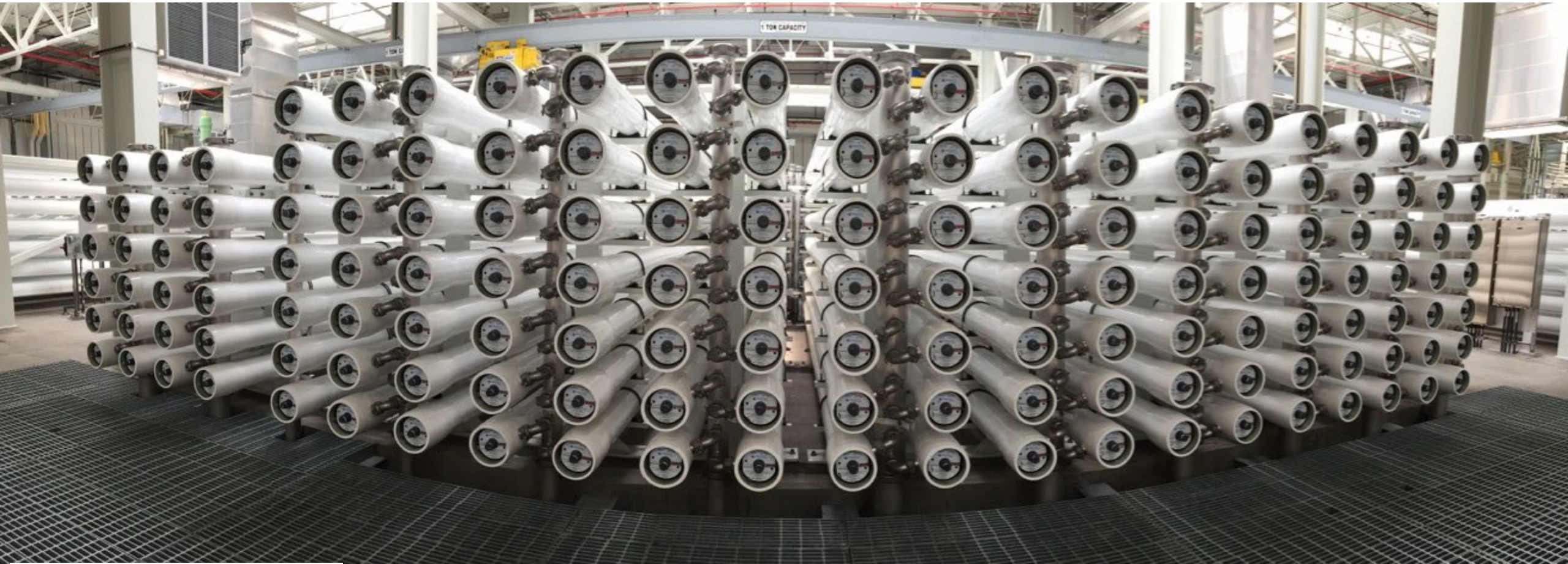


Potable Reuse in California: Past, Present and Future



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

June 13, 2023



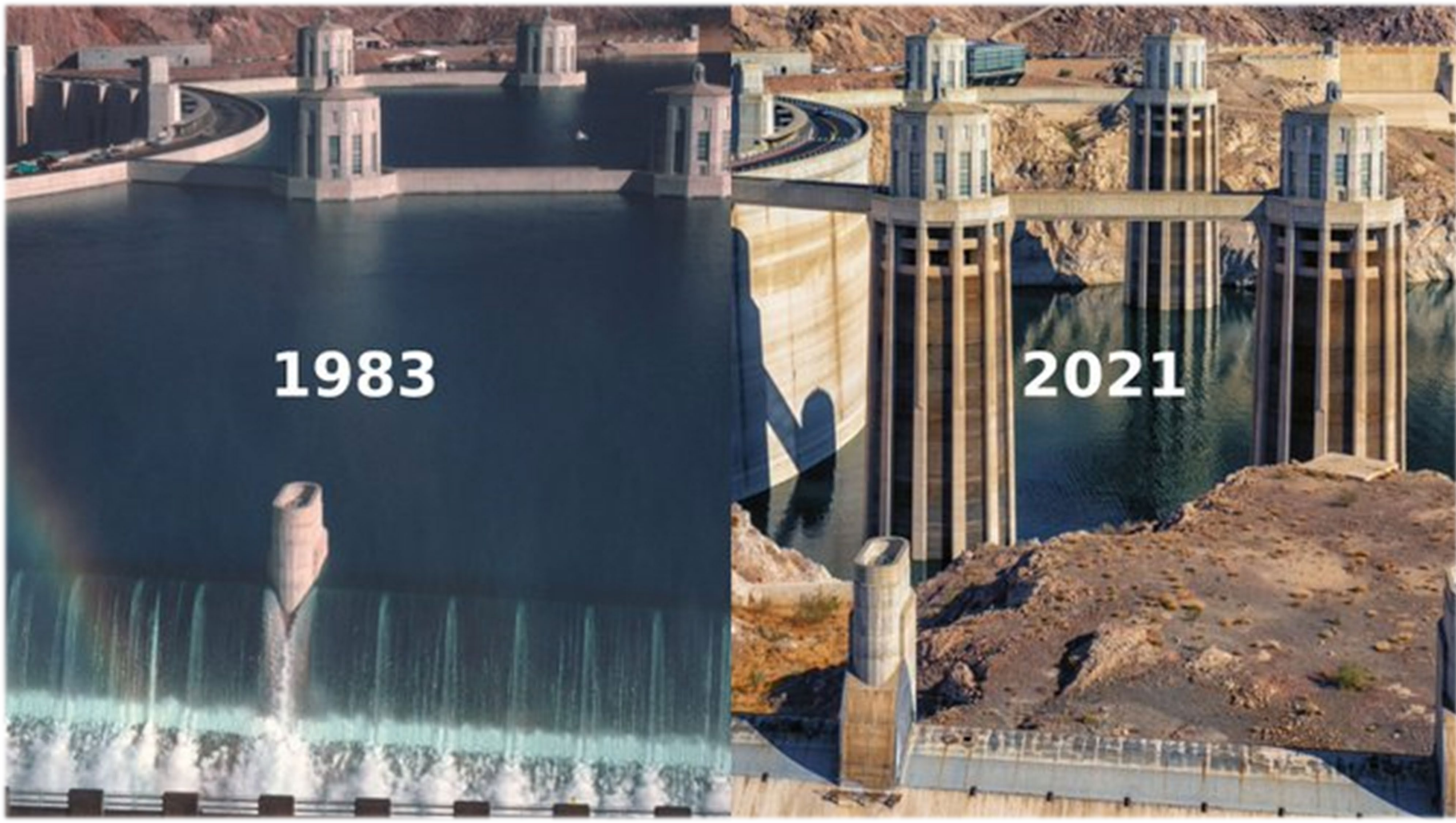




CAPITAL WEATHER GANG

California declares historic water emergency measures amid drought





1983

2021

California Needs to Develop More Local Water Supplies

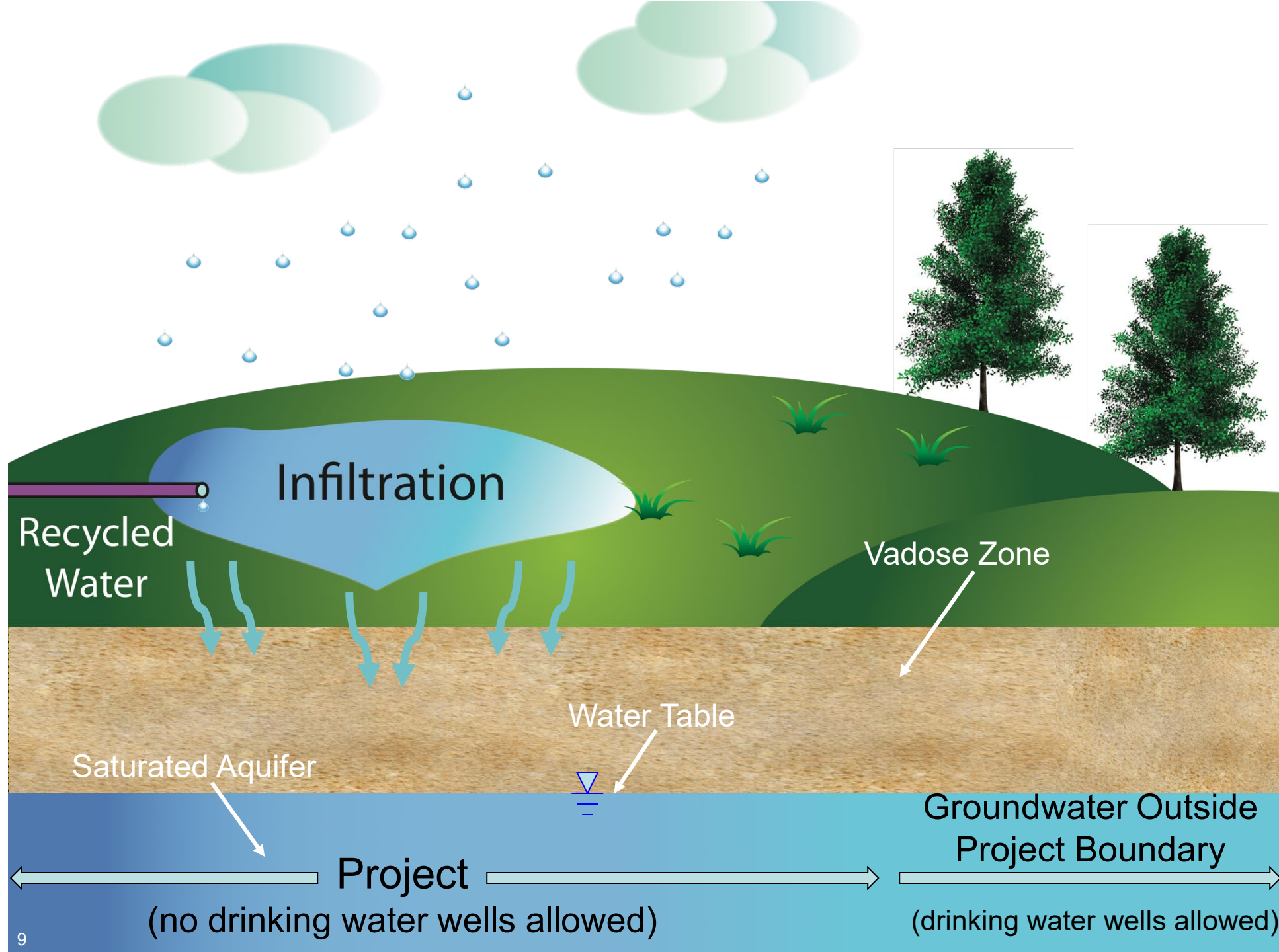
- Climate Change Adaptation
- Local Sustainability
- Water Supply Certainty
- Ecosystem Pressure
- Cost Control



California Has Deep Roots in Potable Reuse

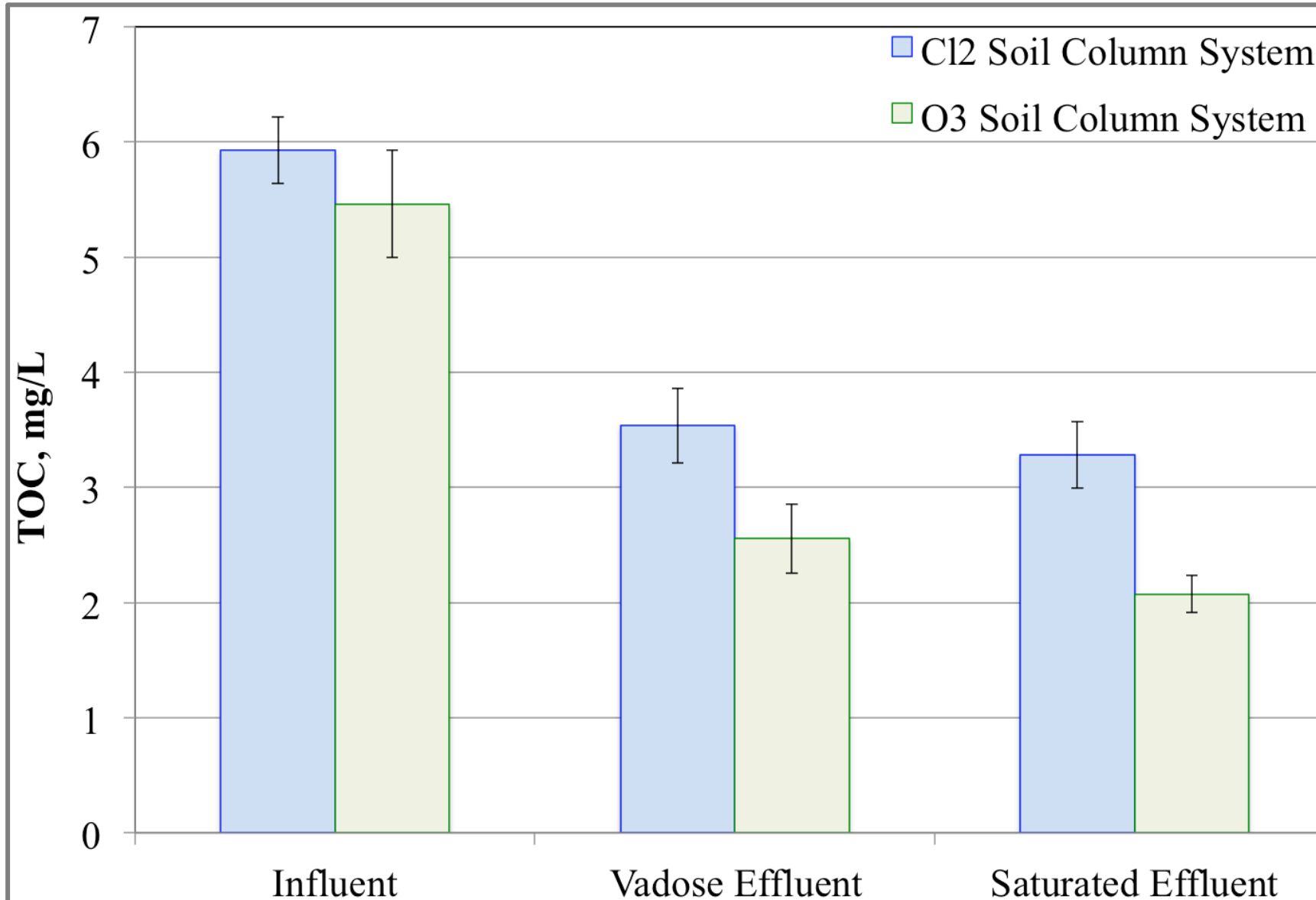


Spreading Projects Play an Important Role and Offer a Non- RO Solution

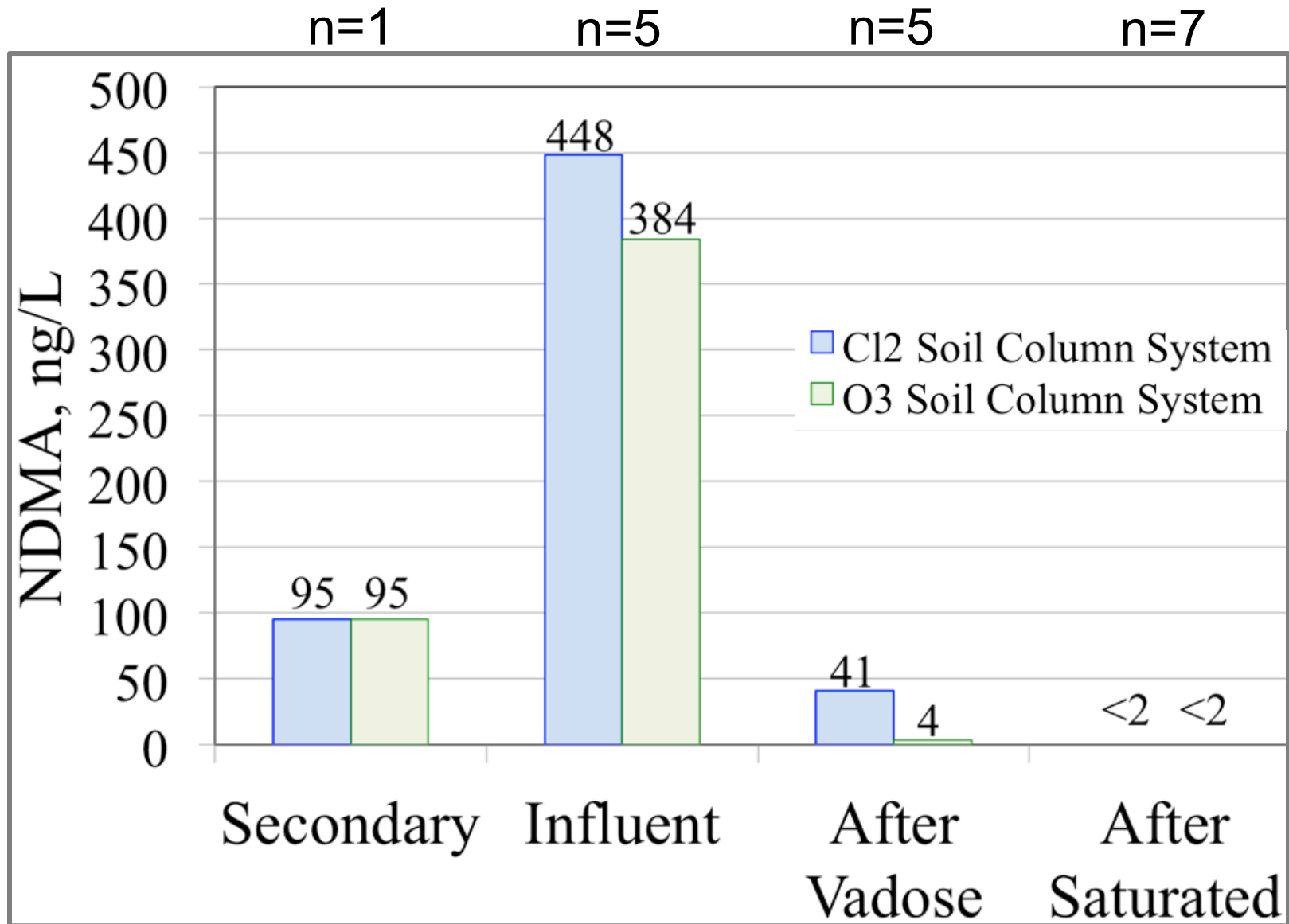


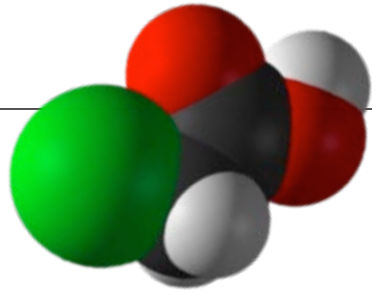
Average recharge
of 215 ML/day

Total Organic Carbon Removal

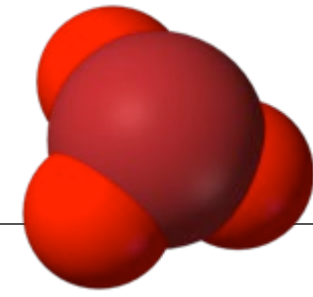


NDMA





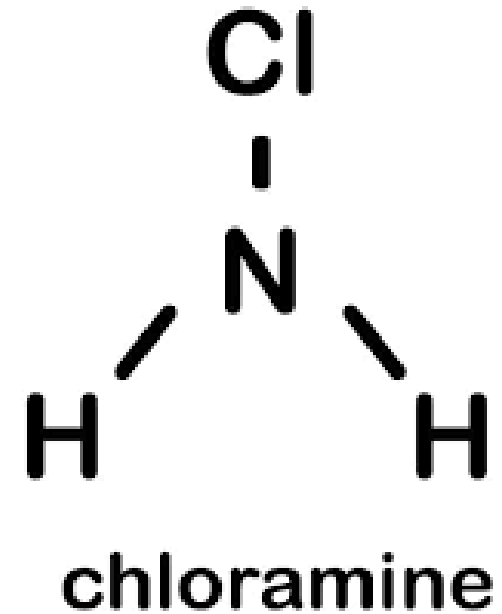
DBP Attenuation



Event 3 Event 4 Event 5 Average

Cl₂ 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
O₃ 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



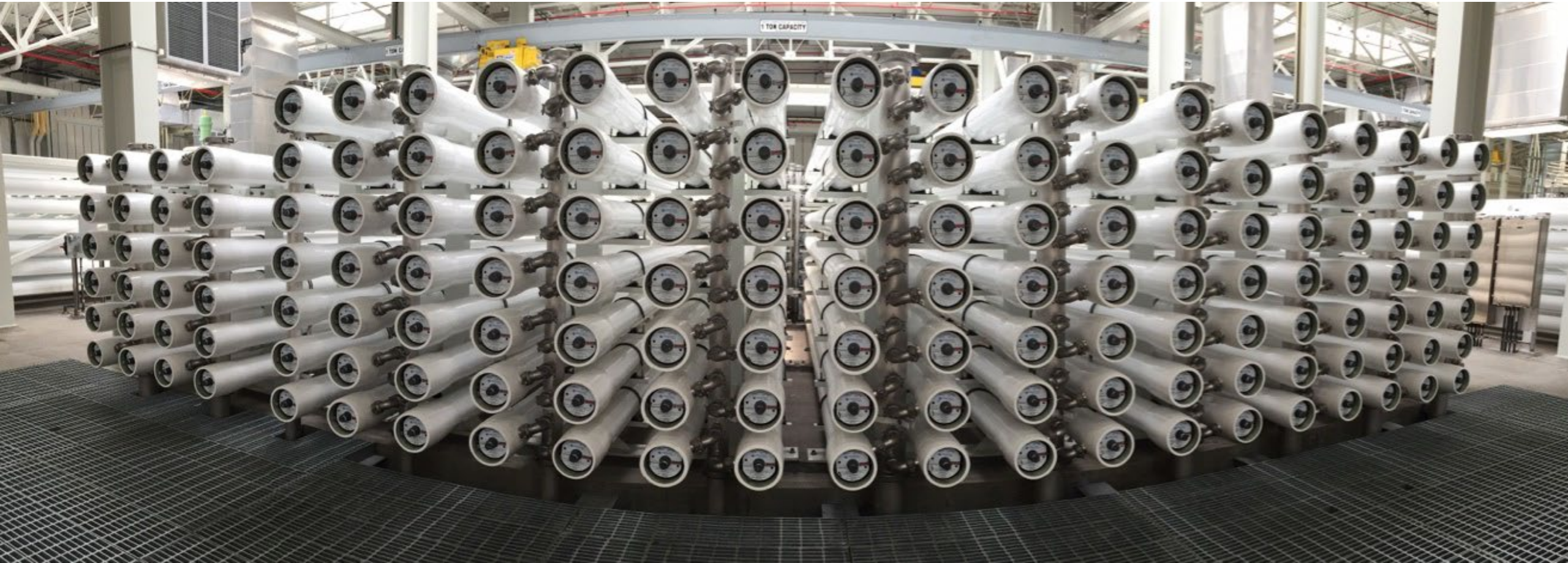
West Basin Municipal Water District Commissions First Full-Scale Microfiltration Reverse Osmosis Facility in 1999



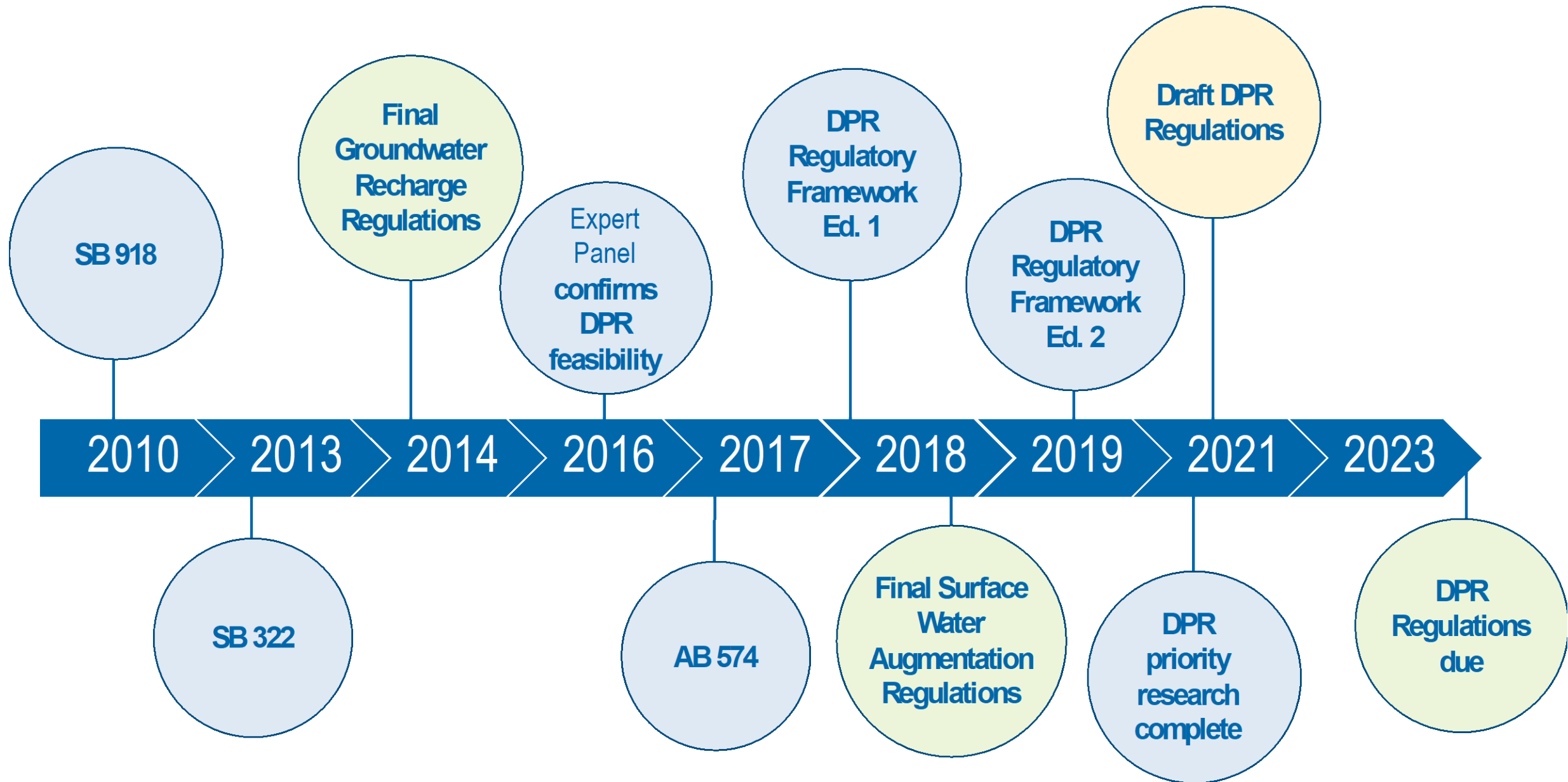
Terminal Island Begins Full-Scale Operation of MF/RO in 2003



Orange County Water District Commissions the Groundwater Replenishment System in 2008



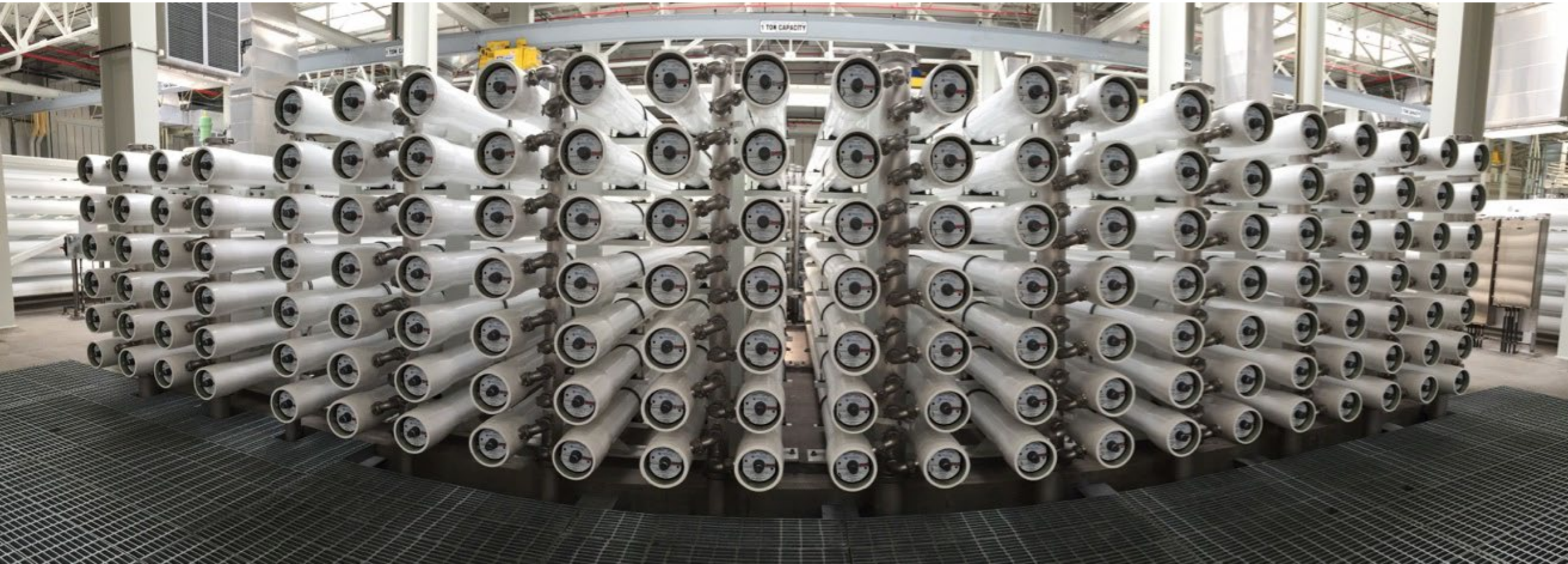
Rapid Development of Potable Reuse Regulations



Terminal Island Expansion (12 MGD) and UV-HOCl



Groundwater Replenishment System (130 MGD)



Albert Robles Center (14 MGD)



Pure Water Monterey (5.5 MGD)



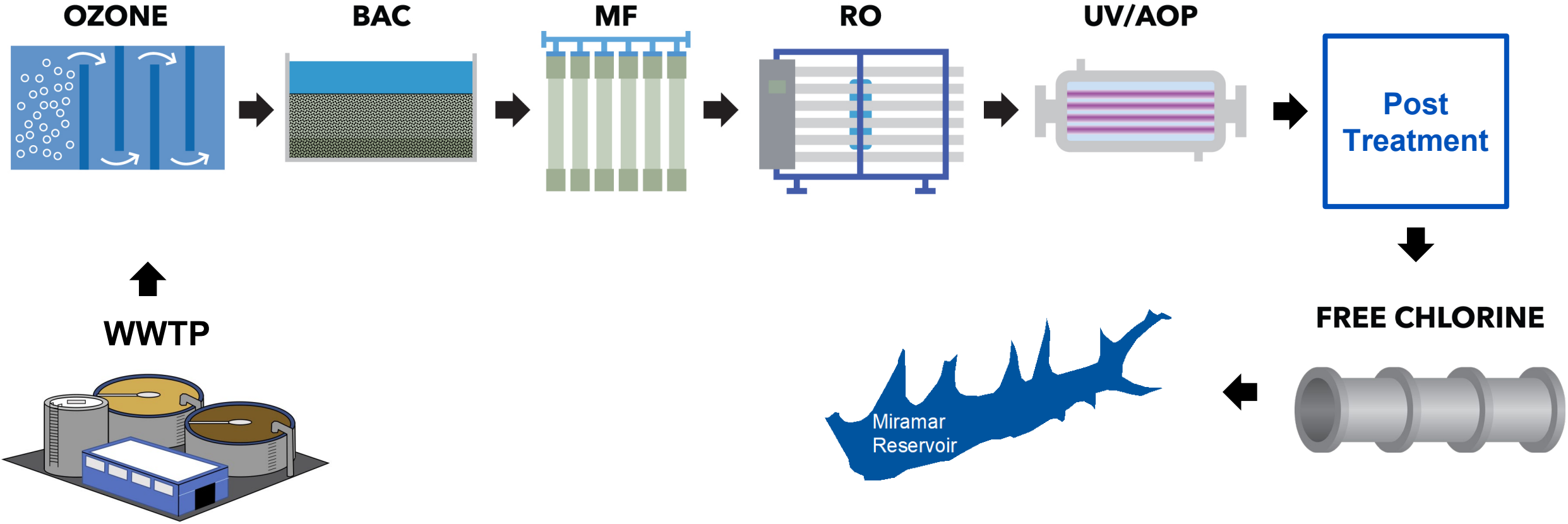
Pure Water Oceanside (4.5 MGD)



The Next Frontier for Potable Reuse in California



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



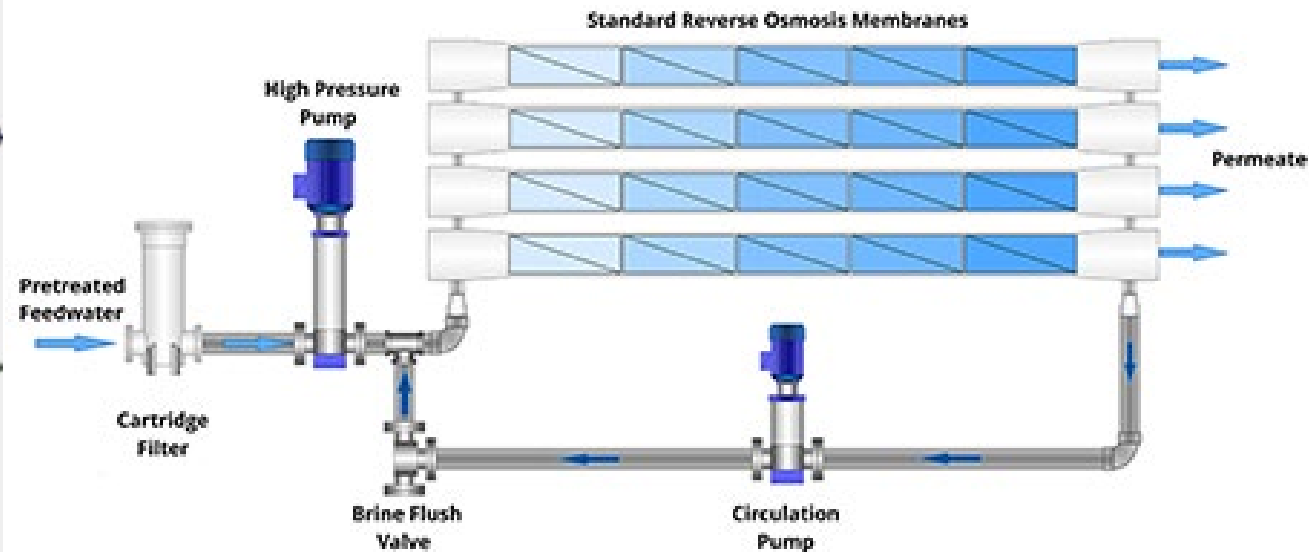
Phase 1 Pure Water San Diego (34 MGD)



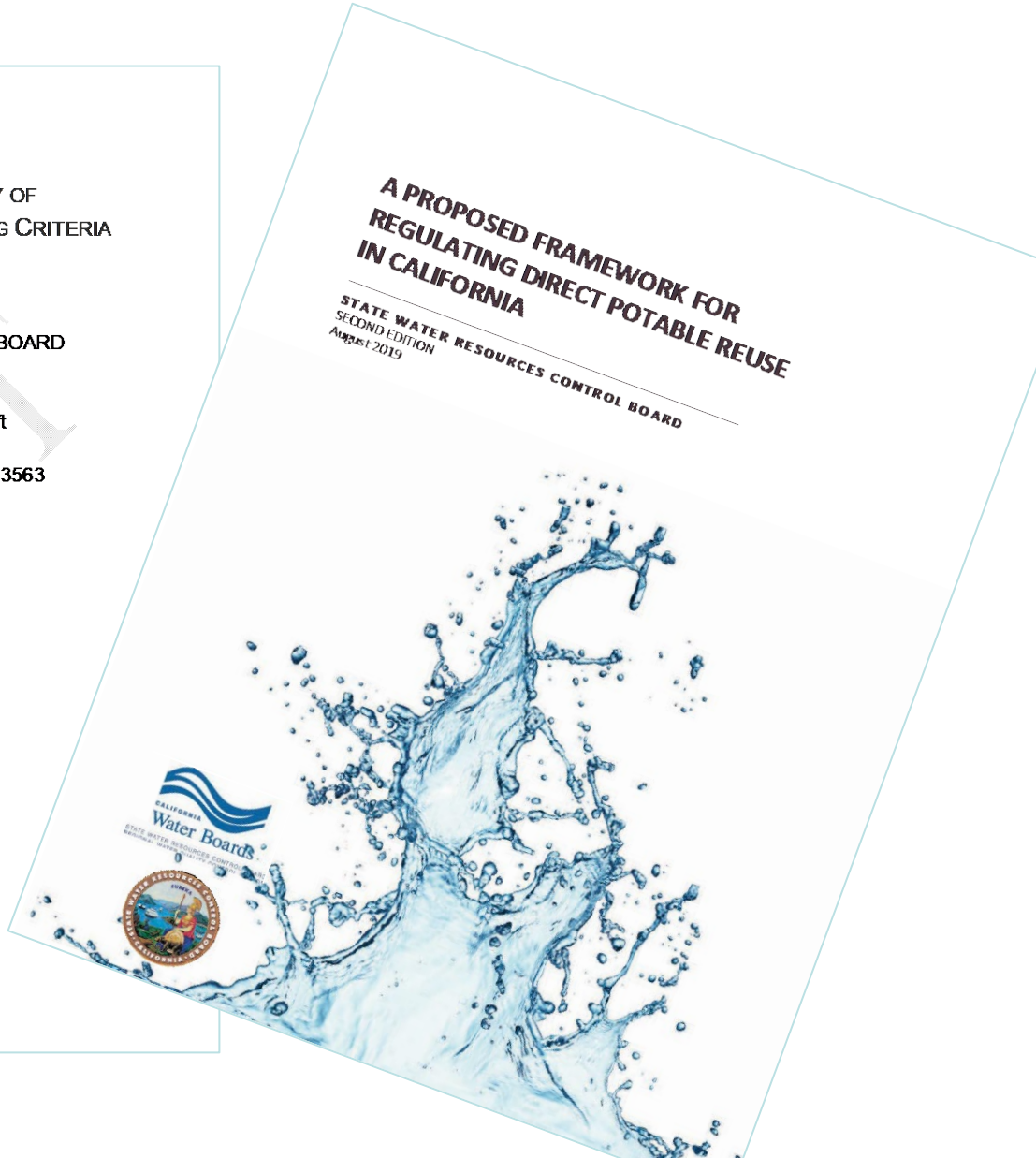
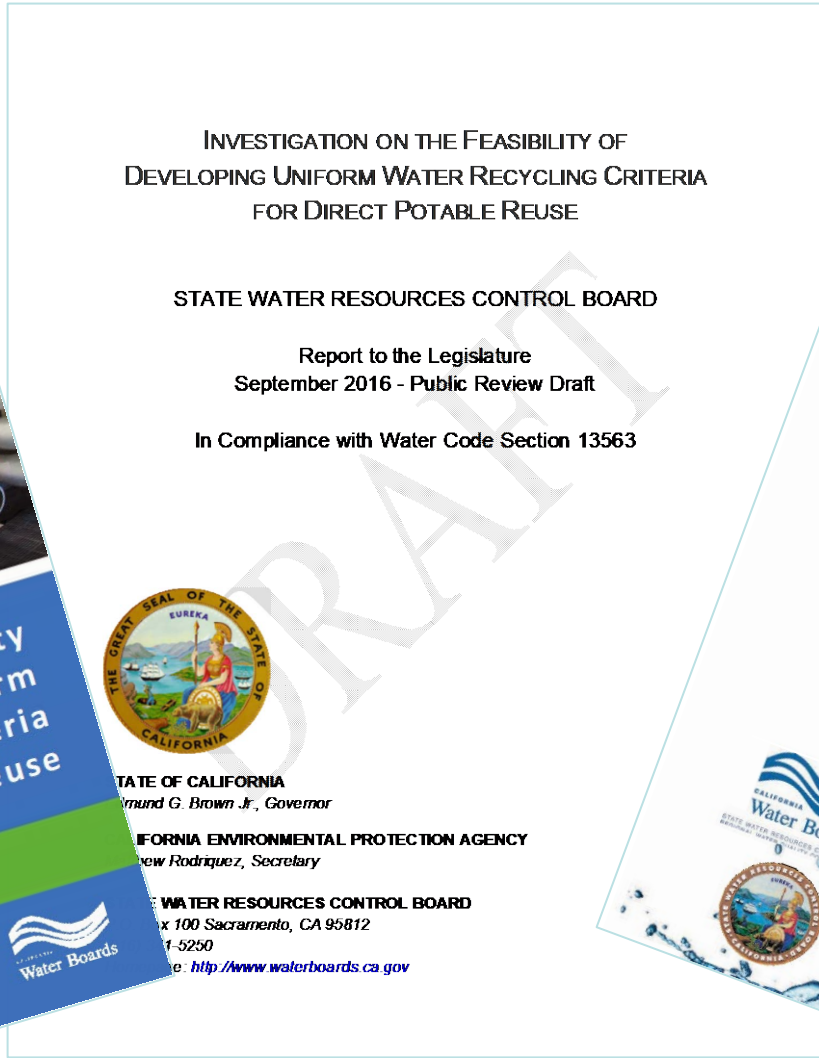
East County AWWPF (12.5 MGD)



First Potable Reuse Facility with 95% RO Recovery

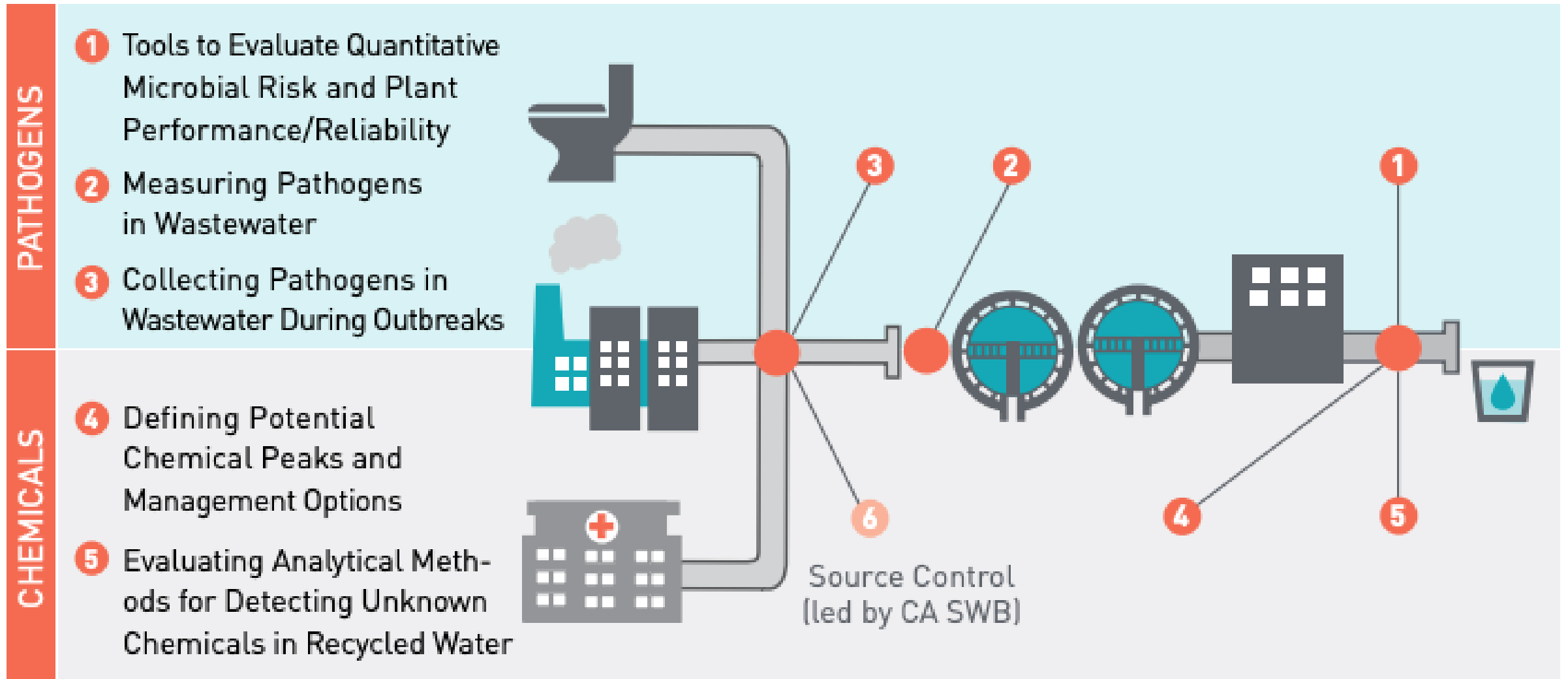


Draft Direct Potable Reuse Criteria Released

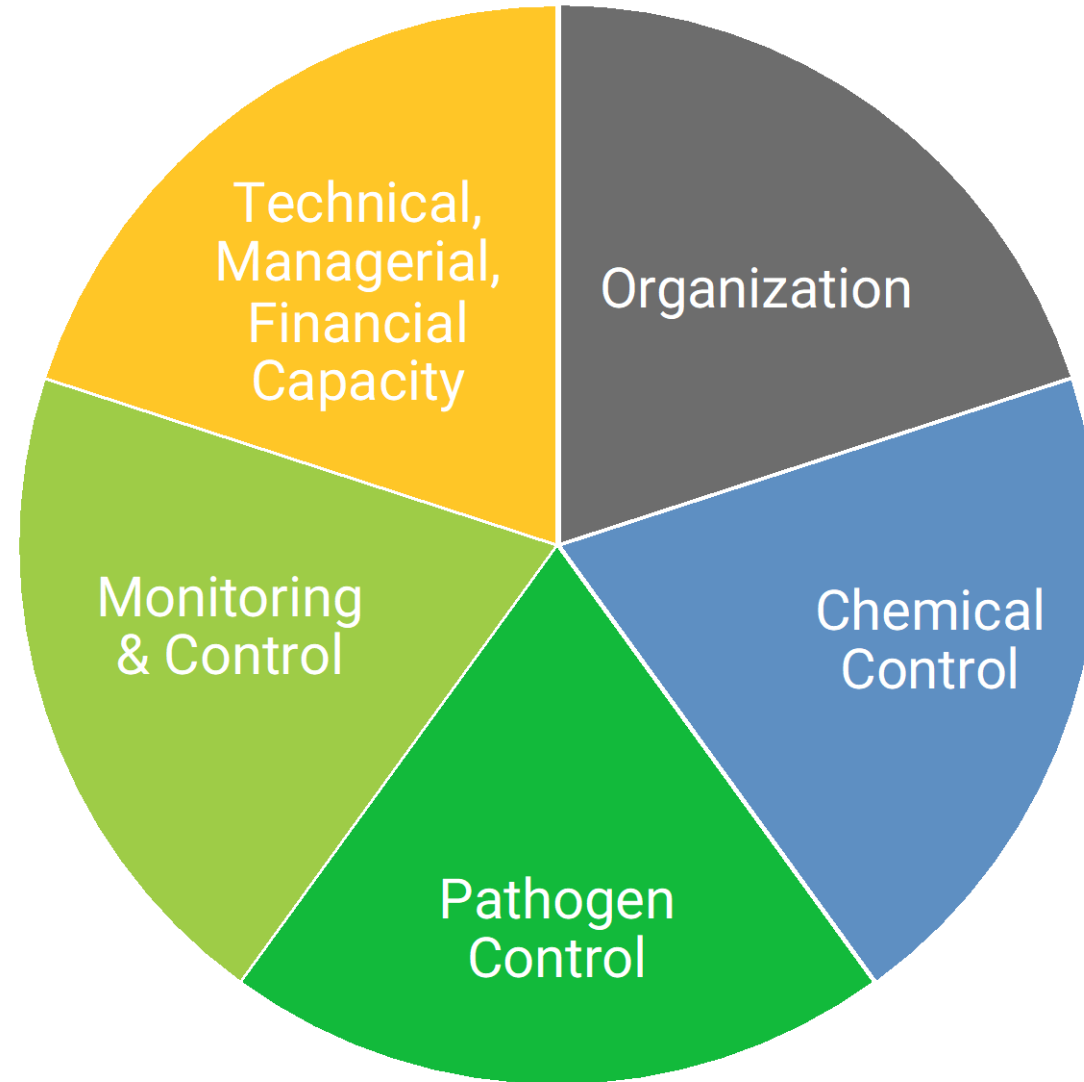


>\$10M in Research to Support DPR Regulations

PROJECTS TO INFORM THE DEVELOPMENT OF DPR REGULATIONS

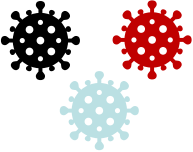




Major Provisions

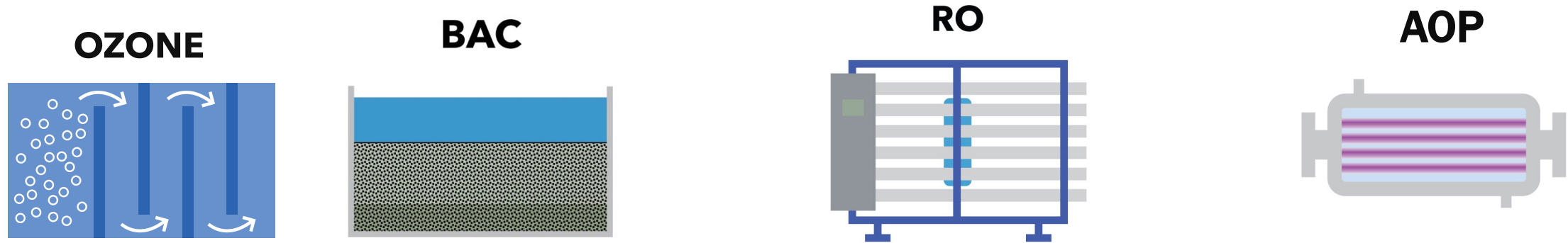


Pathogen Control

- 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

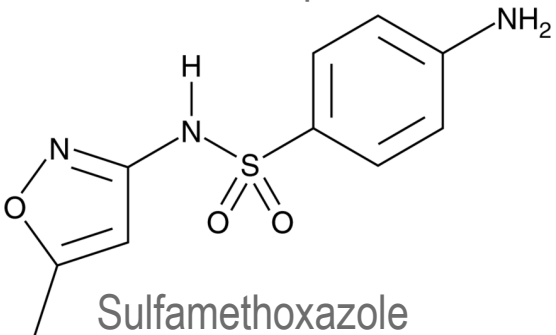
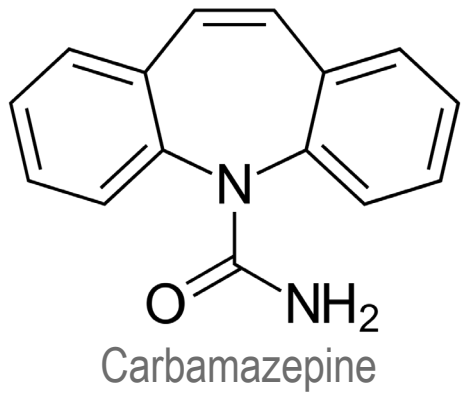
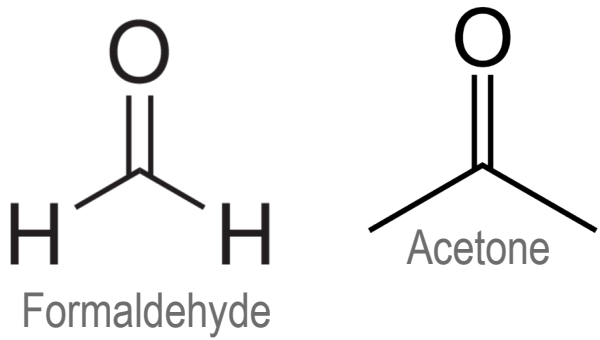


New requirement

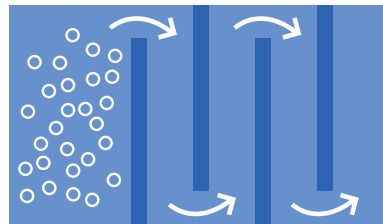
New operational
triggers

Treatment must be in this order

O3/BAC Requirements



OZONE

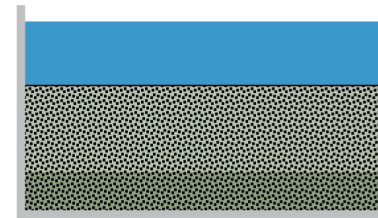


$O_3:TOC > 1$

1-log reduction:

- Sulfamethoxazole
- Carbamazepine

BAC



EBCT ≥ 15 min

1-log reduction:

- Formaldehyde
- Acetone

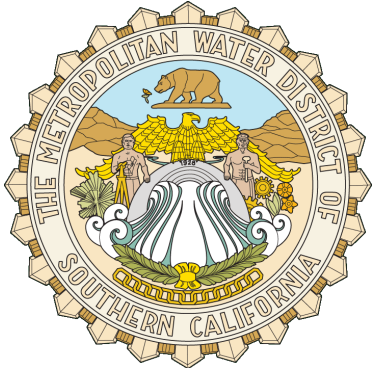
Central Area Project to Produce 53 MGD

Phase 2 Central Area Delivery Reservoir Alternatives:

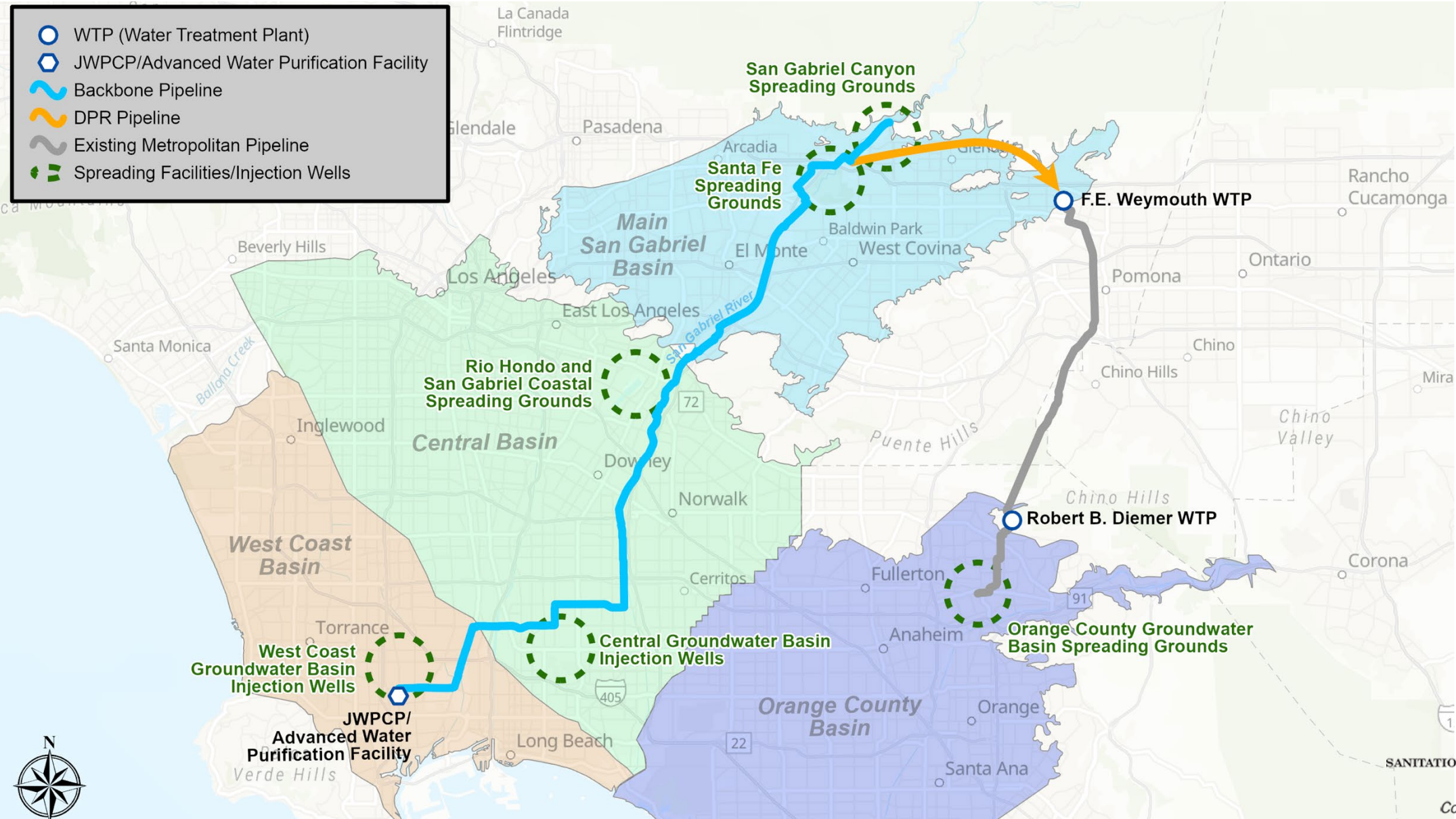
- Option 1 – 53 mgd Purified Water Delivery to Murray Reservoir
- Option 2 – 53 mgd Purified Water Delivery to San Vicente Reservoir



Pure Water Southern California (150 MGD)



- WTP (Water Treatment Plant)
- JWPCP/Advanced Water Purification Facility
- Backbone Pipeline
- DPR Pipeline
- Existing Metropolitan Pipeline
- Spreading Facilities/Injection Wells



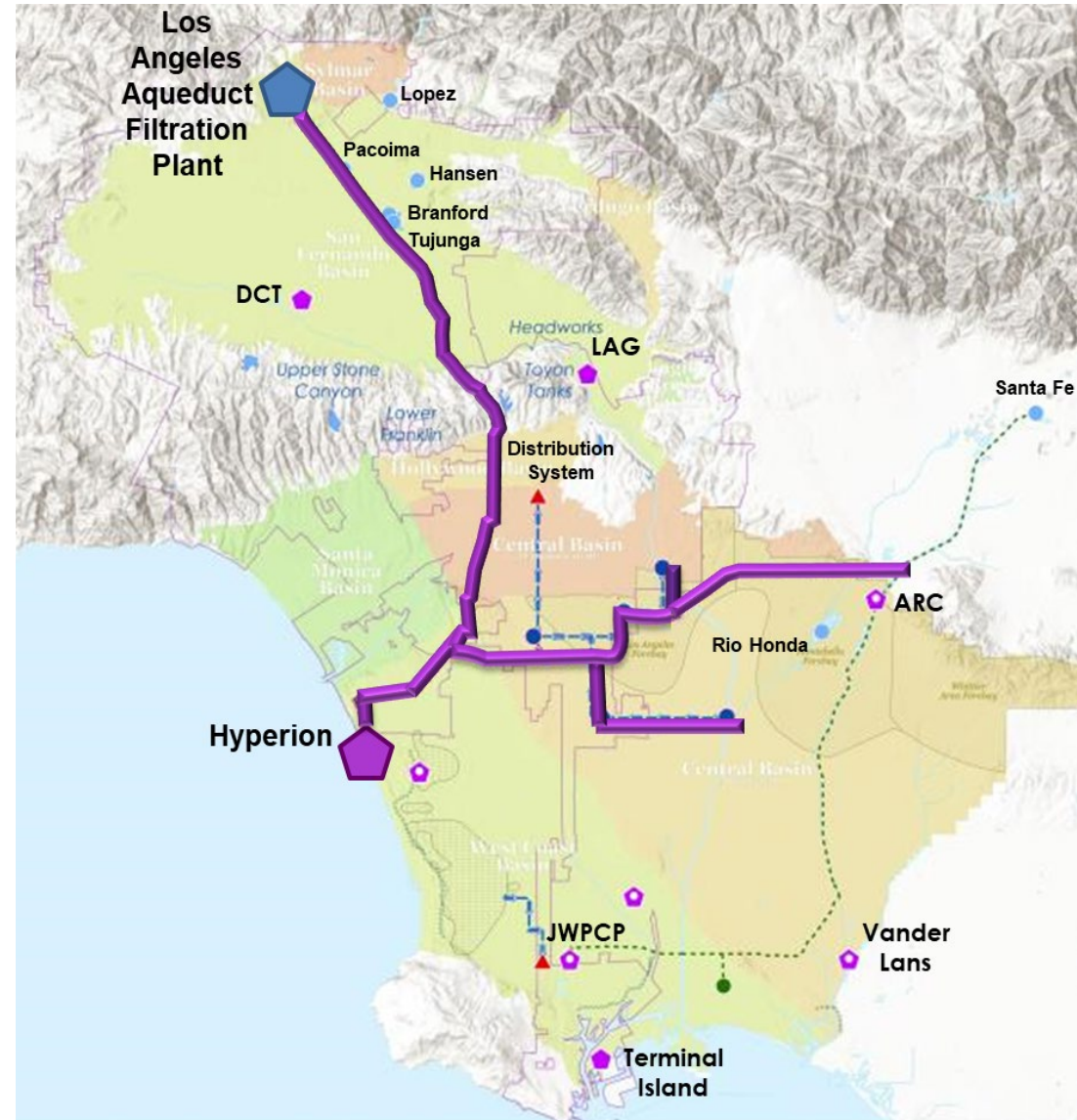
Advanced Purification Center (0.5 MGD)



City of Los Angeles

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