Purified Recycled Water for Drinking in California
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 and Illustration:
- **Indirect Potable Reuse (IPR)**: Reusing treated wastewater in a way that does not directly contact drinking water supplies. This typically involves storing the treated wastewater in a reservoir to allow for dilution and to provide a margin of safety before it is released for reuse.
- **Dilution and Storage Time**: The process of allowing the treated wastewater to be stored and diluted in a reservoir before being used. This helps to reduce the concentration of contaminants and provides a safety buffer.
- **Surface Water Reservoir**: A reservoir used for storing treated wastewater to allow for dilution and storage.
- **Water Supply**: The source of water that is treated and stored in the reservoir.
- **AWTF (Advanced Water Treatment Facility)**: A facility that further treats water to meet high-quality standards for reuse.
- **WTP (Water Treatment Plant)**: A facility responsible for treating water for potable use.
- **City**: The entity that uses the treated water for various purposes.
- **WWTP (Wastewater Treatment Plant)**: A facility where wastewater is treated to a level suitable for discharge into the environment or for reuse.

Diagram:
- The treated effluent from the WWTP is stored in the surface water reservoir.
- Over time, the water is diluted and stored in the reservoir.
- The stored water is then treated further at the AWTF to ensure it meets high-quality standards.
- The treated water is then supplied to the city for various uses.
Definitions - Direct Potable Reuse (DPR) via Raw Water Augmentation
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.
// Two Types of Advanced Treatment Trains
Proven to produce safe potable quality water

Reverse Osmosis-Based Advanced Treatment

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

Carbon-Based Advanced Treatment

- Removes Pathogens: Yes
- Removes Trace Organics: Yes
- Removes Salinity: No
- Requires Brine Disposal: No
- Energy-Intensive: 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 AWPF

**Conventional Activated Sludge**

- Removes Pathogens
- Removes Trace Organics
- Removes Solids
- Pretreats Ahead of AWPF
Example Full-scale RBAT for PRW:
- LA (CA)
- OCWD (CA)
- Scottsdale (AZ)
- Big Spring (TX)

Example Full-scale CBAT for PRW:
- Gwinnett (GA)
- UOSA (VA)
- El Paso (TX)
- Rio Rancho (NM)
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

Sucralose Health Base Criterion = 150,000,000 ng/L
Need
DUAL Drivers for (Potable) Reuse in the US

1. Water Supply Scarcity

2. Discharge Avoidance (Nutrients)

Drought Drives PRW in CA

April 28, 2020

April 27, 2021

For more project information, click here: https://docs.google.com/spreadsheets/d/1Elh07x0o5RZ49/aV2kPZdXv4JY8u-1VG7L94PQk-7L5/edit
- 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)
California has been doing potable water reuse since the 1960s.
The Gold Standard for PRW treatment, Orange County Water District, was implemented 20 years ago.
## California PRW Regulations

<table>
<thead>
<tr>
<th>Pathogen Control</th>
<th>Groundwater Recharge</th>
<th>Surface Water Augmentation</th>
<th>Draft Direct Potable Reuse</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virus</td>
<td>12-log</td>
<td>12 to 14-log</td>
<td>20-log</td>
</tr>
<tr>
<td>Giardia</td>
<td>10-log</td>
<td>10 to 12-log</td>
<td>14-log</td>
</tr>
<tr>
<td>Crypto</td>
<td>10-log</td>
<td>10 to 12-log</td>
<td>15-log</td>
</tr>
</tbody>
</table>

### Treatment Train
- Tertiary disinfected
- RO + UV/AOP
- RO + UV/AOP
- Ozone/BAC + RO + UV/AOP

### Plans
- Operations Plan
- Joint Plan
- Operations Plan
- Treatment Plant and Distribution System Impacts Plan
- 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
- DPR Feasibility Reports
- DPR Framework
- Final SWA Criteria
- 2021 Draft DPR Criteria (March and August)

Year:
- 1976
- 2014
- 2016
- 2018
- 2021
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
A Clear Engagement Plan is Essential to a Successful Engagement Program
Transparent Information and Direct Engagement Leads to Public Confidence in PRW
Understanding Public Perspective Focuses Engagement

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

- Tap Water: 30%
- Tap Water that is filtered: 25%
- Bottled Water: 45%
- All are equally safe: 5%

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:

- Scientists (n=218)
- Medical researchers (n=211)
- Independent lab researchers (n=212)
- Department of Public Health (n=216)
- Environmental Protection Agency (EPA) (n=215)
- Medical doctors (n=217)
- Residents of a community that have already implemented potable reuse (n=217)
- Environmental organizations (n=215)
- Nutritionists (n=215)
- Professors at local universities (n=218)
- Ventura Water Department (n=212)
- The agricultural community (n=215)
- Local Business Owners (n=215)
- Local community leaders (n=216)
- Taxpayer advocate organizations (n=216)
- City Council members (n=217)
- Mayor of Ventura (n=214)
- The local newspapers (n=214)
- The local radio stations (n=217)
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
Las Virgenes-Triunfo Pure Water Project
Las Virgenes-Triunfo Pure Water Project
// The YUCK Factor

SO WHAT'S THE BIG DEAL? I'VE BEEN DRINKING IT FOR YEARS.

CITY PLANS RECYCLING TOILET WATER FOR DRINKING
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
Water Supply

2022 Current Water Supply: 17,224 acre-feet (drought conditions)
2000-2021 Water Production By Source

- Groundwater
- Ventura River
- Casitas

Year


Actre-feet

0 5,000 10,000 15,000 20,000 25,000

42% 37% 34% 43% 42% 57% 58% 54% 54% 52% 45% 42% 53% 54% 51% 57% 67% 57% 66% 70% 63% 64%

31% 30% 30% 33% 27% 7% 12% 11% 15% 17% 19% 21% 20% 12% 18% 9% 67% 57% 66% 70% 63% 64%

27% 33% 36% 24% 31% 36% 30% 35% 31% 31% 36% 37% 27% 34% 31% 34% 19% 27% 16% 20% 19% 27%
Current Water Supplies are Rain Dependent & Vulnerable

**IMPACTS & RISKS**

- **Climate Change**: Predict increased frequency and duration of droughts
- **Augment & Diversify Supply Portfolio**
- **Future decreases to existing sources**
  - Oxnard Basin allocation anticipated to decrease by 50% by 2040
  - Ventura River litigation
  - Lake Casitas levels

**Lake Casitas**

**Ventura River**
# Drought Orders and Conservation

<table>
<thead>
<tr>
<th>Year</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2021</td>
<td>Governor Newsom calls on Californians to voluntarily reduce water use by 15%</td>
</tr>
<tr>
<td>2022</td>
<td>State Water Resources Control Board adopts emergency regulations to encourage up to 20% water savings</td>
</tr>
<tr>
<td>Future</td>
<td>State to set standards on indoor and outdoor residential water use and CII outdoor water use</td>
</tr>
<tr>
<td>2027</td>
<td>City required to meet standards</td>
</tr>
</tbody>
</table>
Challenges of Drought and Water Supply

- 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
Long-Term Demand and Supply Projections

Five Year Drought Demand and Supply Projections (UWMP)

- Existing Supplies
- Planned Supplies
- Dry Year Demand
Long-Term Solutions

- **Lawn Replacement Rebate**
- **Free Efficient Sprinkler Nozzles**
- **Smart Irrigation Controller**
- **Free Water Survey**
- **Washing Machine Rebate Program**
- **50% off Rain Barrel**
- **Instant Hot Water Recirculating Pump**
- **Toilet Rebate**

- EMERGENCY INTERTIE
- IMPROVE WATER QUALITY
- • Now in permitting and design
- • Regional Agreements in progress
- • Estimated Start of Construction: 2024
Long-Term Solutions

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
# VenturaWaterPure (VWP)

## Timeline

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>NPDES Permit requiring studies and litigation regarding estuary discharge</td>
</tr>
<tr>
<td>2011/2012</td>
<td>City enters Consent Decree with Wishtoyo Foundation and Heal the Bay</td>
</tr>
<tr>
<td>2015</td>
<td>VWP demonstration facility operations</td>
</tr>
<tr>
<td>2018</td>
<td>VWP Comprehensive Water Resources Report confirms diversified supplies needed to avoid future water shortages</td>
</tr>
<tr>
<td>2019</td>
<td>Final EIR certified</td>
</tr>
<tr>
<td>2019-2023</td>
<td>Environmental Permitting</td>
</tr>
<tr>
<td>2022</td>
<td>Pre-Construction Assessment Program (PCAP) for baseline data collection prior to Phase 1A</td>
</tr>
<tr>
<td>2022-2025</td>
<td>Preliminary Design expansion</td>
</tr>
<tr>
<td>2026-2028</td>
<td>Monitoring &amp; Adaptive Mgmt. Program (MAAMP) prior to Phase 1B</td>
</tr>
<tr>
<td>2028-2030</td>
<td>Final Design expansion</td>
</tr>
<tr>
<td>2029</td>
<td>Evaluate MAAMP results and proceed to Phase 1B</td>
</tr>
<tr>
<td>2031-2032</td>
<td>Construction expansion</td>
</tr>
</tbody>
</table>

### Phase 1A: Diversion - Discharge to Estuary ≤ 1.9 MGD
- Delivered water capacity: 3,600 AFY (2,800 AFY minimum)
- Discharge to Estuary: ≤ 1.9 MGD

### Phase 1B: 5,400 AFY Delivered water capacity (4,000 AFY minimum)
- Discharge to Estuary: 0-0.5 MGD

- Phase 1A:
  - 2019 – 2022: Final EIR certified
  - 2022 – 2027: Pre-Construction Assessment Program (PCAP) for baseline data collection prior to Phase 1A
  - End of 2025: Outfall Discharge Facilities construction complete

- Phase 1B:
  - 2026-2028: Monitoring & Adaptive Mgmt. Program (MAAMP) prior to Phase 1B
  - End of 2027: MBR and AWPF construction complete
  - 2029: Evaluate MAAMP results and proceed to Phase 1B

- 2030-2032: Construction expansion
## Outfall Permits - Anticipated Schedule

<table>
<thead>
<tr>
<th>Year</th>
<th>Agenda Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>CA Environmental Quality Act (CEQA)</td>
</tr>
<tr>
<td>2020</td>
<td>National Environmental Policy Act (NEPA) – conducted by USBR</td>
</tr>
<tr>
<td>2021</td>
<td>National Marine Fisheries Service (NMFS) – Biological Opinion</td>
</tr>
<tr>
<td>2022</td>
<td>United States Fish and Wildlife Service – Biological Opinion</td>
</tr>
<tr>
<td>2023</td>
<td>LA Regional Quality Control Board – CWA 401</td>
</tr>
<tr>
<td>2024</td>
<td>CA Coastal Commission – CDP Ocean</td>
</tr>
<tr>
<td>2025</td>
<td>CA State Lands Commission - Lease</td>
</tr>
</tbody>
</table>

- CA Coastal Commission – LCDP Conveyance Pipeline
- State Regional Water Quality Control Board – 1211
- LA Regional Water Quality Control Board – NPDES renewal – estuary and ocean discharge
Potential Funding Scenario

Clean Water State Revolving Fund Loan (CWSRF)
- Outfall (funding list)
  - $34.8 M Loan
  - $15.0 M Grant
- MBR/UV (applied)
  - $143.5 M

Estimated Costs:
- Phase 1a - $213 M
- Phase 1b - $77 M
- MBR - $143 M

Other sources from Net Zero, Cash Reserves, Revenue Bonds

EPA Water Infrastructure Finance and Innovation Act Loan
- $174 M
- Phase 1a
- Includes funding for MBR

Bureau of Reclamation
Title XVI Grants
- 2018 - $2.5 M
- 2021 - $1.7 M
- 2022 - $14.0 M
- $18.2 M
- Future $11.8 M
Long-Term Demand and Supply Projections

Five Year Drought Demand and Supply Projections

- Casitas
- Ventura River
- Groundwater
- Recycled Water
- State Water
- VenturaWaterPure
- Dry Year Demand

Year | Demand | Supply
--- | --- | ---
2025 | 11,939 | 1,100
2030 | 11,325 | 1,100
2035 | 10,710 | 1,100
2040 | 10,096 | 1,100
2045 | 10,096 | 1,100

Water Quality Improvement

EMERGENCY

Long-Term Demand and Supply Projections
Thank You!
Central Coast of California
San Luis Obispo County
South San Luis Obispo County relies on three water sources to meet the community’s diverse needs.

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

Advanced Water Purification Facility
Advanced treatment technologies purify the water and stabilize it for groundwater recharge.

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

Groundwater Pumping
Later, the purified water is pumped for drinking water.

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