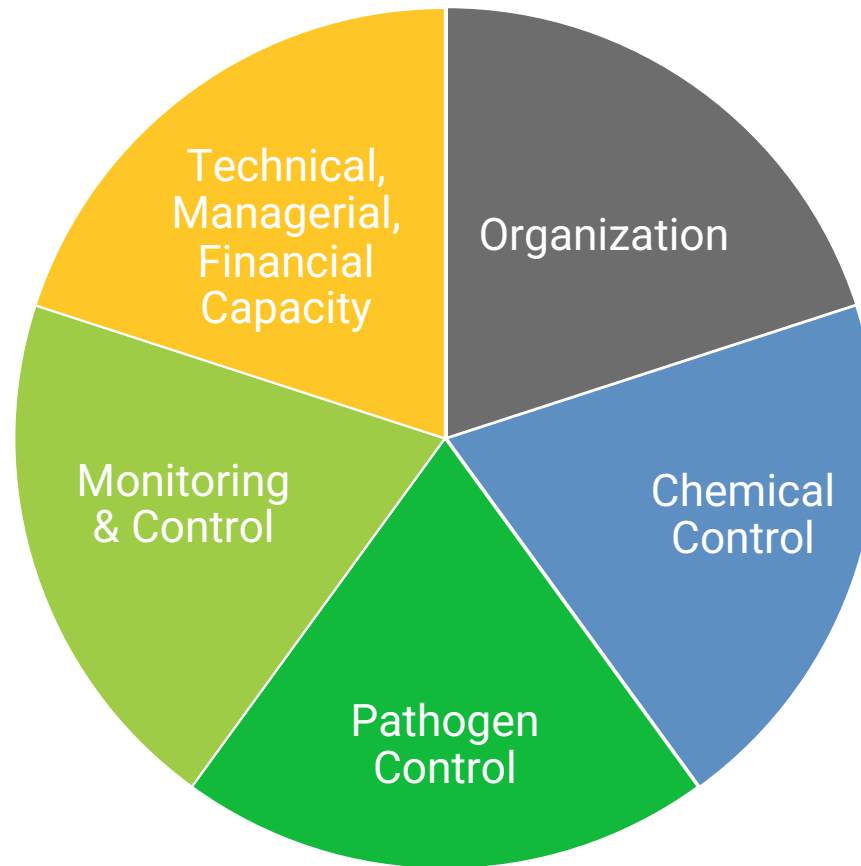


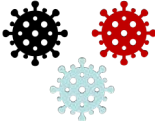


Figure credit: Water Research Foundation

Major Provisions

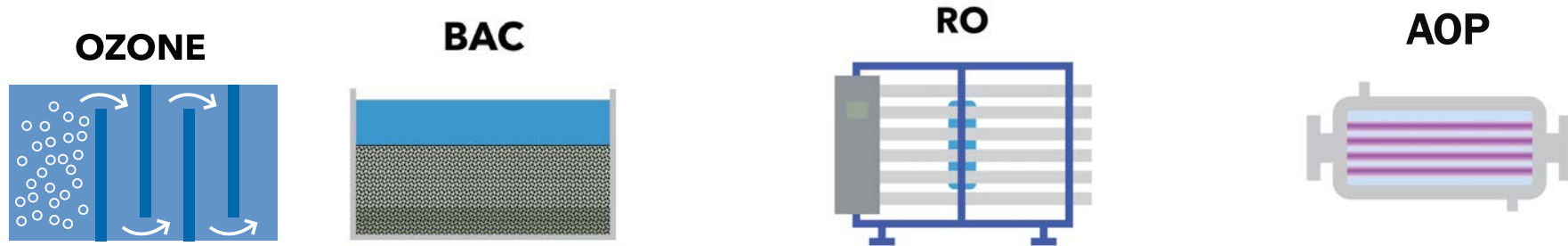


Pathogen Control

- 4 processes providing at least 1-log for *each* pathogen
 - GWR is 3 processes total
 - SWA is 2-3 processes total
- 3 *mechanisms* including:
 - UV disinfection
 - Physical separation
 - Chemical disinfection

	Groundwater Recharge	Surface Water Augmentation	Direct Potable Reuse
Virus 	12	12 to 14	20
Giardia 	10	10 to 12	14
Cryptosporidium 	10	10 to 12	15

Chemical Control – Treatment Requirements

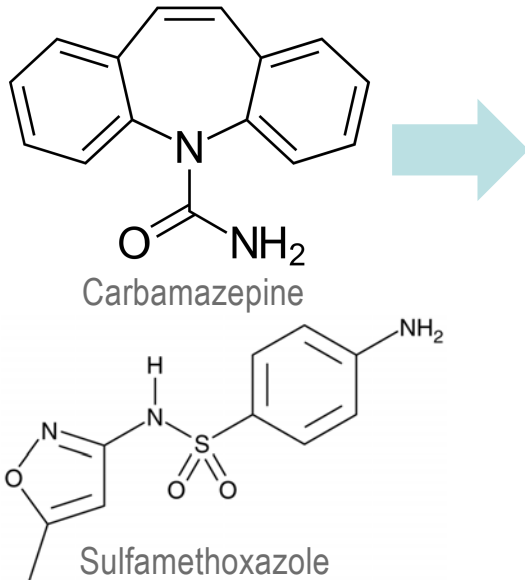
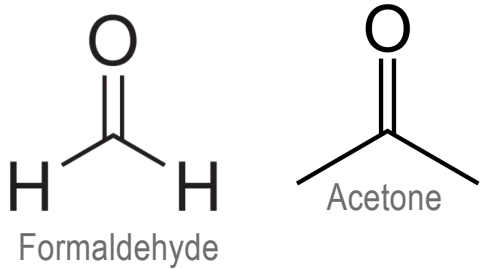


New requirement

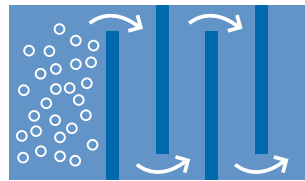
New operational
triggers

Treatment must be in this order

O₃/BAC Requirements



OZONE

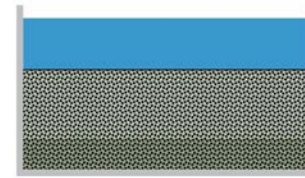


$O_3:TOC > 1$

1-log reduction:

- Sulfamethoxazole
- Carbamazepine

BAC



$EBCT \geq 15 \text{ min}$

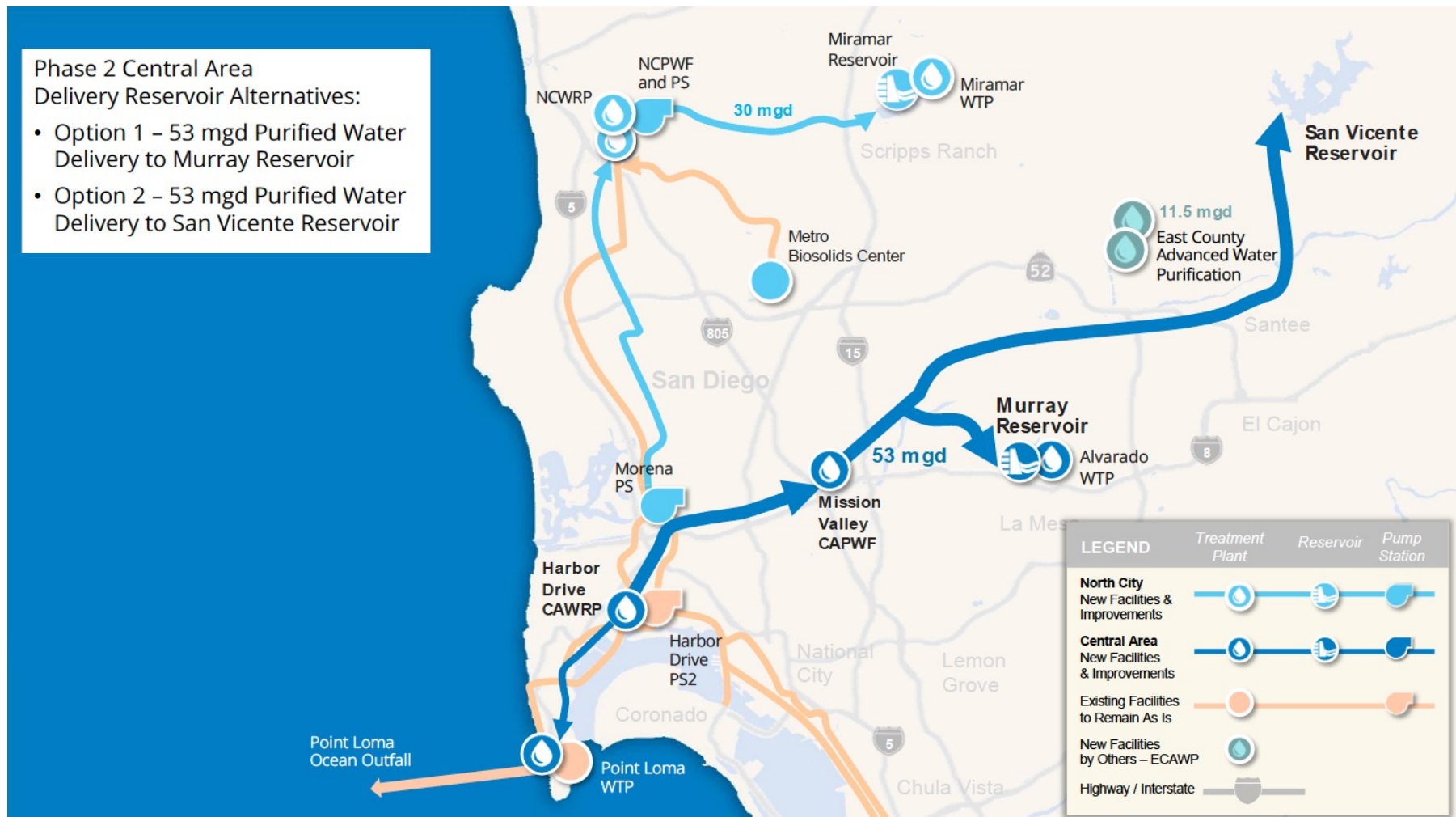
1-log reduction:

- Formaldehyde
- Acetone

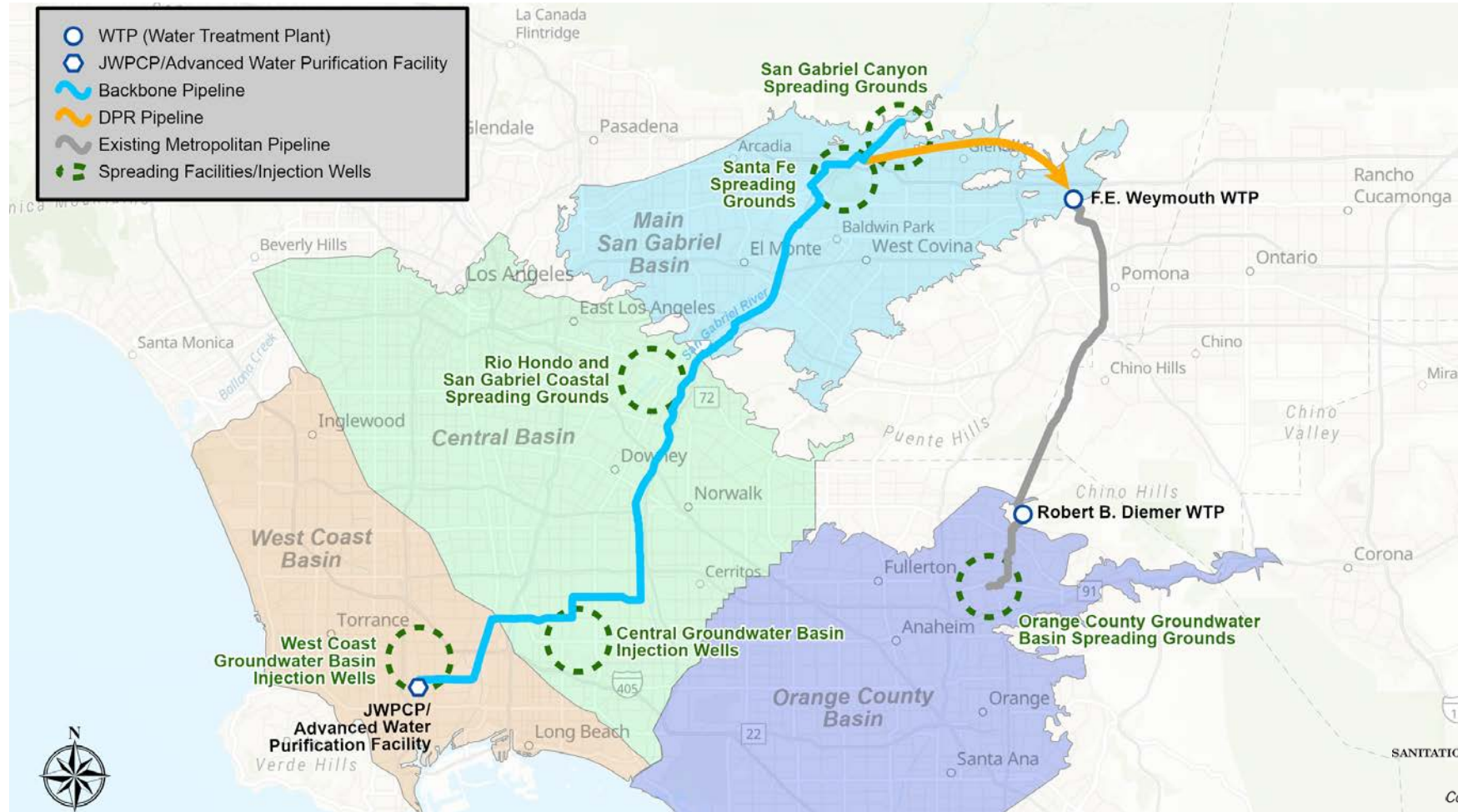
Central Area Project to Produce 53 MGD

Phase 2 Central Area Delivery Reservoir Alternatives:

- Option 1 – 53 mgd Purified Water Delivery to Murray Reservoir
- Option 2 – 53 mgd Purified Water Delivery to San Vicente Reservoir



Pure Water Southern California (150 MGD)



Advanced Purification Center (0.5 MGD)



City of Los Angeles

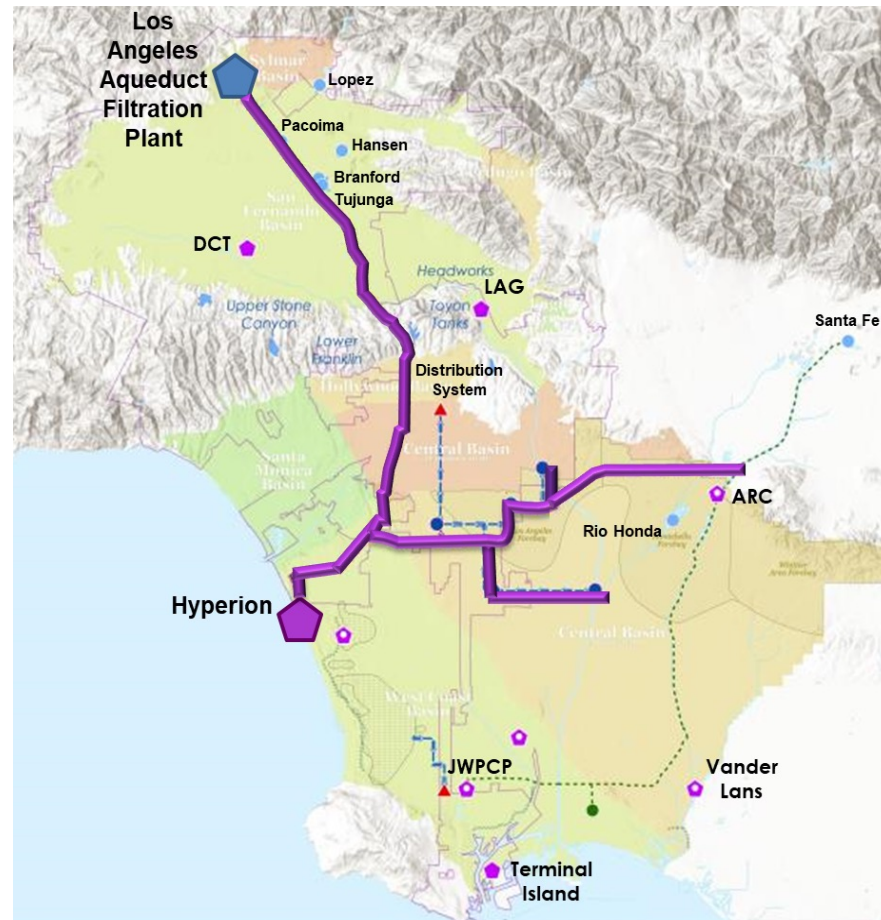


**Los Angeles
Department of
Water & Power**



Operation NEXT

- **Largest Potable Reuse Project (200 MGD)**
- **1/3 City's Water Demand**
- **\$16 Billion**



Potable Reuse Will Dramatically Change California



More Seawater Desalination Facilities in Our Future



Thank you for listening!



R. Shane Trussell

President

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Trussell

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