

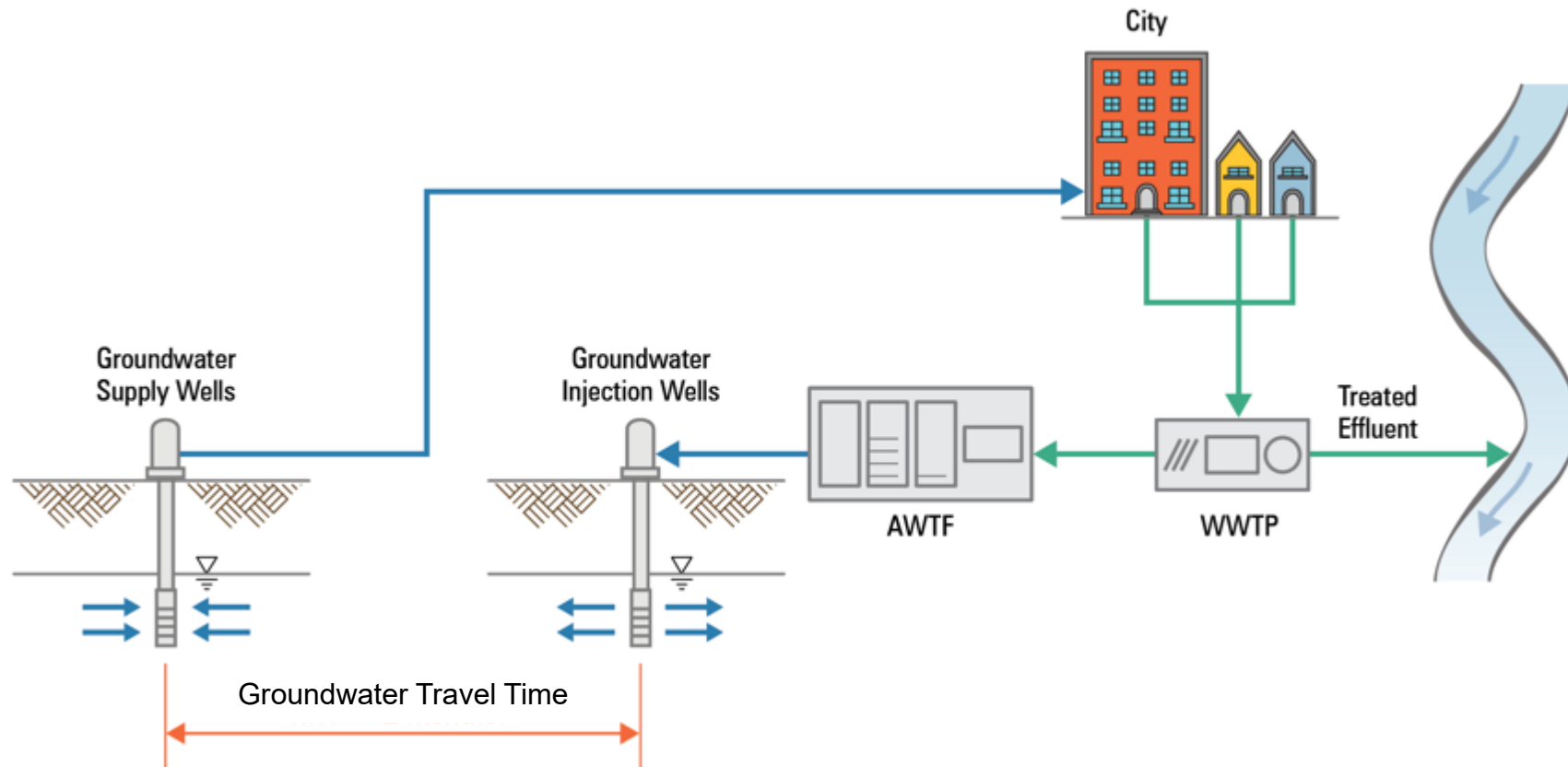


Purified Recycled Water for Drinking in California



Concepts

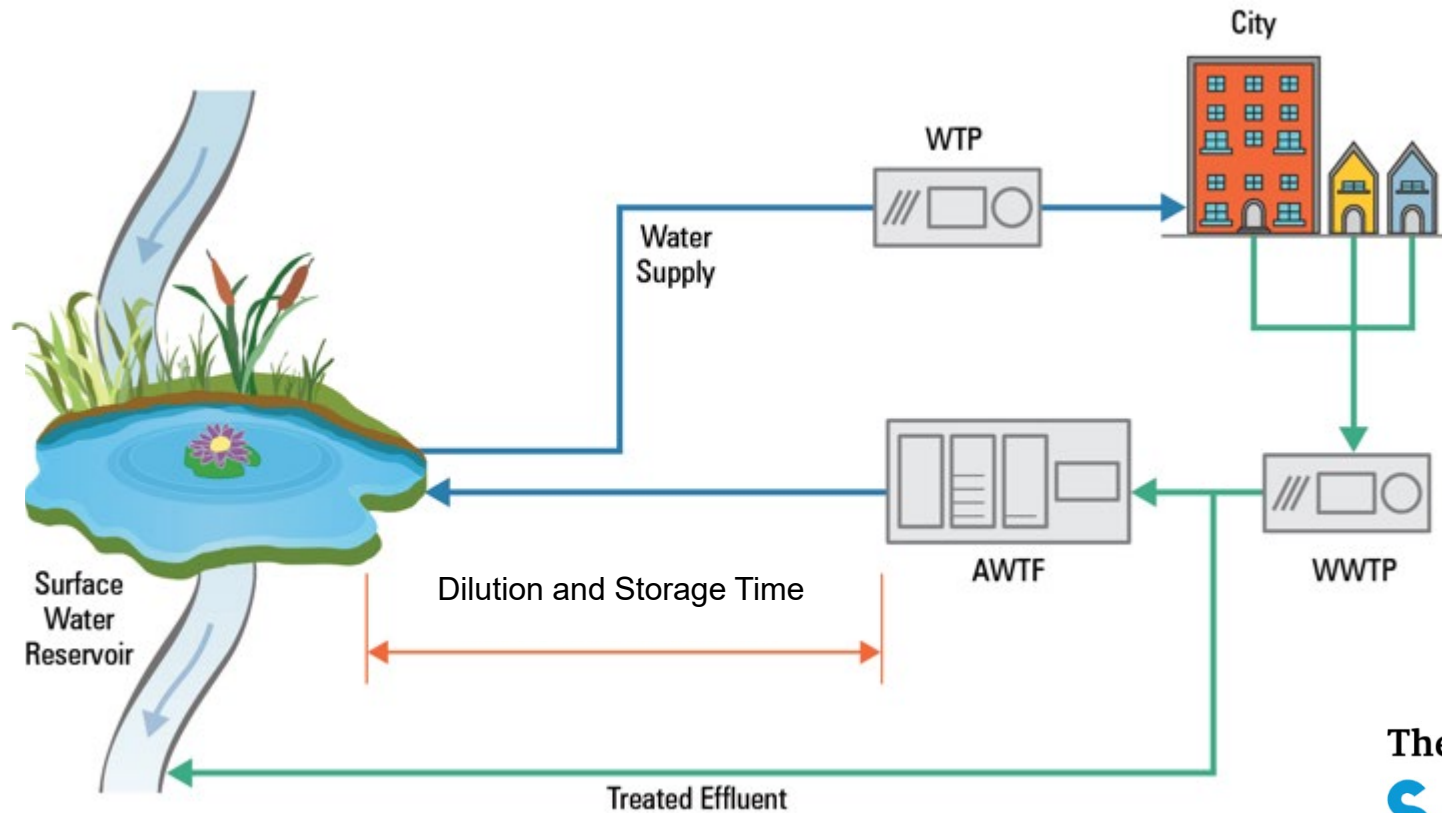
Definitions - Indirect Potable Reuse (IPR) via Groundwater Injection



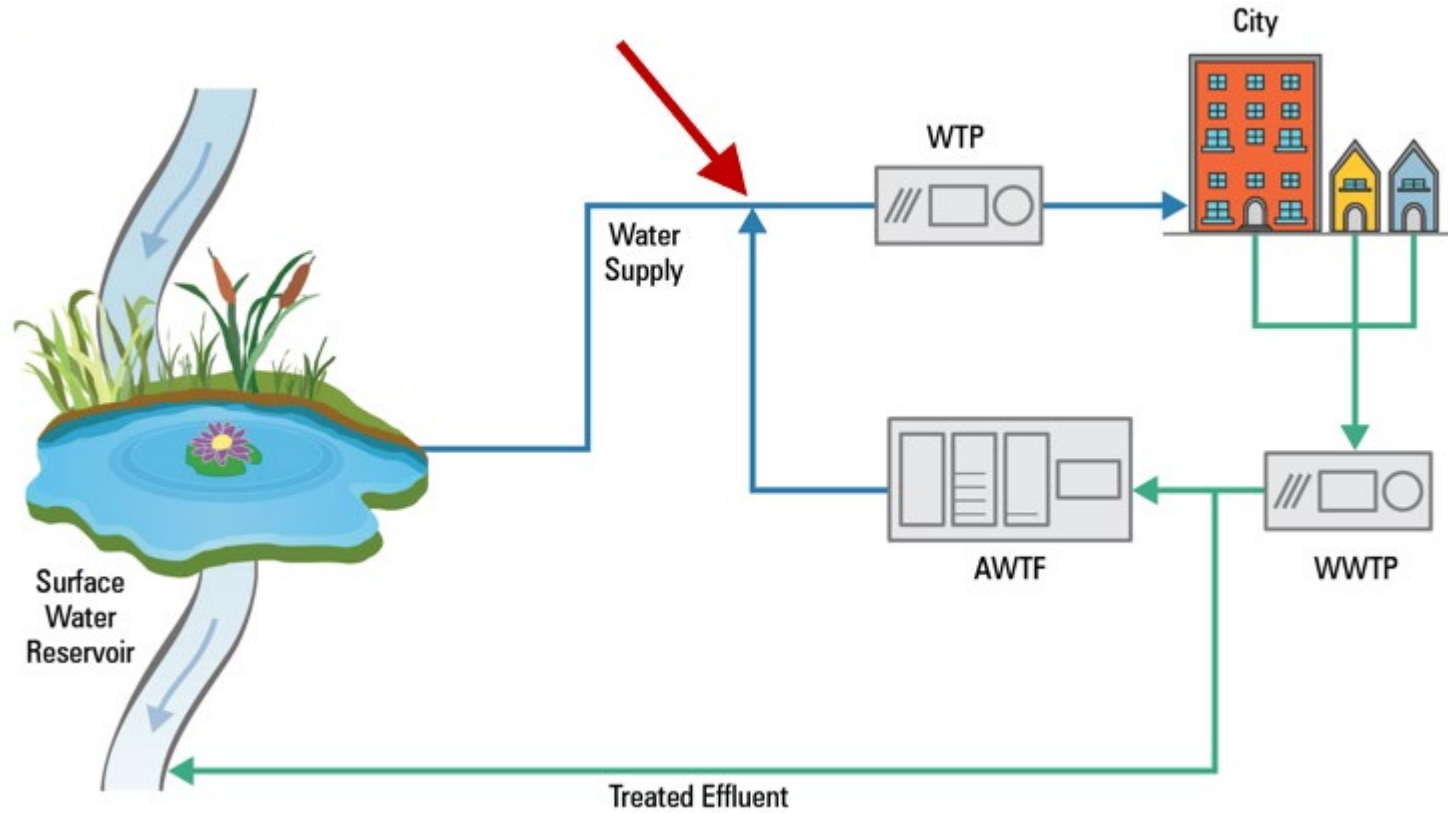
All current IPR projects in CA are GW recharge projects
~200 mgd of total capacity
OCWD, LA, West Basin, WRD, Oceanside, Monterey, IEUA



Definitions - Indirect Potable Reuse (IPR) via Reservoir Augmentation



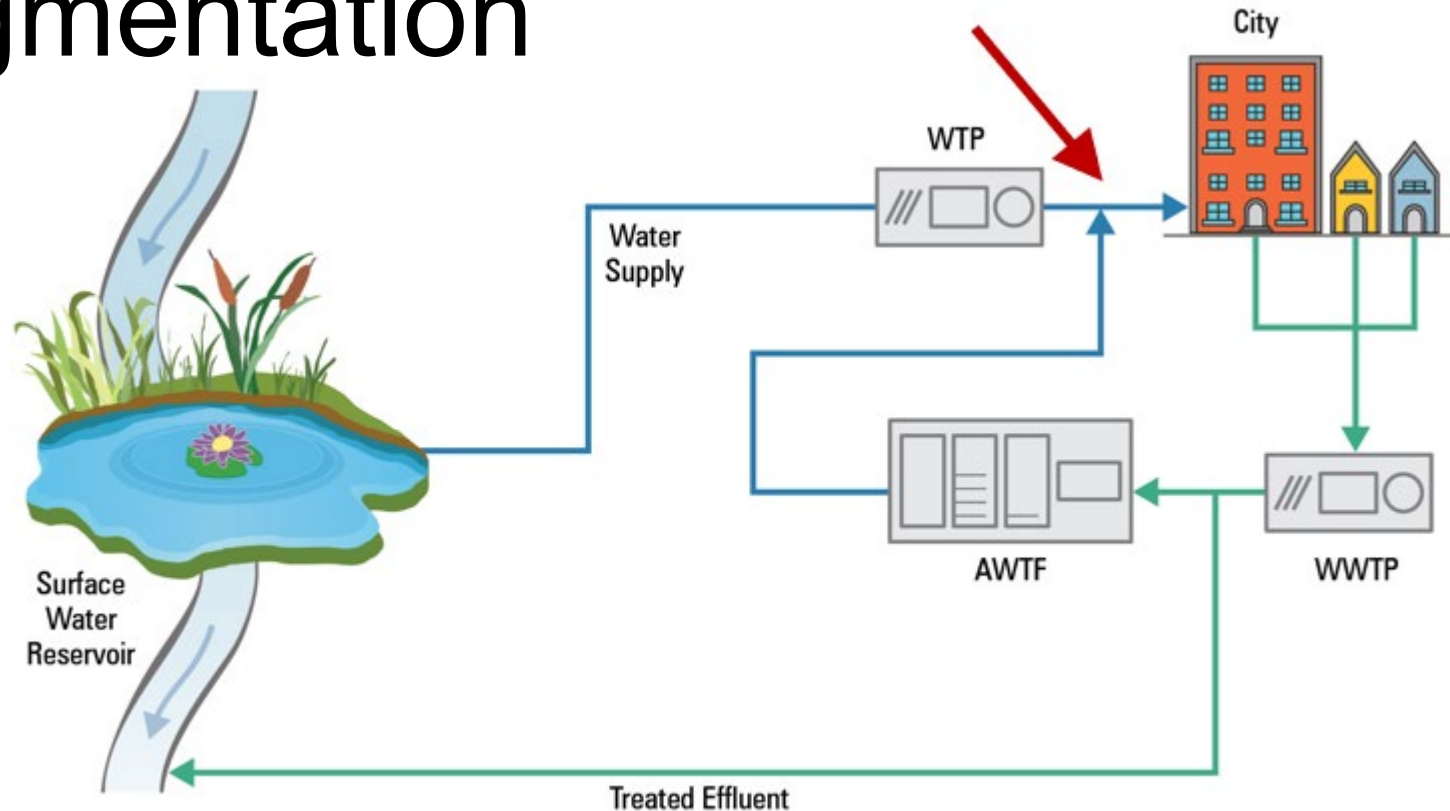
Definitions - Direct Potable Reuse (DPR) via Raw Water Augmentation





**Big Spring Texas
DPR System
Successfully Operating Since 2013**

Definitions - Direct Potable Reuse (DPR) via Treated Water Augmentation



City of Windhoek, New Goreangab Water Reclamation Plant (NGWRP), Namibia

- Oldest DPR globally
- Old Goreangab WRP (1968 – 2002) 7.5 MLD.
- NGWRP (2002 – present) 21 MLD.
- Private Management Agreement – Financial Penalties for Quality Excursions.
- No guidance at inception has developed and changed with the times.
- No disease incidence linked to recycled water during entire history of operation.

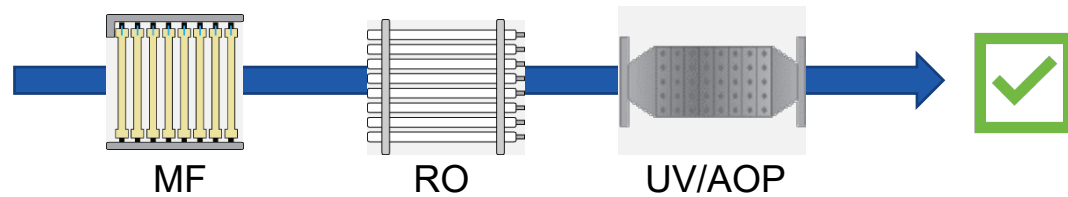


<https://www.veoliawatertechnologies.com/sites/g/files/dvc2476/files/image/2018/12/Windhoek-banner.jpg> (Date Accessed: 17/2/2019)

// Two Types of Advanced Treatment Trains

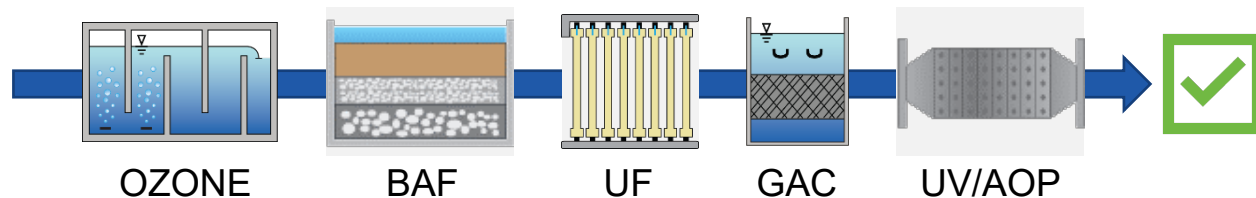
Proven to produce safe potable quality water

Reverse Osmosis-Based Advanced Treatment



Removes Pathogens	Removes Trace Organics	Removes Salinity	Requires Brine Disposal	Energy-Intensive
✓	✓	✓	Yes	Yes

Carbon-Based Advanced Treatment

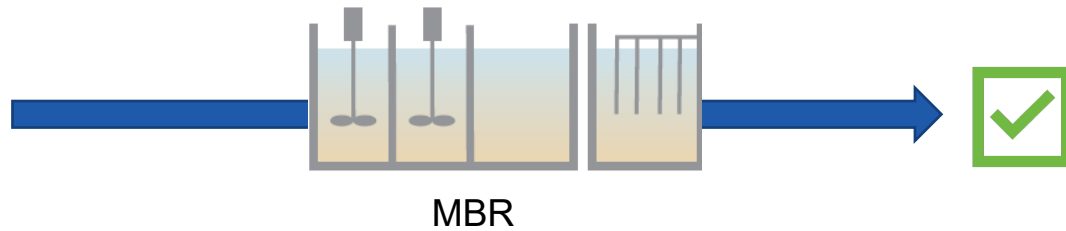


Removes Pathogens	Removes Trace Organics	Removes Salinity	Requires Brine Disposal	Energy-Intensive
✓	✓	✗	No	No

// Two Different Modes of Wastewater Treatment

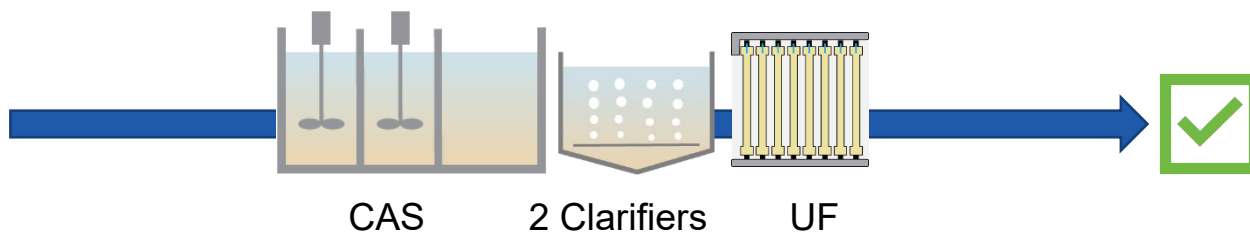
Proven to produce high quality feed water for purification

MBR

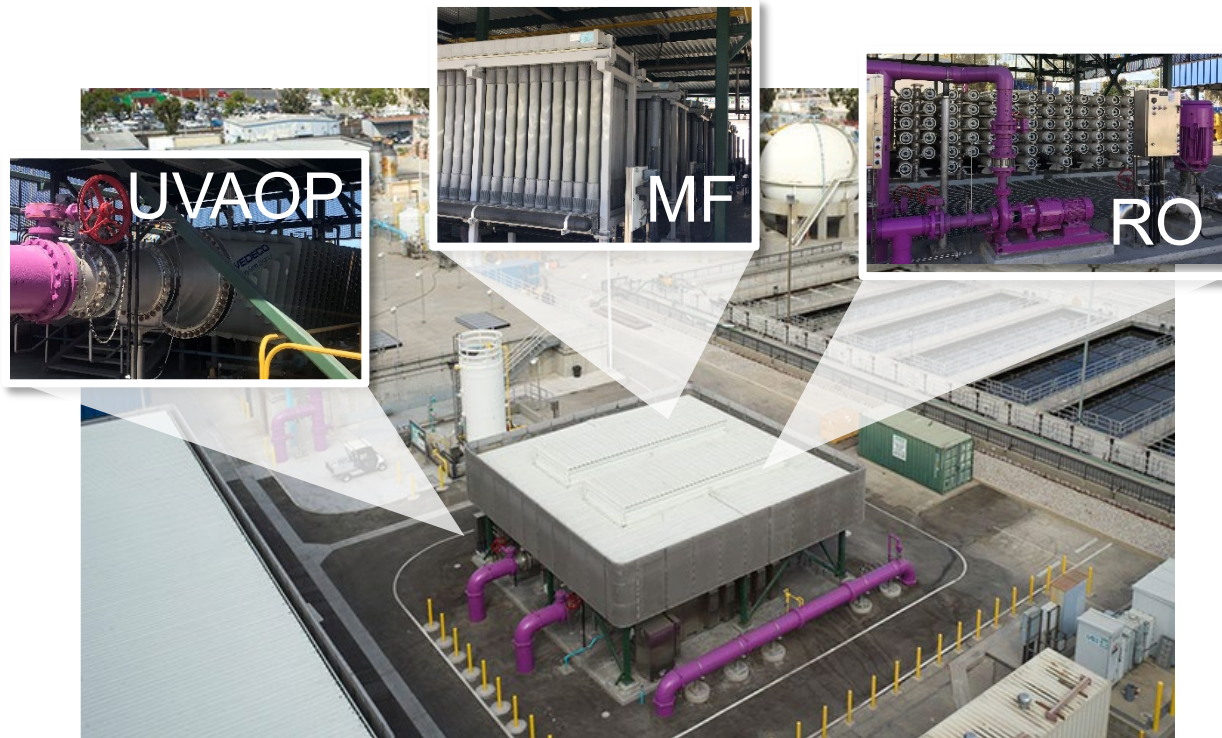


Removes Pathogens	Removes Trace Organics	Removes Solids	Pretreats Ahead of AWWP
✓	✓	✓	✓

Conventional Activated Sludge



Removes Pathogens	Removes Trace Organics	Removes Solids	Pretreats Ahead of AWWP
✓	✓	✓	✓



CITY OF LOS ANGELES TERMINAL ISLAND
AWPF

**Example Full-scale
RBAT for PRW:**

- LA (CA)
- OCWD (CA)
- Scottsdale (AZ)
- Big Spring (TX)



CITY OF ALTAMONTE SPRINGS (FLORIDA)
DEMONSTRATION AWPF

**Example Full-scale
CBAT for PRW:**

- Gwinnett (GA)
- UOSA (VA)
- El Paso (TX)
- Rio Rancho (NM)

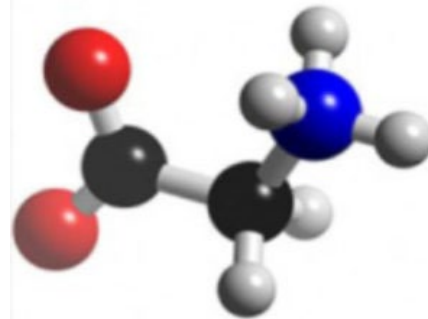
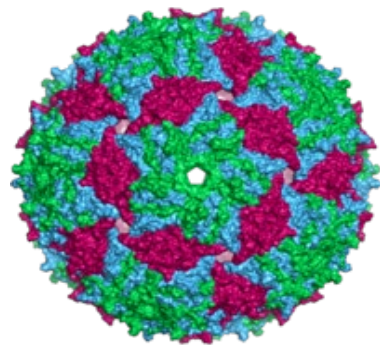




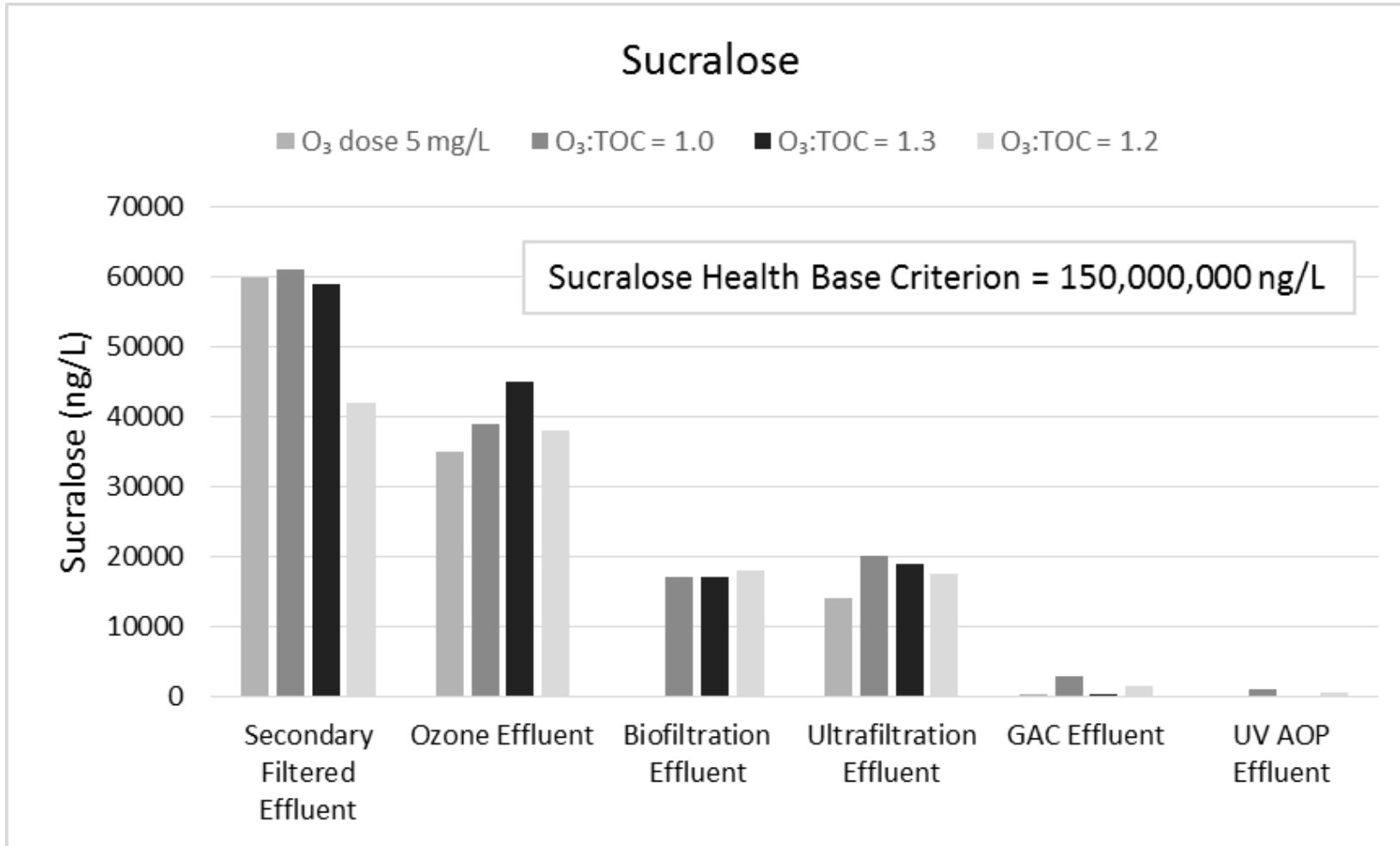
Quality

Purified Recycled Water Quality is Proven...Many Times Over

- Highest Quality Municipal Water (and lowest risk)
- Meets all Regulated Parameters, vast majority non-detectable
- Robust barrier to emerging pollutants
- Robust barrier to pathogens



CECs, PPCPs, PFCs are Removed

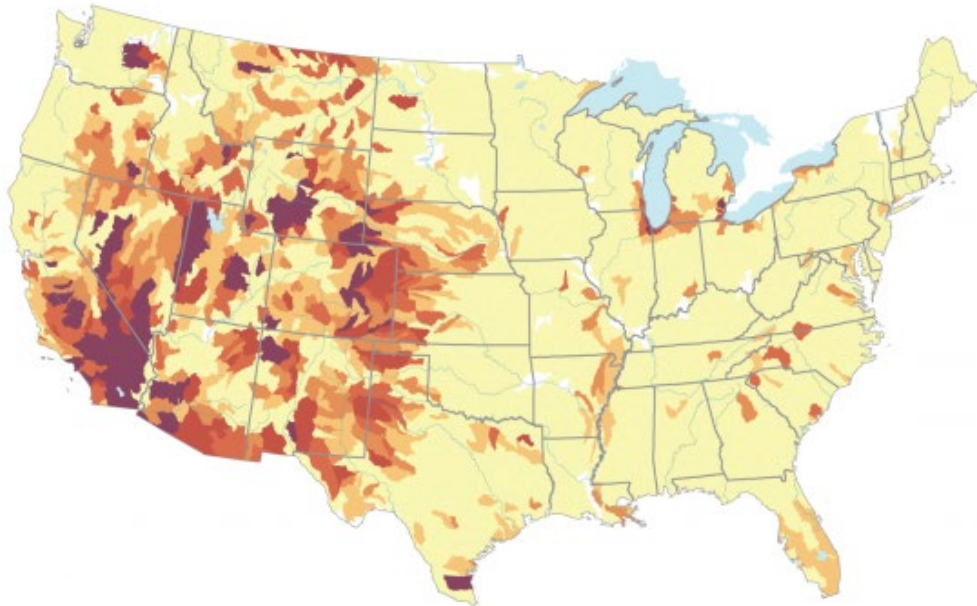




Need

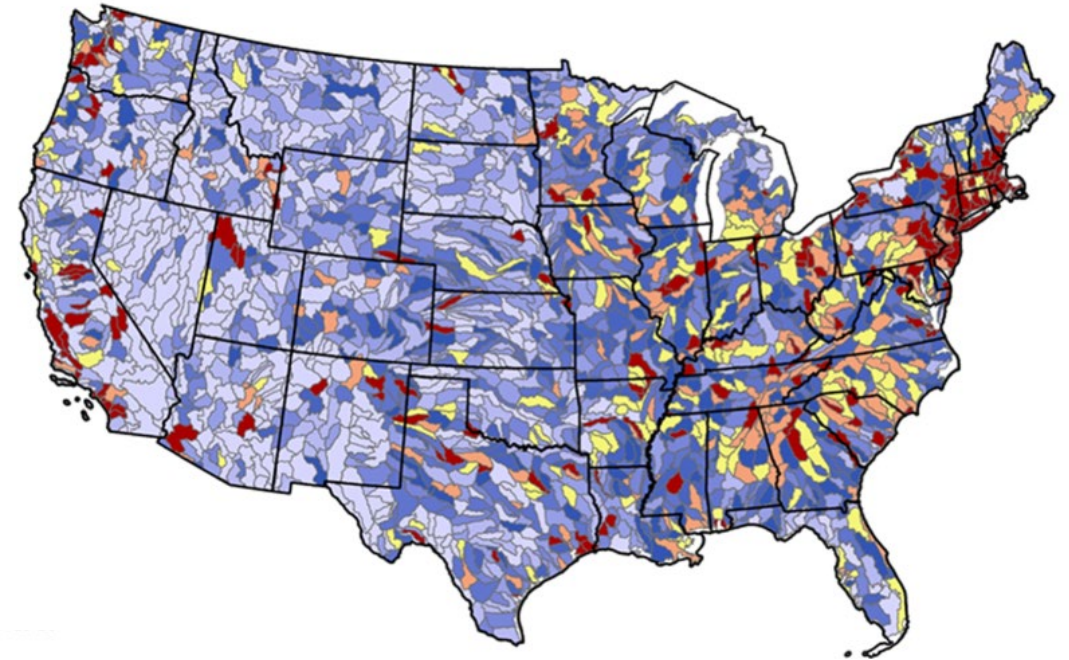
DUAL Drivers for (Potable) Reuse in the US

1. Water Supply Scarcity



Source <https://www.globalchange.gov/browse/multimedia/water-stress-us>

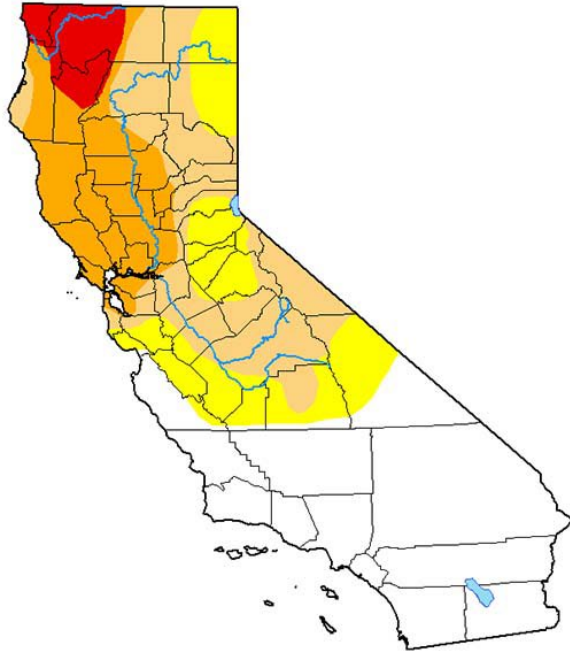
2. Discharge Avoidance (Nutrients)



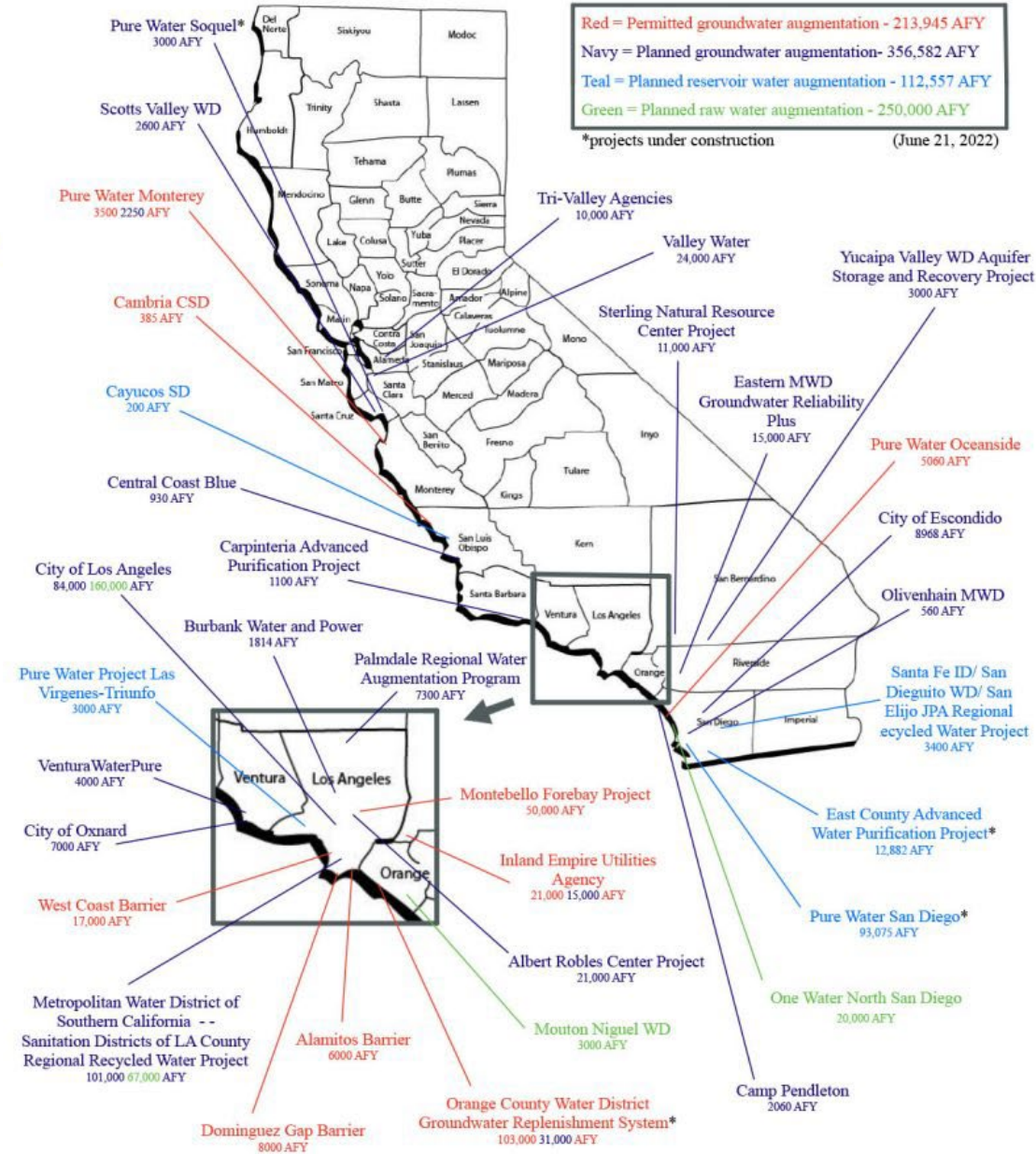
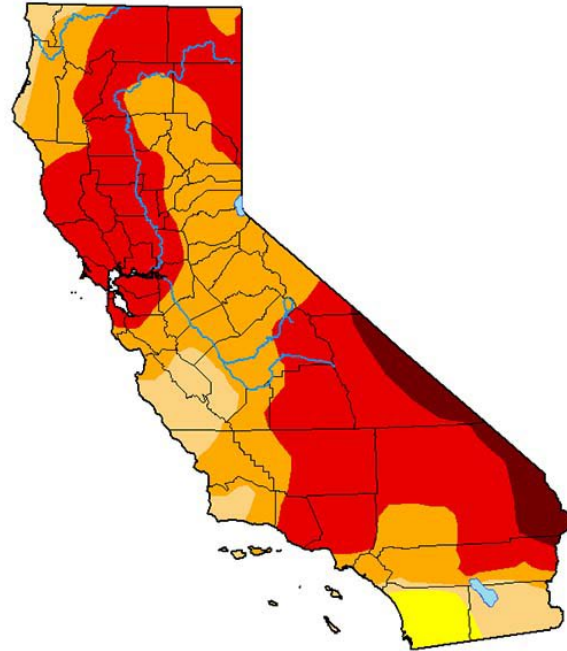
Source: Sabo et al, 2021 at <https://iopscience.iop.org/article/10.1088/2515-7620/abf296>

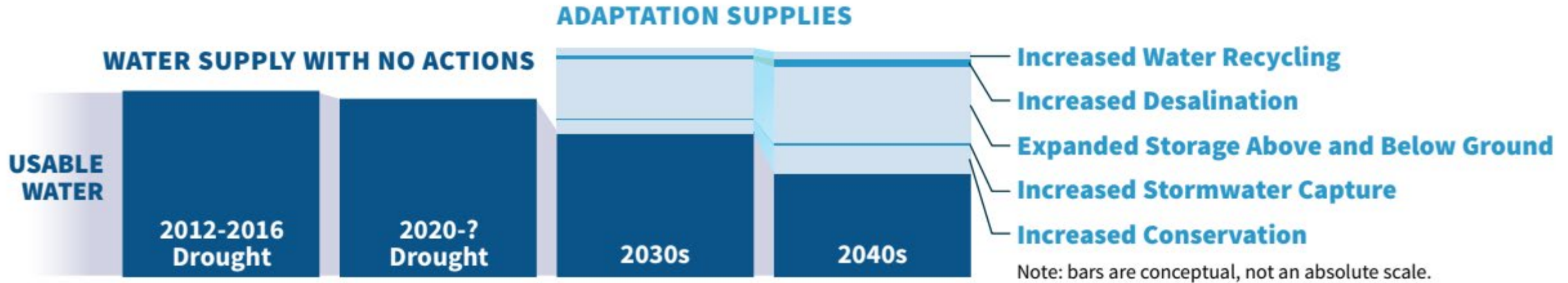
Drought Drives PRW in CA

April 28, 2020



April 27, 2021





- 72,000 acre-feet per year of additional recycled water by 2030 (800,000 AFY total)
- 1,000,000 acre-feet per year of additional recycled water by 2040 (1,800,000 AFY total)



History



California has been doing potable water reuse since the 1960s

THEN



NOW





The Gold Standard for PRW treatment, Orange County Water District, was implemented 20 years ago





State of California Support

// California PRW Regulations

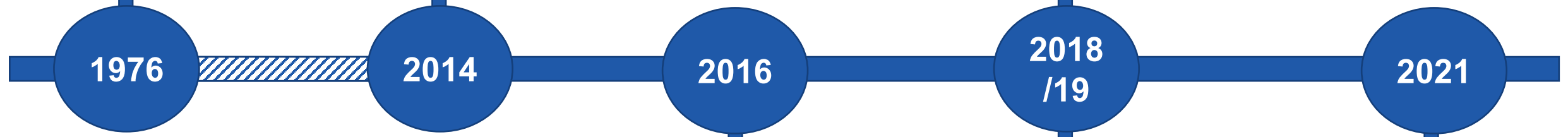
		Groundwater Recharge	Surface Water Augmentation	Draft Direct Potable Reuse
Pathogen Control	Virus	12-log	12 to 14-log	20-log
	<i>Giardia</i>	10-log	10 to 12-log	14-log
	<i>Crypto</i>	10-log	10 to 12-log	15-log
Treatment Train	Tertiary disinfected	RO + UV/AOP	RO + UV/AOP	Ozone/BAC + RO + UV/AOP
Plans	<ul style="list-style-type: none"> • Operations Plan 	<ul style="list-style-type: none"> • Joint Plan • Operations Plan • Treatment Plant and Distribution System Impacts Plan 	<ul style="list-style-type: none"> • Joint Plan • Water Safety Plan • Operations Plan • Pathogen & Chemical Control Point Monitoring and Response Plan • Monitoring Plan • Corrosion Control & Stabilization Plan 	

// Regulatory Context for DPR

First GWR Project

Final GWR Criteria

Final SWA Criteria



DPR Feasibility Reports

DPR Framework

2021 Draft DPR Criteria (March and August)



The image shows the Table of Contents for the "DPR Framework 2nd Edition Addendum - Early Draft of Anticipated Criteria for Direct Potable Reuse".

Table of Contents	
Table of Contents	2
1. Introduction	2
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37. Regulatory Process	6
38. Regulatory Process	6
39. Regulatory Process	6
40. Regulatory Process	6
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42. Regulatory Process	6
43. Regulatory Process	6
44. Regulatory Process	6
45. Regulatory Process	6



IMPLEMENTATION OF DIRECT POTABLE REUSE

A GUIDE FOR CALIFORNIA WATER UTILITIES

FINAL | MARCH 2021



13 KEY COMPONENTS TO IMPLEMENT POTABLE REUSE PROJECTS

- 1 Project Definition
- 2 Technical, Managerial, and Financial Capability
- 3 Interagency Agreements
- 4 Outreach and Education
- 5 Wastewater Source Control
- 6 Wastewater Treatment
- 7 Multiple Treatment Barriers
- 8 Pathogen Control and Monitoring
- 9 Chemical Control and Monitoring
- 10 Operations
- 11 Water Quality Management
- 12 Emerging Issues
- 13 Collaboration to Spur Innovation

NWRI
NATIONAL WATER RESEARCH INSTITUTE

carollo
Engineers... Working Wonders With Water®



Engagement

// A Clear Engagement Plan is Essential to a Successful Engagement Program



WaterReuse Colorado
Advancing Direct Potable Reuse to Optimize
Water Supplies and Meet Future Demands

Technical Memorandum 2
COMMUNICATIONS AND OUTREACH
PLAN FOR DIRECT POTABLE REUSE
IN COLORADO

FINAL | July 2018



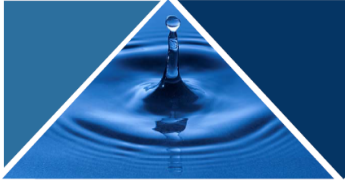
Table 2 Key Audiences in Colorado for DPR Outreach

Group or Organization	Priority ⁽¹⁾	Category
Local elected officials	High	Influencer
Press/media	High	Influencer
Town Councils and Boards	High	Implementer
Community organizations	High	Influencer
Local health department	High	Influencer
Managers/executives	High	Influencer and Implementer
Community leaders (public as water utility customers)	High	User
Colorado Department of Public Health and Environment	High	Regulator/Agency
Industry (food and beverage, manufacturing, etc.)	High	User
Environmental groups	High	Influencer
State legislators	Medium	Influencer
Water associations and organizations (CFWE, AWWA, CWC, etc.)	Medium	Influencer
Basin Roundtables and Inter-Basin Compact Commission	Medium	Influencer
Schools (K-12)	Medium	Influencer
Secondary education academic staff	Medium	Influencer
Water providers' leadership (Front Range Water Council, etc.)	Medium	Influencer
Water providers operations staff	Medium	Implementer
Water resources staff	Medium	Implementer
Agriculture and downstream constituents	Medium	Users
Colorado Water Conservation Board	Medium	Regulator/Agency
Medical professionals	Low	Influencer
Other state elected officials	Low	Influencer
Development community	Low	Influencer

Notes:

(1) Audiences prioritized by workgroup based on initial impact on DPR project implementation.

// Transparent Information and Direct Engagement Leads to Public Confidence in PRW




Increasing Public Acceptance of Direct Potable Reuse as a Drinking Water Source in Ventura, California

A Group Project submitted in partial satisfaction of the requirements for the degree of Master of Environmental Science and Management for the Bren School of Environmental Science & Management

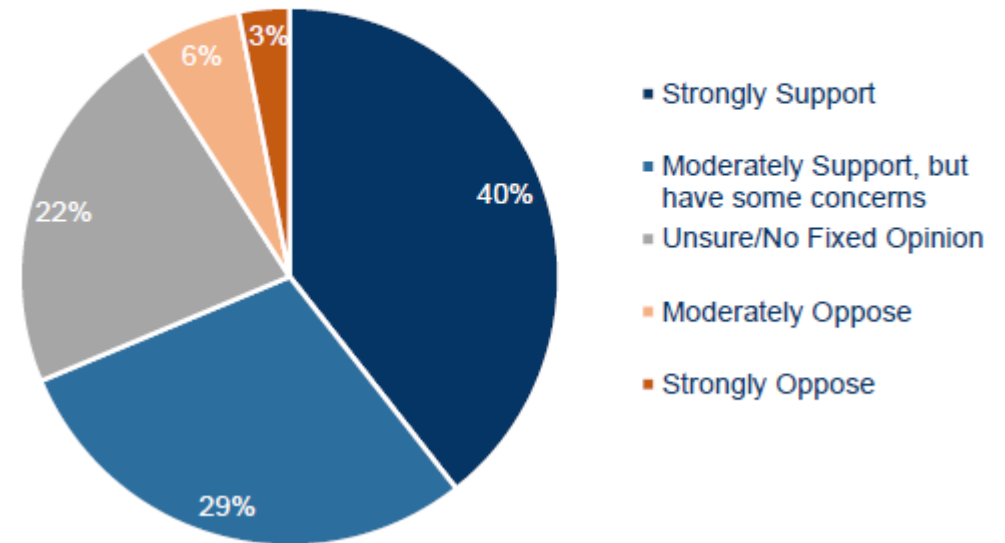
By
Sara-Katherine Coxon
C. Micah Eggleton
Catherine Iantosca
Jennifer Sajor

Advisors: Naomi Tague & Jeff Dozier



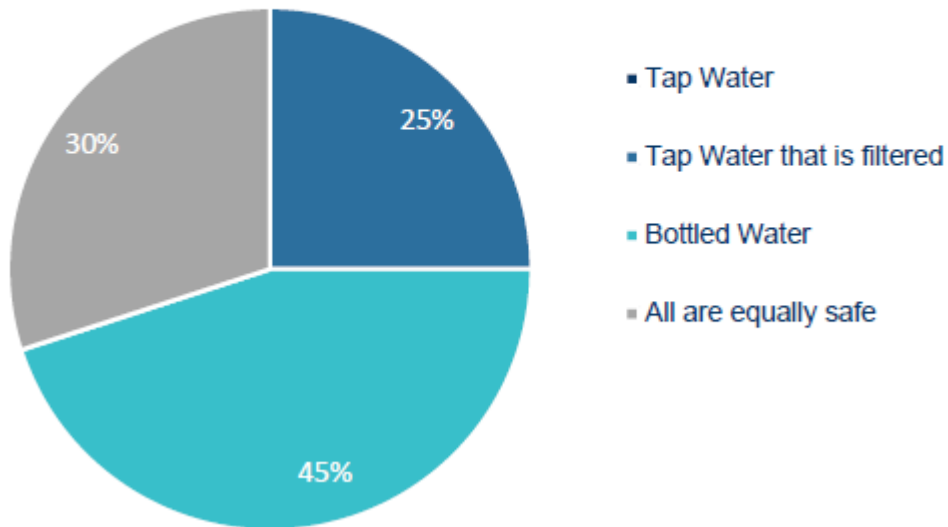
BREN SCHOOL
ENVIRONMENTAL SCIENCE & MANAGEMENT
UNIVERSITY OF CALIFORNIA, SANTA BARBARA

Q: How do you feel about adding advanced purified water to Ventura's drinking water supply if it was treated to the same quality (or higher) as regular tap water?

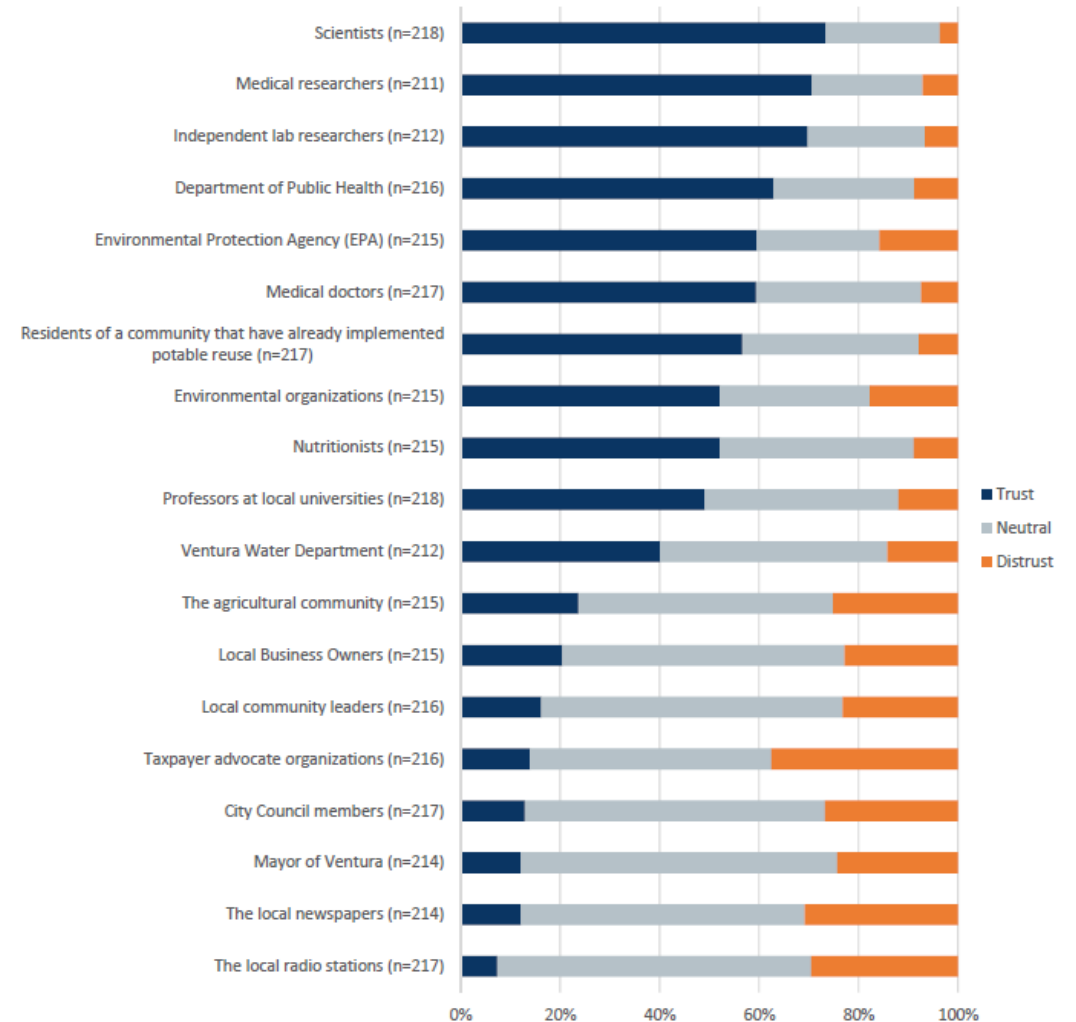


// Understanding Public Perspective Focuses Engagement

Q: What water source do you consider the safest?
(APW Opposed Segment)

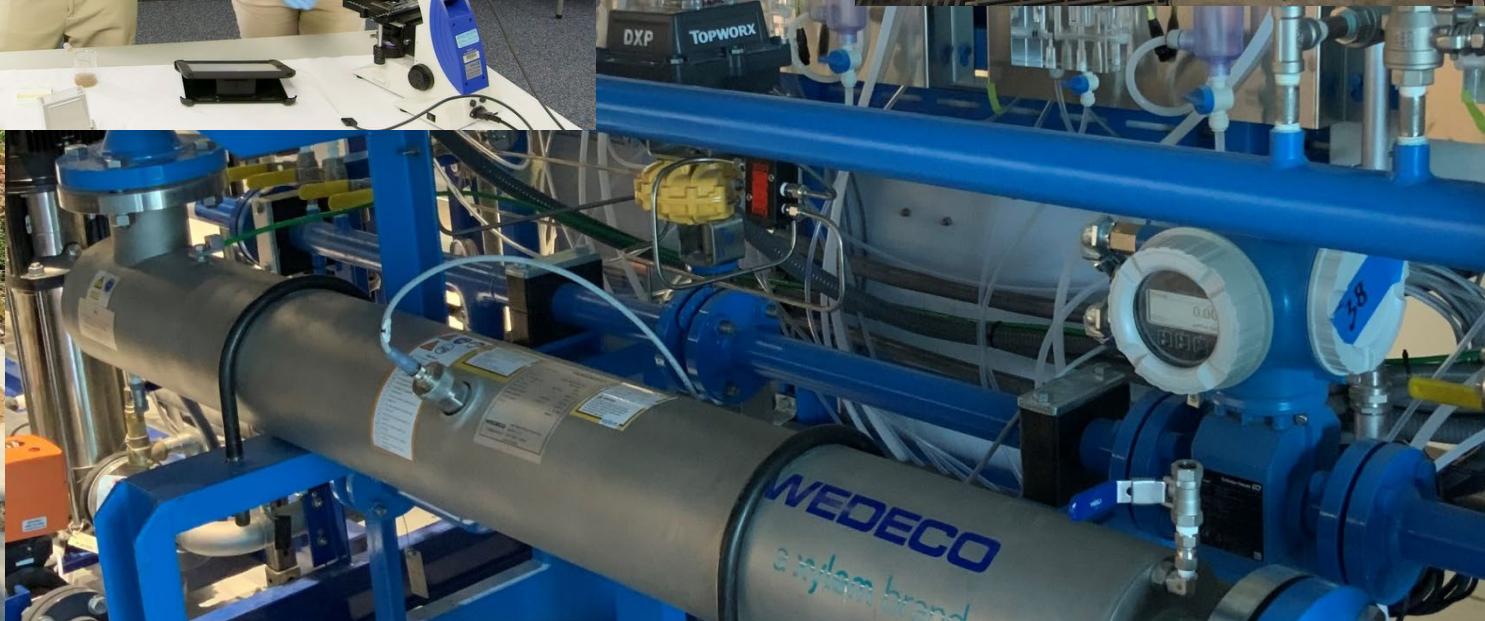


The following is a list of people and organizations that may provide information about advanced purified water. Please tell us who you would generally trust or distrust.





Using Science **(and Demos!)** to Foster
Regulatory, Political, and Public Support



Why Do a Demonstration?



Regulatory



Engineering



Operations



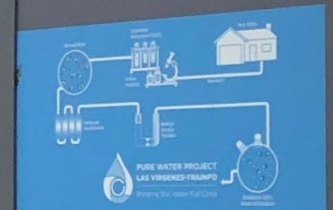
Public



R&D

Las Virgenes-Triunfo Pure Water Project

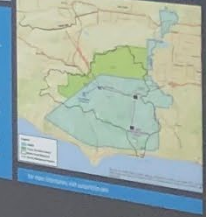
BRINGING OUR WATER FULL-CIRCLE



Our Pure Water



Having good water is essential to our health and well-being. The Pure Water Project is a landmark achievement that will ensure we have clean, safe water for generations to come.



Our Climate Appropriate Landscaping

Climate-appropriate landscaping is essential for reducing water consumption and maintaining healthy ecosystems.



Las
Virgenes-
Triunfo Pure
Water
Project



Las Virgenes-Triunfo Pure Water Project



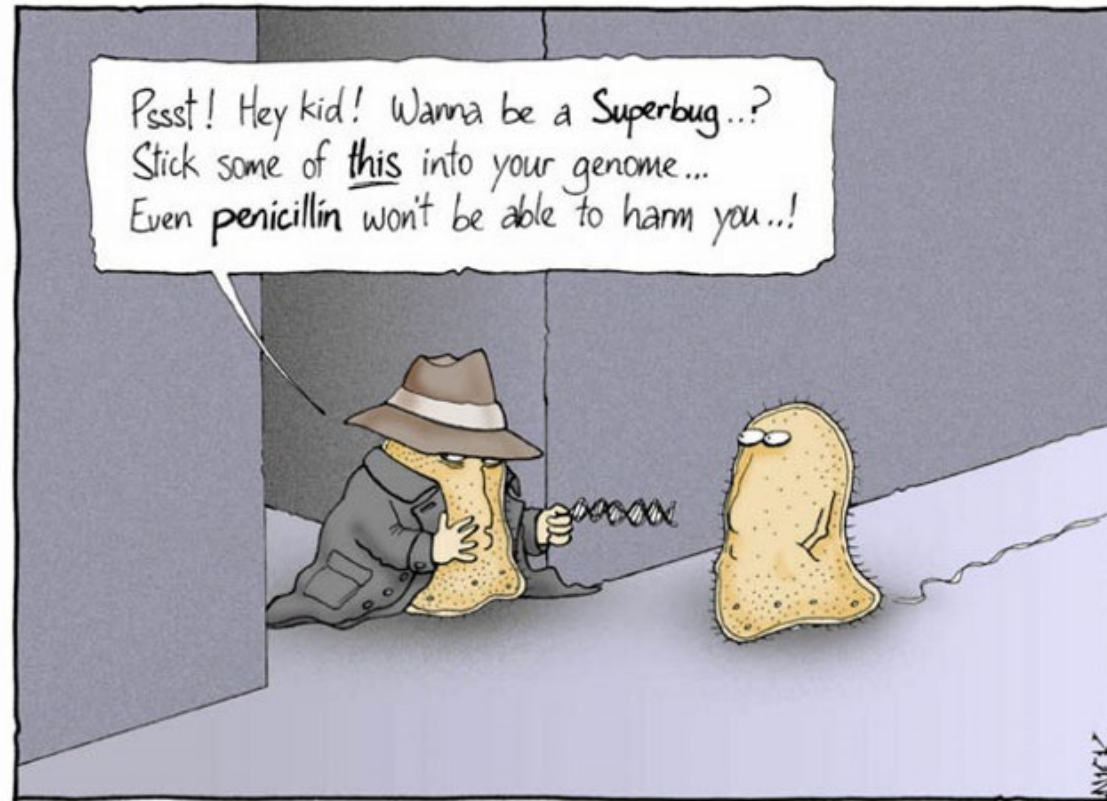


Closing PRW Jokes

// The YUCK Factor



// Emerging Pollutants



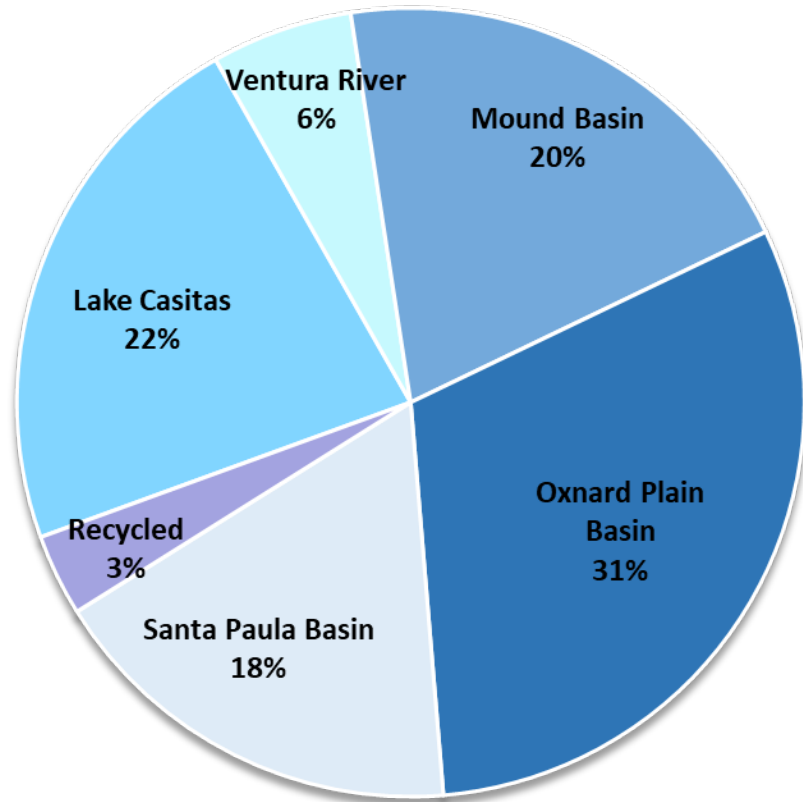
It was on a short-cut through the hospital kitchens that Albert was first approached by a member of the Antibiotic Resistance.

Drought, Seawater Intrusion, and Potable Reuse on California's Central Coast



Presenting:
Gina Dorrington
General Manager
Ventura Water

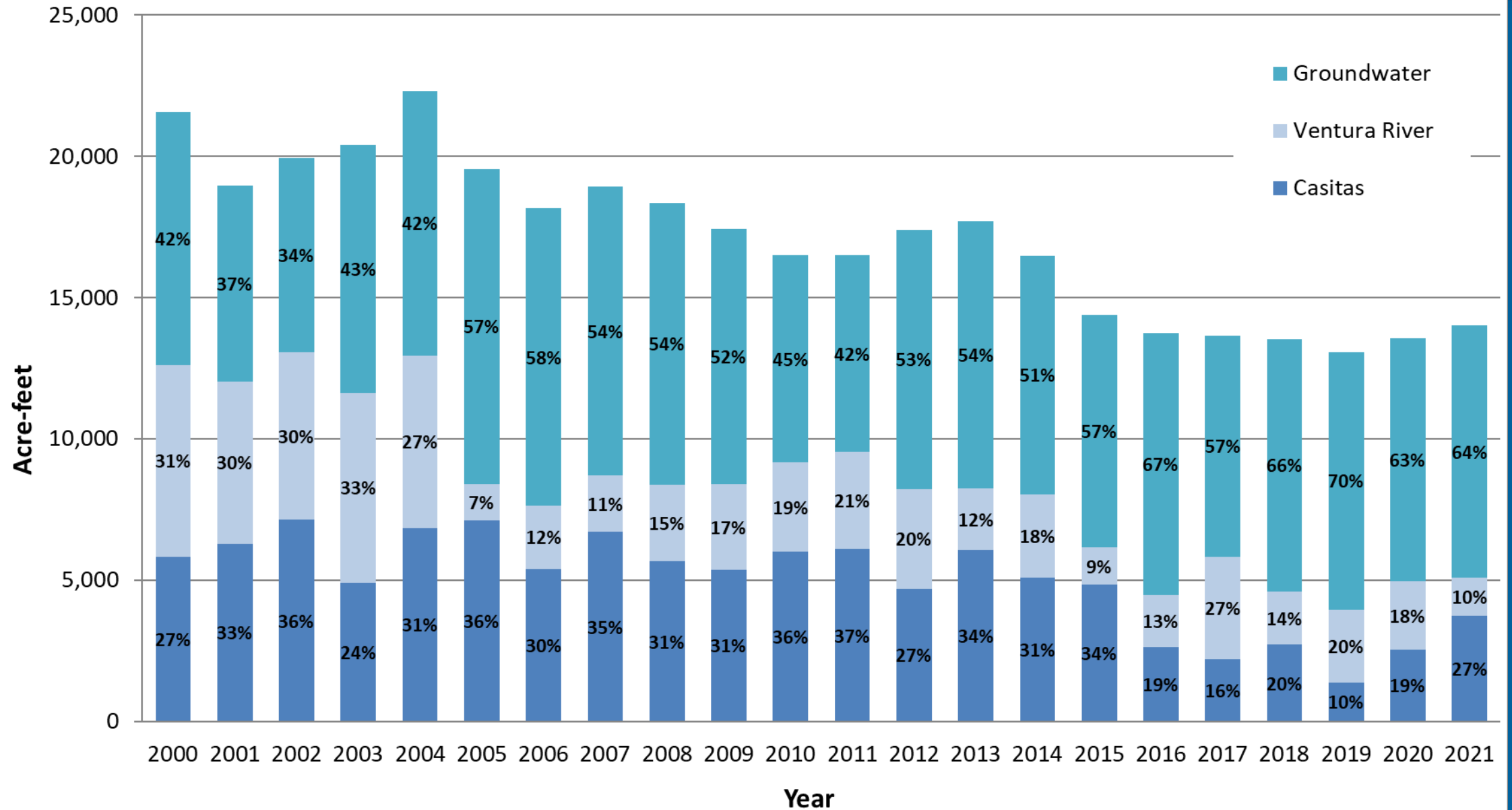




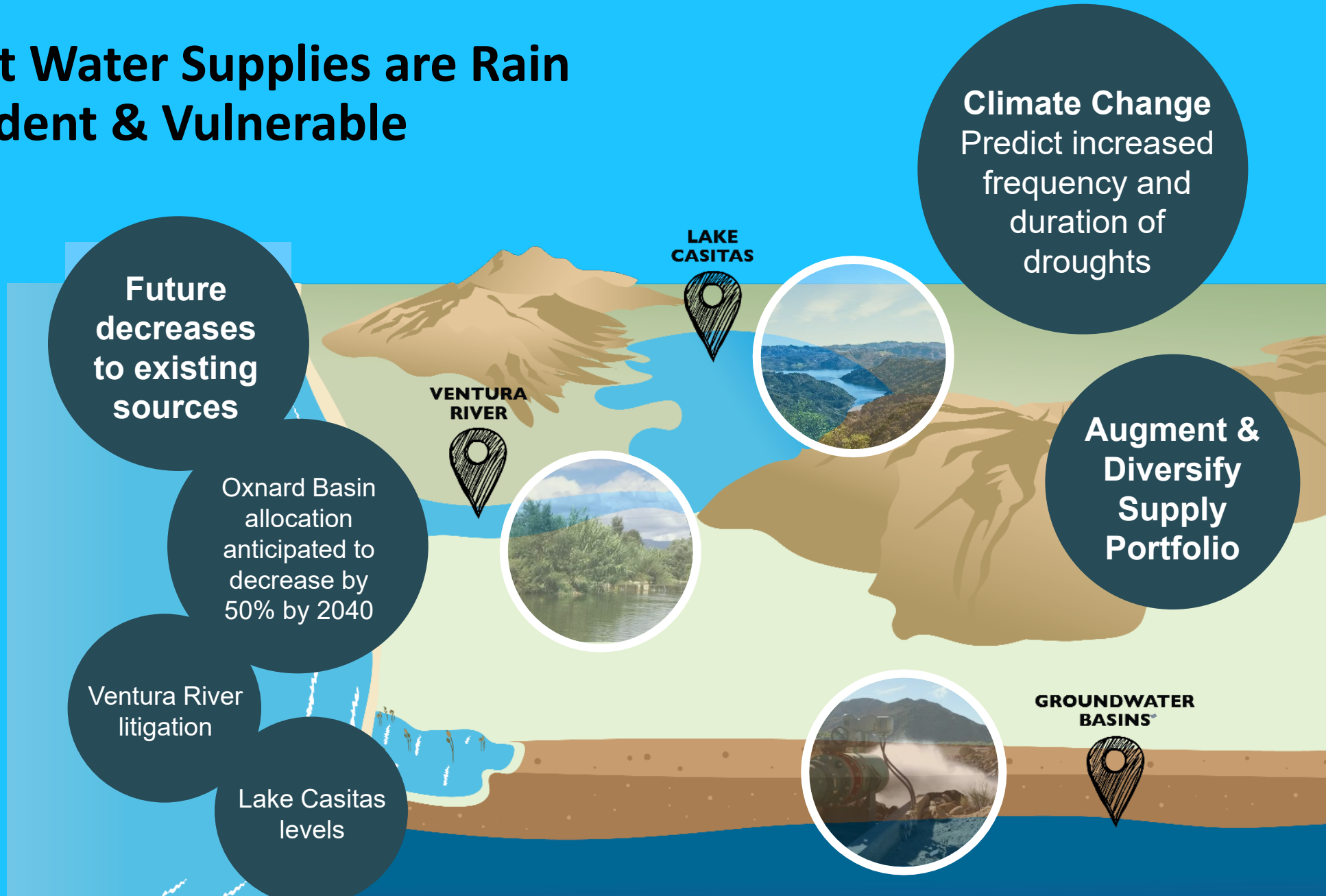
2022 Current Water Supply: 17,224 acre-feet (drought conditions)



2000-2021 Water Production By Source



Current Water Supplies are Rain Dependent & Vulnerable



2021

- Governor Newsom calls on Californians to voluntarily reduce water use by 15%

2022

- State Water Resources Control Board adopts emergency regulations to encourage up to 20% water savings

Future

- State to set standards on indoor and outdoor residential water use and CII outdoor water use

2027

- City required to meet standards



- Need to develop new water supply for resiliency, diversity, and projected growth



- Continue to promote and meet conservation levels

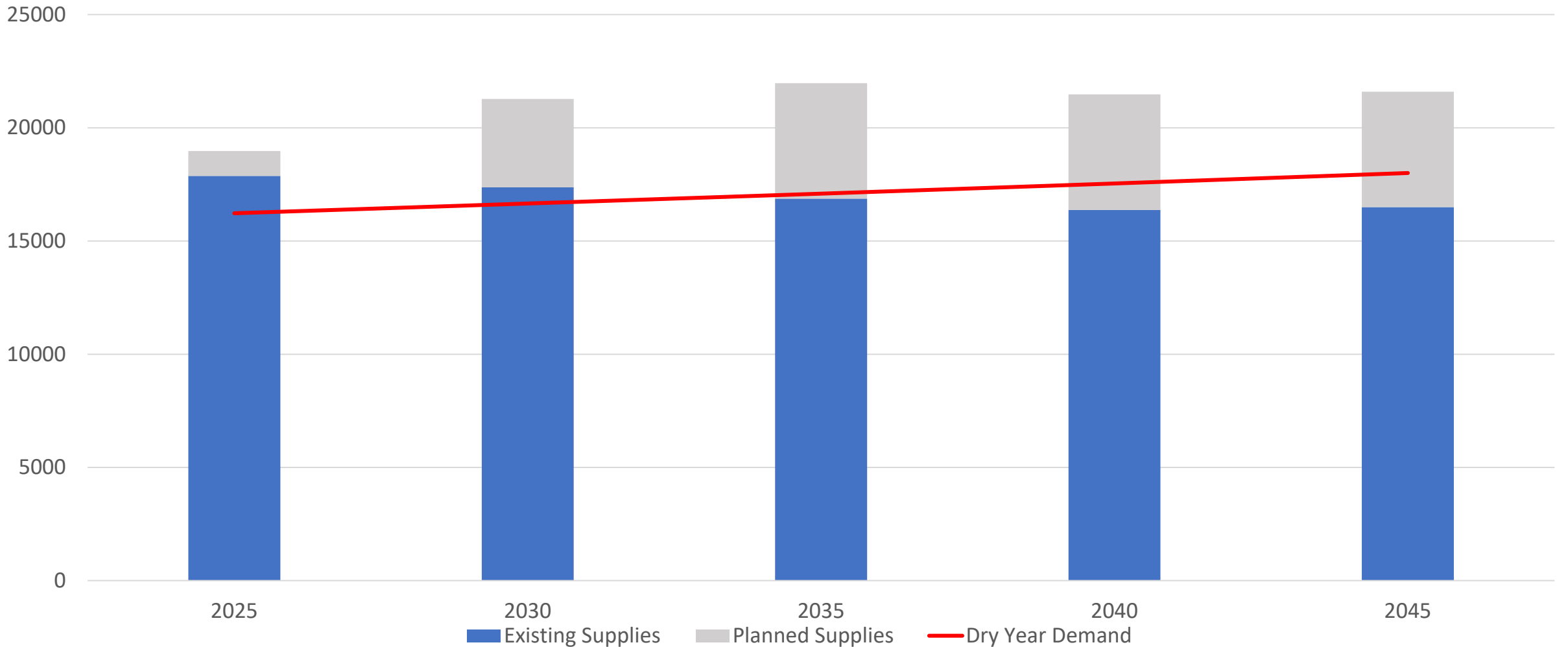


- Tell residents to reduce water usage while justifying rate increases



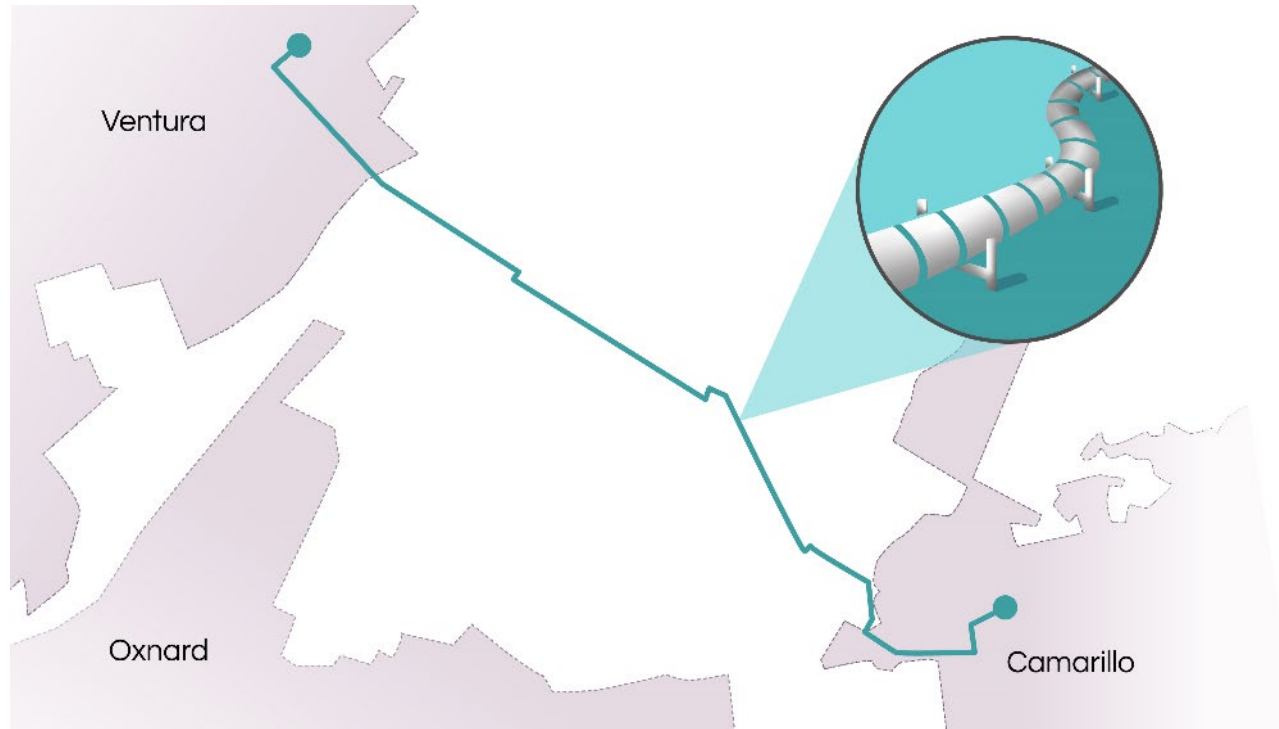
- Keep operational and maintenance pace with aging infrastructure

Five Year Drought Demand and Supply Projections (UWMP)





State Water Interconnection Project



- Now in permitting and design
- Regional Agreements in-progress
- Estimated Start of Construction: **2024**



SECURE
water supply

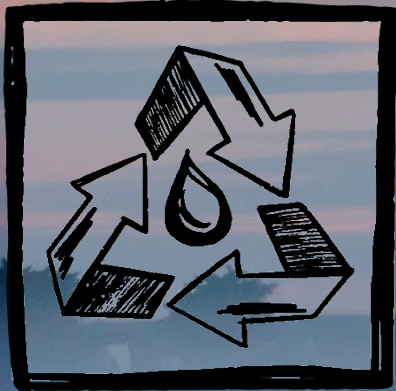


EMERGENCY
intertie



IMPROVE
water quality

Long-Term Solutions



DROUGHT RESISTANT

Creates a drought-resistant, reliable water supply that isn't dependent on rain

ENVIRONMENTALLY PROTECTIVE

Reduces water discharge to the estuary, creating a natural environment for endangered species

HIGH QUALITY

Produces high-quality drinking water



Components

New Outfall and Concentrate Line

New Advanced Water Purification Facility (AWPF)

New Pumps/Pipes to Wells

Ventura Water Reclamation Facility (VWRF)

New Pumps/Pipes VWRF to AWPF

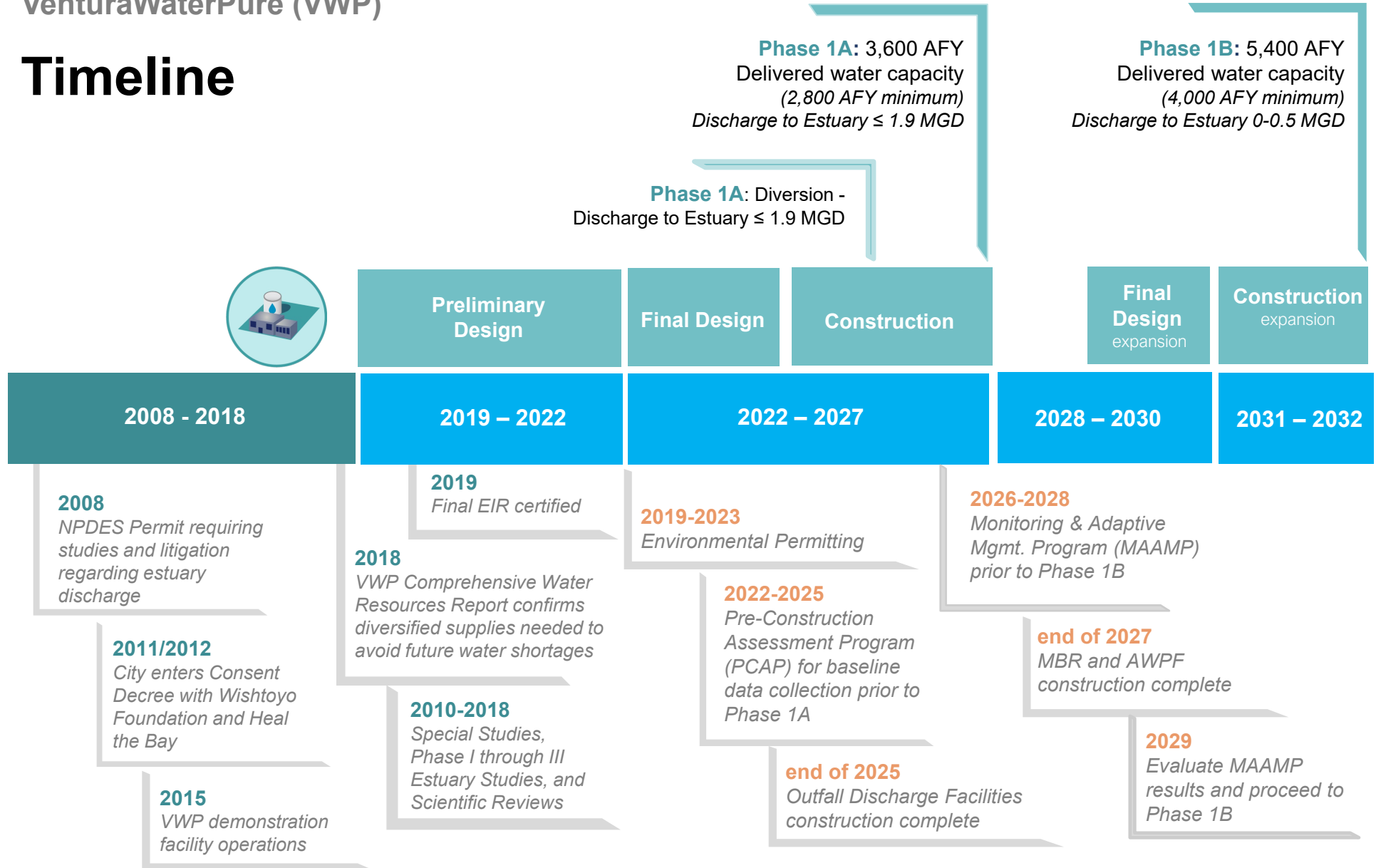
Santa Clara River Estuary

New Injection Wells

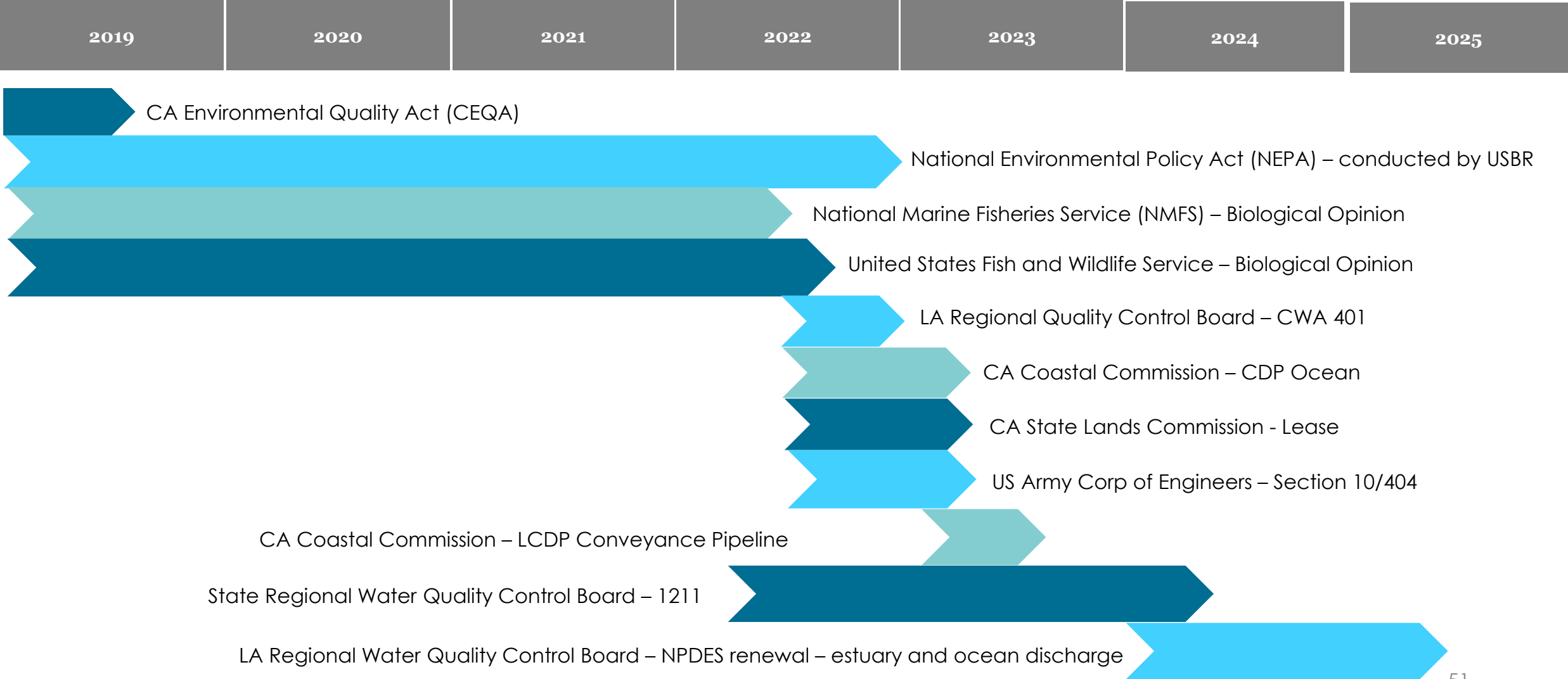


VenturaWaterPure (VWP)

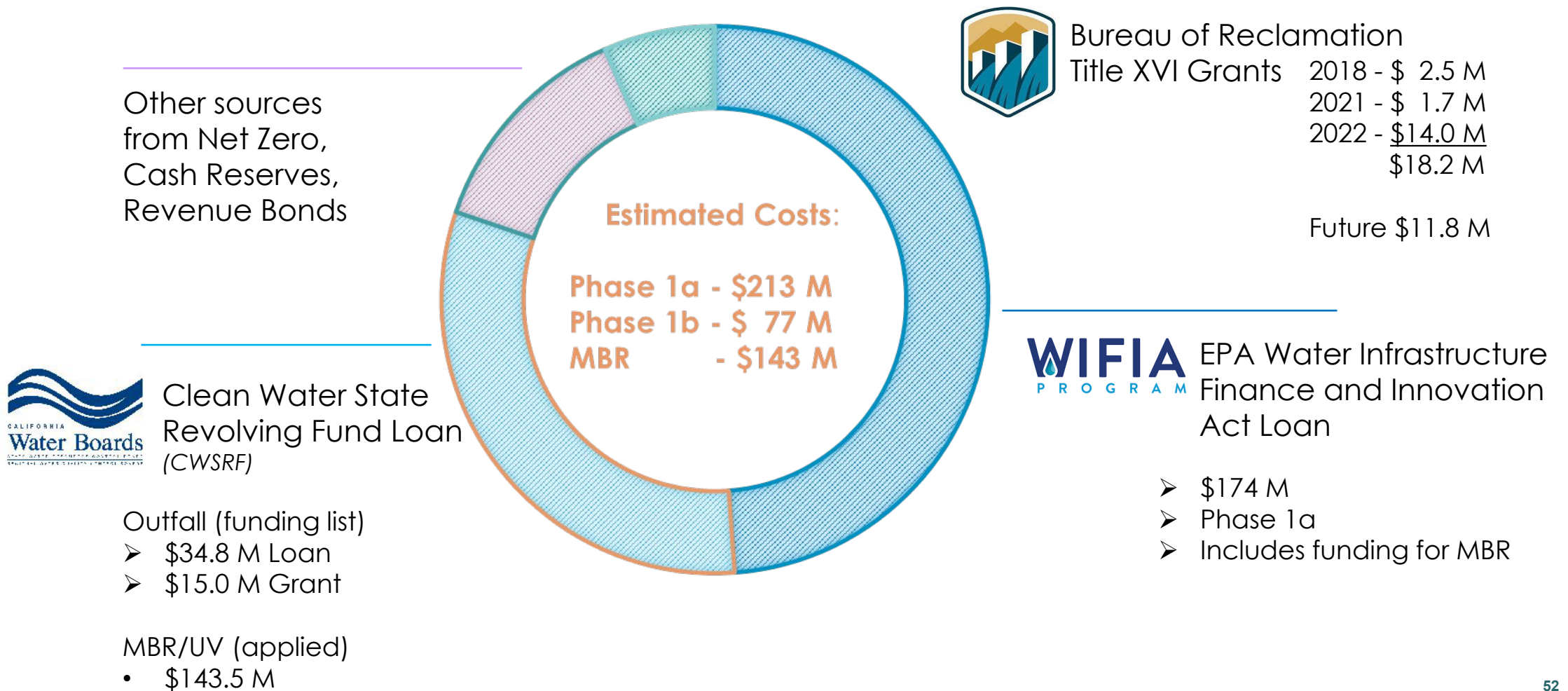
Timeline

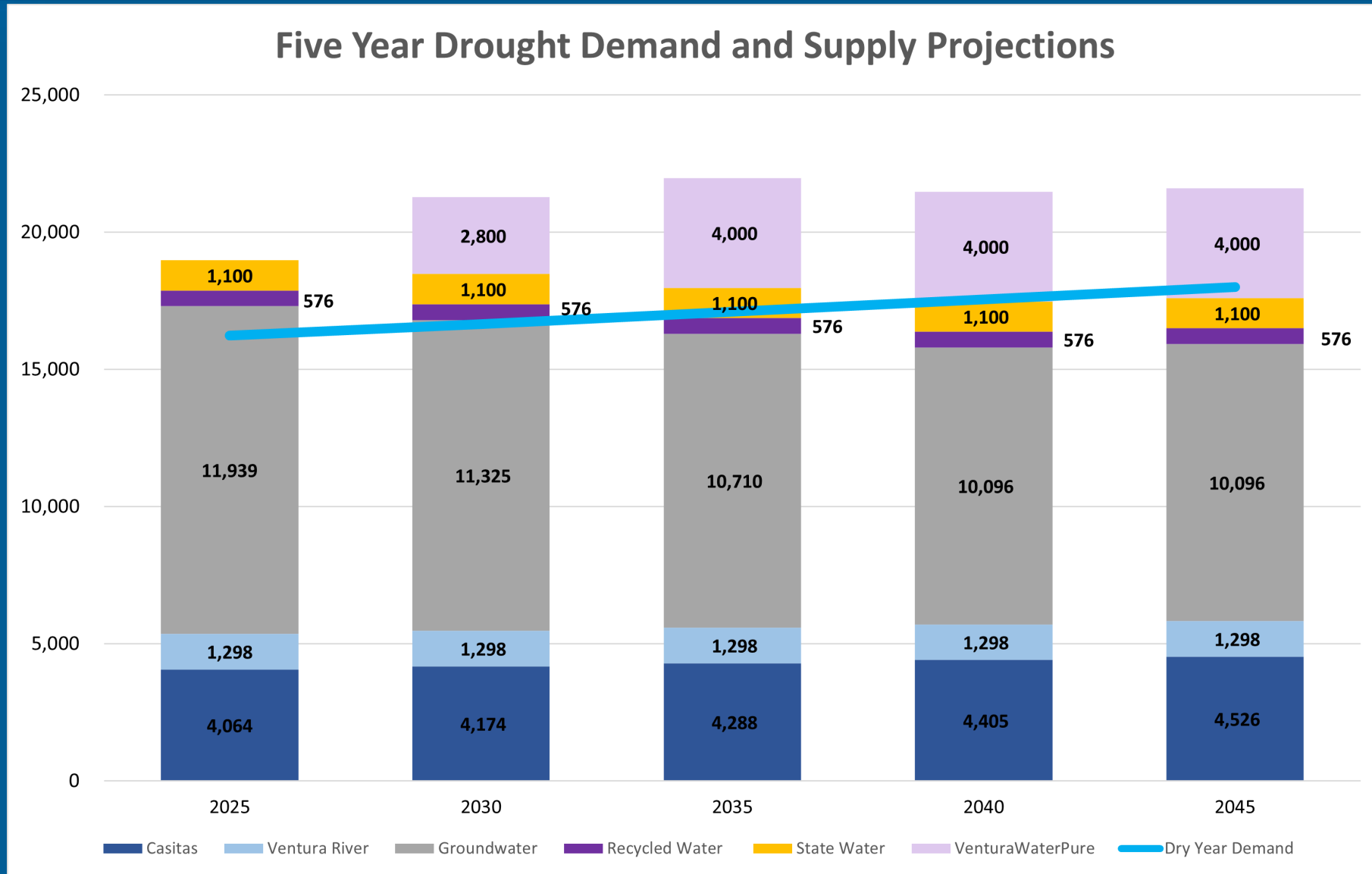


Outfall Permits - Anticipated Schedule

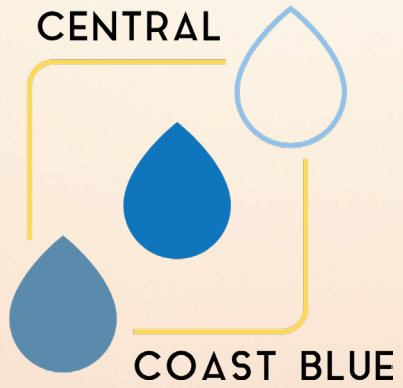


Potential Funding Scenario





Thank You!



CENTRAL COAST BLUE

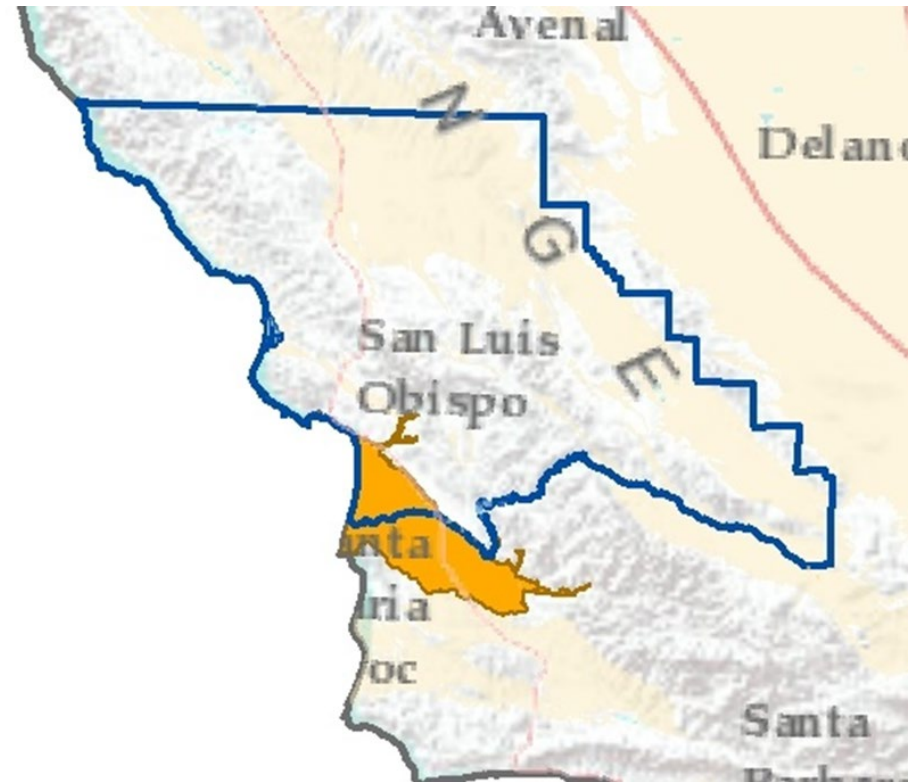
Cal Cities - DRAFT

March 8, 2023



Central Coast of California

San Luis Obispo County



0 30 60 120
Mile



LOPEZ RESERVOIR

STATE WATER PROJECT

However, prolonged drought and changing environmental conditions have dramatically impacted these sources.

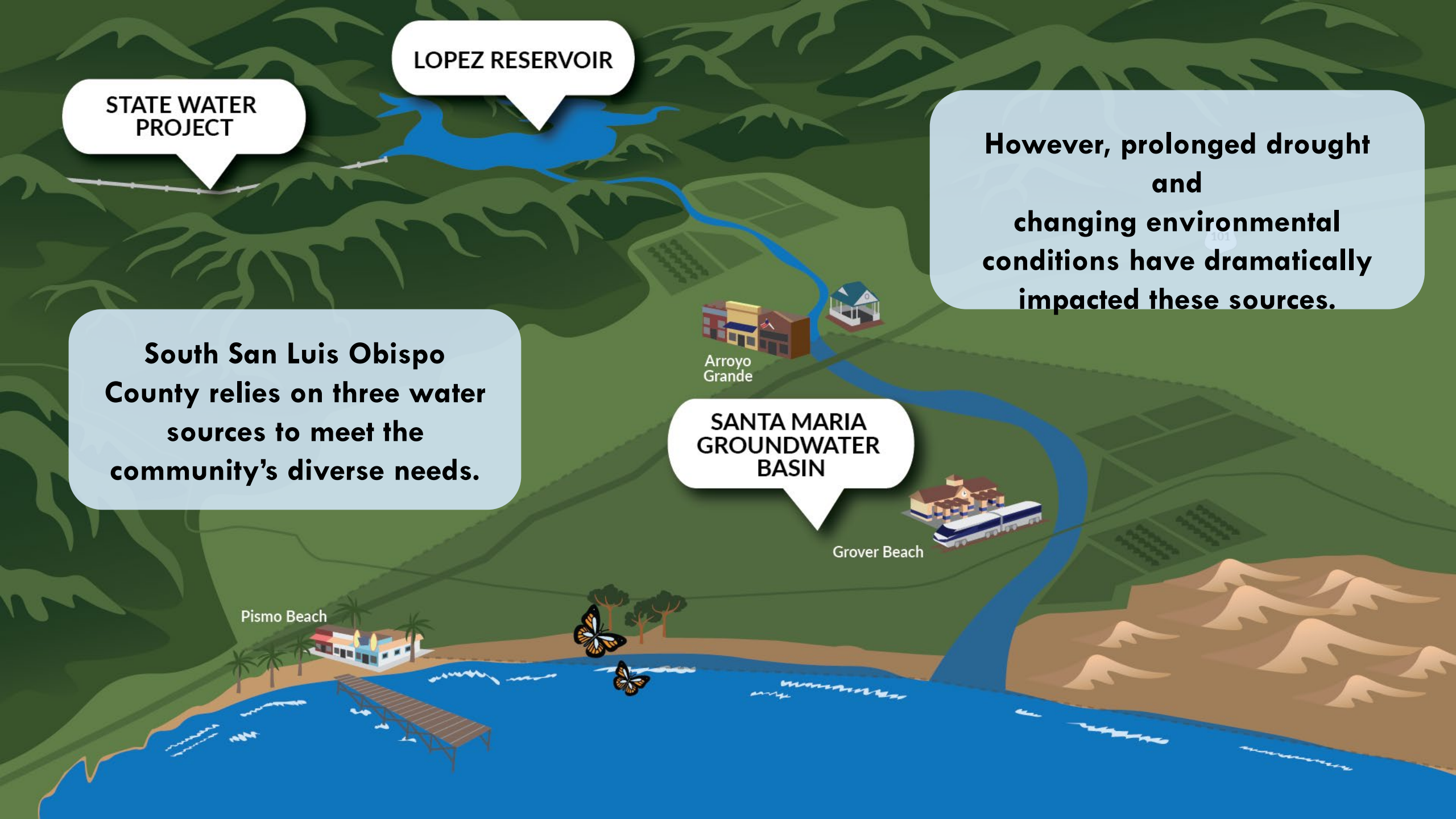
South San Luis Obispo County relies on three water sources to meet the community's diverse needs.

SANTA MARIA GROUNDWATER BASIN

Arroyo Grande

Grover Beach

Pismo Beach



HOW IT WORKS

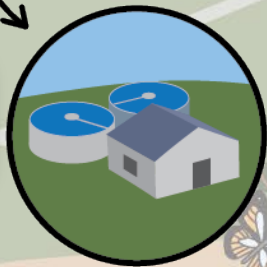
Community

The community's wastewater is sent to Pismo Beach's Wastewater Treatment Plant



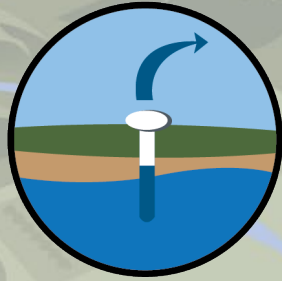
Pismo Beach Wastewater Treatment Plant

Treated water from Pismo Beach's WWTP is piped to the new Advanced Water Purification Facility



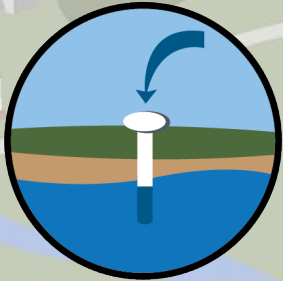
Groundwater Pumping

Later, the purified water is pumped for drinking water



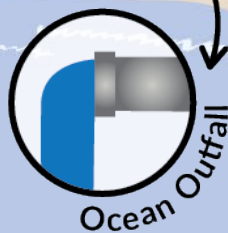
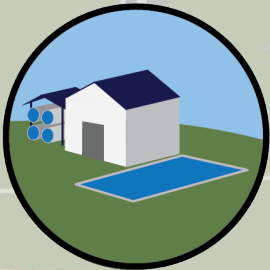
Groundwater Storage

~900 AFY of purified water is injected into the groundwater basin to replenish the supply and to protect against seawater intrusion



Advanced Water Purification Facility

Advanced treatment technologies purify the water and stabilize it for groundwater recharge

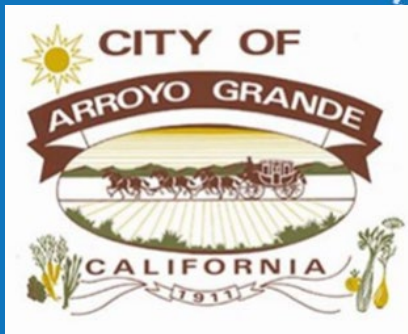


The community benefits from a new, drought-proof water supply

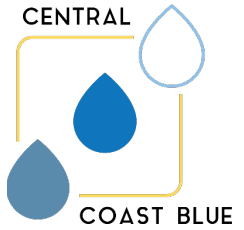
Pismo Beach

Arroyo Grande

101



Regional Collaboration

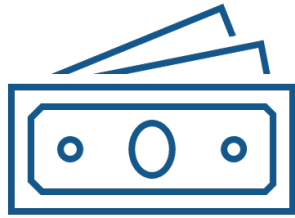


- Competing Priorities
- Ownership Share
- Affordability
- Project Management Structure
- Joint Powers Agreement

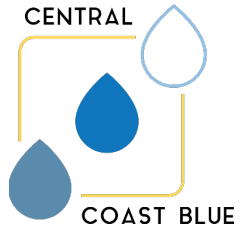


Economics

- Affordability
- Funding & Financing Strategy
- Cost Share Agreement
- Market Conditions
- Facility Operation



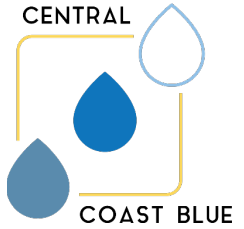
Public Outreach



- Public Awareness
- Public Acceptance
- Rate Impacts



Regulatory Landscape



- CEQA/EIR
- EIR Addendum
- Coastal Development Permit
- Federal Consultations

An aerial photograph of a coastal town, likely Santa Cruz, California. The town is built on a hillside overlooking a sandy beach and the ocean. A long pier extends into the water. The background features rolling green hills under a blue sky with scattered white clouds. A large, semi-transparent yellow rounded rectangle is overlaid on the image, containing the text "THANK YOU".

THANK YOU

