



**the international  
water association**

**[www.iwa-network.org](http://www.iwa-network.org)**



the international  
water association

A photograph of a water treatment facility. In the foreground, there is a metal walkway with railings overlooking a large, circular concrete tank filled with dark blue water. The tank has a series of small, white, circular floats or sensors along its inner edge. In the background, there is a chain-link fence and some greenery under a clear sky.

# Water Reuse and Public Engagement – A Global Look

12 DECEMBER 2024

**inspiring change**

## AGENDA

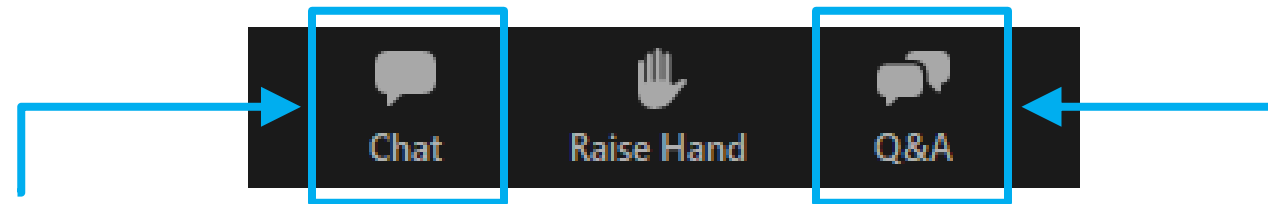
- Welcome/Housekeeping Rules/Poll  
*Kristan VandenHeuvel, The Water Tower, USA*
- Introductory Remarks  
*Josef Lahnsteiner, WABAG, Austria*
- Communication Strategies  
*Mark Millan, Data Instincts, USA*
- UK Initiatives  
*Heather Smith, Cranfield University, UK*
- Global Potable Reuse Map  
*Danielle Francis, Water Services Association of Australia*
- Q&A Panel Discussion  
*Speaker and moderator*
- Close  
*Kristan VandenHeuvel, The Water Tower, USA*

## WEBINAR INFORMATION



- This webinar will be **recorded and made available “on-demand”** on the [IWA Connect Plus](#) platform and IWA Network website, with presentation slides, and other information.
- The **speakers** are responsible for **securing copyright permissions** for any work that they will present of which they are not the legal copyright holder.
- The opinions, hypothesis, conclusions or recommendations contained in the presentations and other materials are the **sole responsibility of the speaker(s)** and do not necessarily reflect IWA opinion.

## WEBINAR INFORMATION



- **‘Chat’ box:** please use this for general requests and for interactive activities.
- **‘Q&A’ box:** please use this to send questions to the panelists. (We will answer these during the discussions)

*Please Note: Attendees’ microphones are muted. We cannot respond to ‘Raise Hand’.*

# MODERATOR & SPEAKER



**Kristan VandenHeuvel**  
The Water Tower  
USA



**Josef Lahnsteiner**  
WABAG  
Austria



**Mark Millan**  
Data Instincts  
USA



**Heather Smith**  
Cranfield University  
UK



**Danielle Francis**  
Water Services  
Association of  
Australia



# Introduction to the IWA Water Reuse Specialist Group

IWA WEBINAR “WATER REUSE AND PUBLIC ENGAGEMENT – A GLOBAL LOOK”, 12  
DECEMBER, 2024

©Shutterstock



# WATER REUSE SPECIALIST GROUP

- The Water Reuse Specialist Group is globally the leading forum in water reclamation and reuse and is the largest Specialist Group of IWA.
- Our major aim is the implementation of safe water reuse practice through the promotion of successful water reuse projects and sharing of information via our international knowledge network, website and conferences.



Courtesy City of Windhoek



# IWA INTERNATIONAL CONFERENCES ON WATER RECLAMATION AND REUSE



- 1<sup>st</sup> International Conference, Costa Brava, Spain, 1991
- 2<sup>nd</sup> International Conference, Iraklion, Greece, 1995
- 3<sup>rd</sup> International Conference, Paris, France, 2000
- 4<sup>th</sup> International Conference, Mexico City, Mexico, 2003
- 5<sup>th</sup> International Conference, Jeju Island, Korea, 2005
- 6<sup>th</sup> International Conference, Antwerp, Belgium, 2007
- 7<sup>th</sup> International Conference, Brisbane, Australia, 2009
- 8<sup>th</sup> International Conference, Barcelona, Spain, 2011
- 9<sup>th</sup> International Conference, Windhoek, Namibia, 2013
- 10<sup>th</sup> International Conference, Harbin, China, 2015
- 11<sup>th</sup> International Conference, Long Beach, USA, 2017
- 12<sup>th</sup> International Conference, Berlin, Germany, 2019
- 13<sup>th</sup> International Conference, Chennai, India, 2023
- 14<sup>th</sup> International Conference, 2025, Cape Town, 2025
- 15<sup>th</sup> International Conference, 2027, six proposals, winner will be announced at Cape Town

## “On the Road to Chennai 2023” Webinar Series

- ***Water Reuse in the USA – A Trend on the Rise***  
on 15 February 2022, organised by Melissa Meeker et al.  
[Water Reuse in the United States: A Trend on the Rise - International Water Association \(iwa-network.org\)](https://www.iwa-network.org/water-reuse-in-the-united-states-a-trend-on-the-rise)
- ***Industrial Water Reuse: Perspectives from Emerging Countries***  
on 26 April 2022, organised by Olivier Lefebvre et al.  
[Industrial Water Reuse: Perspectives from Emerging Economies - International Water Association \(iwa-network.org\)](https://www.iwa-network.org/industrial-water-reuse-perspectives-from-emerging-economies)
- ***Water Reuse Applications across Industries in Advanced Economies***  
hosted jointly with the WateReuse Association on 12 May 2022  
[Water Reuse Applications Across Industries in Advanced Economies - International Water Association \(iwa-network.org\)](https://www.iwa-network.org/water-reuse-applications-across-industries-in-advanced-economies)
- ***Advancements in Microbiological Safety for Potable Reuse*** organized in cooperation with the IWA Health Related Water Microbiology Specialist Group on July 27 2022  
[Advancements in Microbiological Safety for Potable Water Reuse - International Water Association \(iwa-network.org\)](https://www.iwa-network.org/advancements-in-microbiological-safety-for-potable-water-reuse)

## *On the Road to Cape Town 2025* Webinar Series

- ***Bridging the gap between the water reuse community and water treatment model developers*** on 31 January 2024, organized by the MIA & WR SGs  
[MIA\\_WR\\_Webina\\_WaterReuse.pdf \(iwa-mia.org\)](#)
- ***Water Reuse and Public Engagement: A Global Look***  
on 12 December 2024
- ***Micropollutants Removal in Water Reclamation***  
on 23 January 2025, organized jointly by the IWA *Assessment and Control of Hazardous Substances in Water & Water Reuse* SGs

# 14<sup>TH</sup> IWA INTERNATIONAL CONFERENCE ON WATER RECLAMATION AND REUSE



Thanks for your attention!

[Josef.lahnsteiner@wabag.com](mailto:Josef.lahnsteiner@wabag.com)

Director Technology, R&D of WABAG Group

Chair Water Reuse Specialist Group



# Water Reuse and Public Engagement - A Global Look

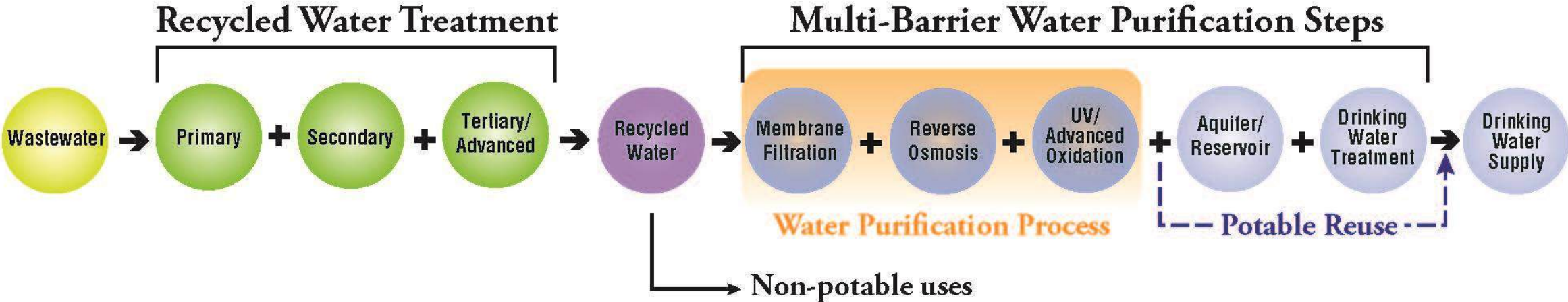
**Mark Millan**

*COMMUNICATION STRATEGIES*

**inspiring change**



# The Technology Works – It is possible to purify wastewater



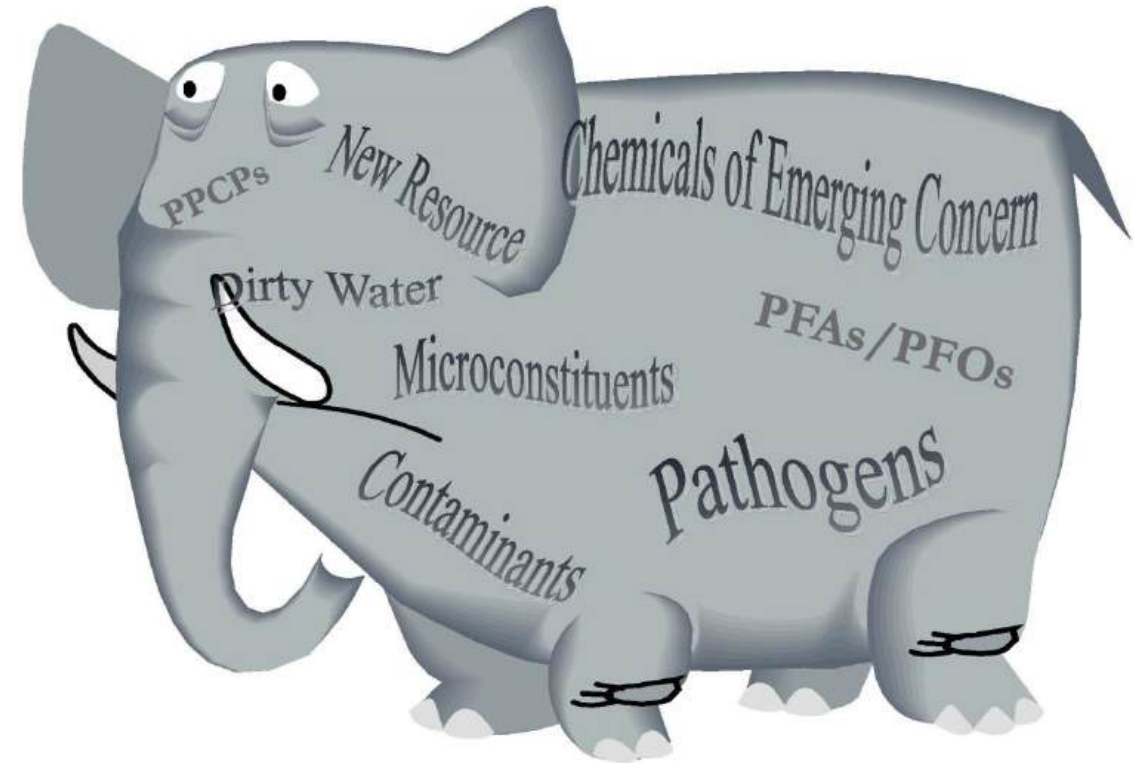
OCWD,  
California

# Public Perception - Facing the Yuck Factor

FEATURE ARTICLE - [September 17, 2007](#) by Peter Friederici



Facing the yuck factor. PAUL LACHINE



**TOILET TO TAP?**  
MAYBE NOT A GOOD IDEA AFTER ALL.  
...has NO full-treatment sewage treatment plants.  
...PARTIALLY treated.  
...chemicals.

*How has the West embraced water recycling? Very (gulp) cautiously*

Source: <http://www.hcn.org/issues/354/17227>

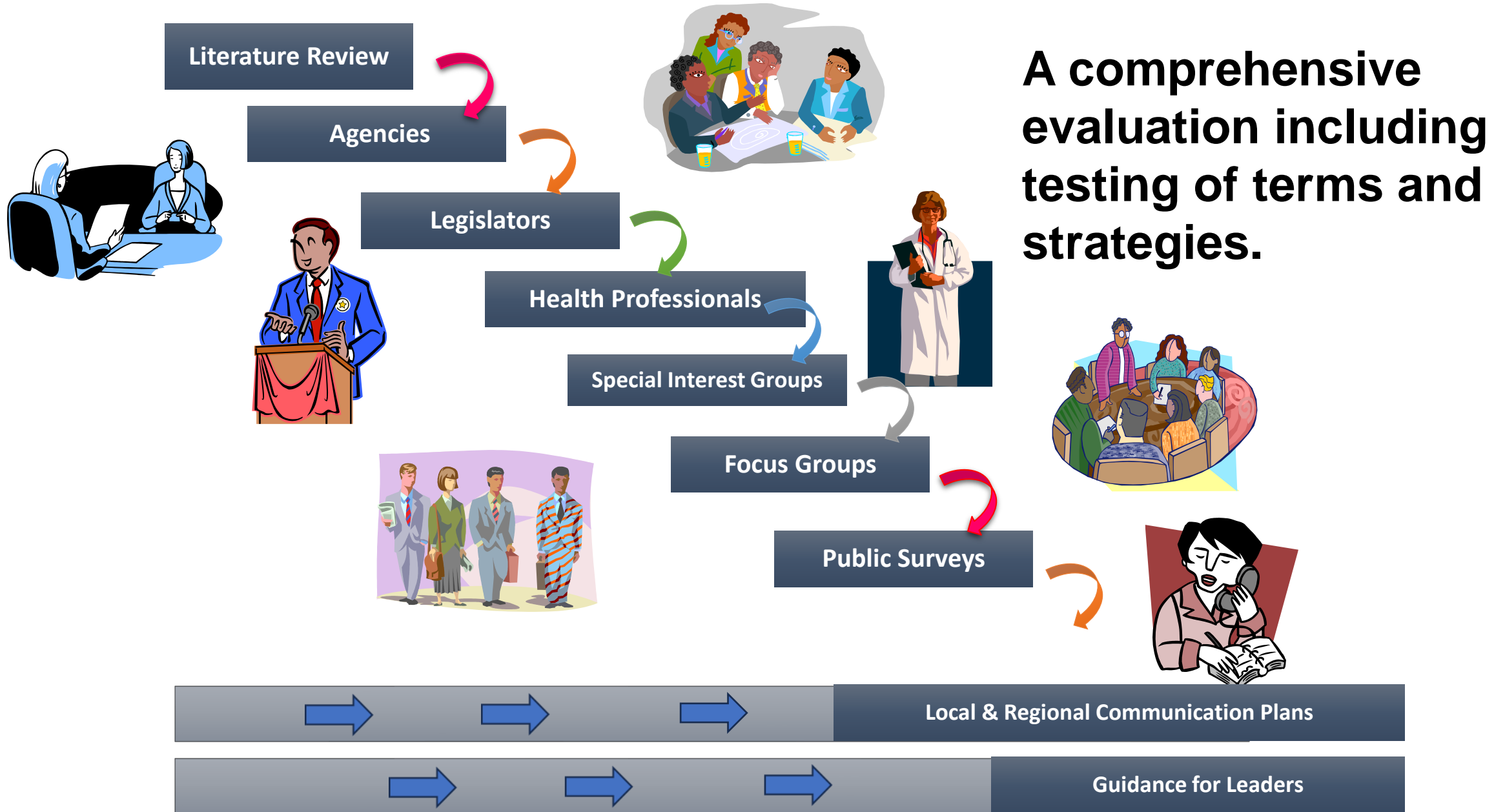


# Water Research Foundation's Model Communication Plans for Advancing DPR Acceptance (WRF 13-02) (Currently referenced as WRF - 4540)

- 💧 Research conducted in 2014/2015
- 💧 Focus on Potable Reuse – IPR & DPR
- 💧 California-centric Research
- 💧 Communication plans still used today



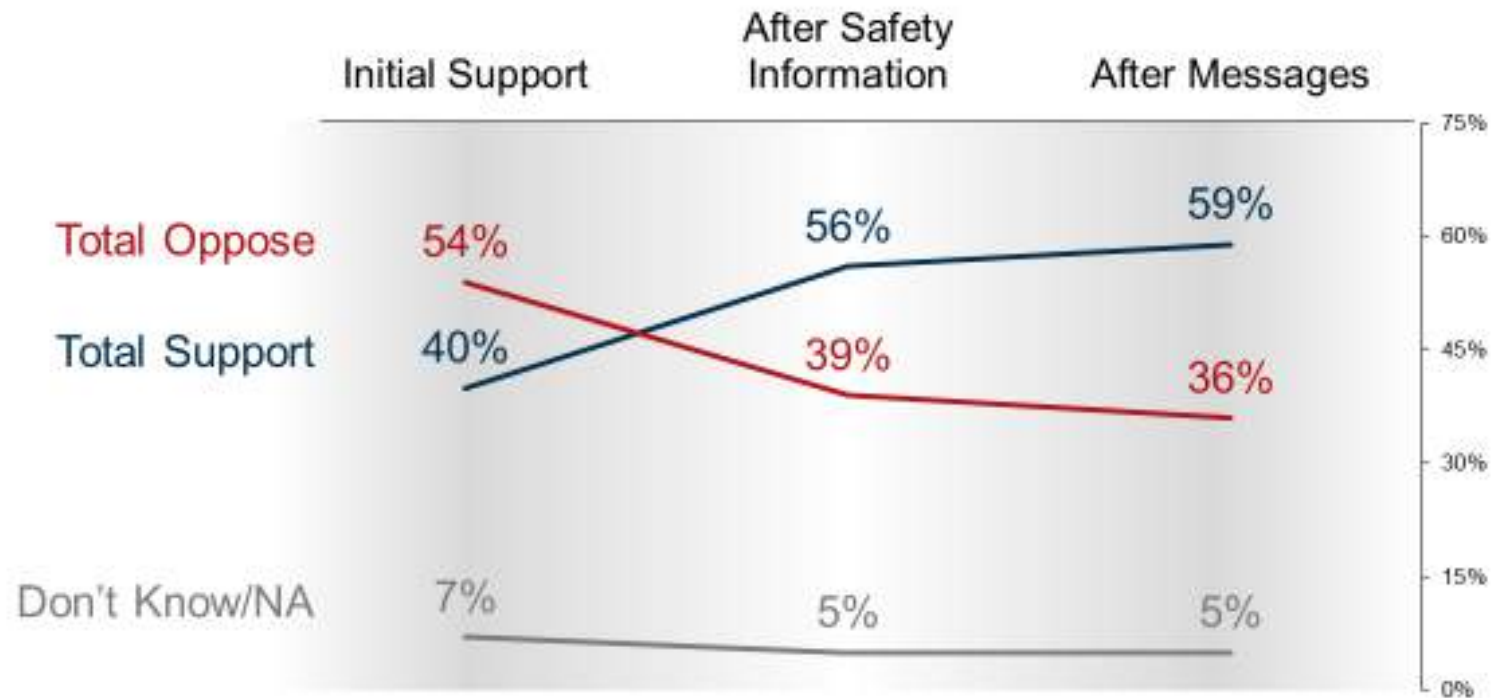
# Research that went into the WRF 13-02 Study



# Key Survey Finding

**Though they are initially opposed, voters quickly become more comfortable with direct potable reuse after information about safety.**

*Do you support or oppose direct reuse of recycled water in your community for all household purposes, including drinking?*



Fairbank,  
Maslin,  
Maullin,  
Metz &  
Associates

FM3

Public Opinion Research  
& Strategy

# Key Focus Group Finding

**Among “purified water” names,  
“advanced purified water” was best.**

*(Participants Allowed to Select One From List)*

“Purified Water” Names	Sunnyvale	San Diego	Total
Advanced Purified Water	8	10	<b>18</b>
Purified Water	7	6	<b>13</b>
Purified Recycled Water	0	3	<b>3</b>
Purified Wastewater	0	1	<b>1</b>

*Fairbank,  
Maslin,  
Maullin,  
Metz &  
Associates*

**FM3**

*Public Opinion Research  
& Strategy*

**SUNNYVALE FEMALE:** “Advanced” means they took that extra step. It’s not just purified water, it’s advanced which sounds better to me.

**SUNNYVALE FEMALE:** It’s advanced in what way? Like you put ten different chemicals in there and that’s why it’s advanced?

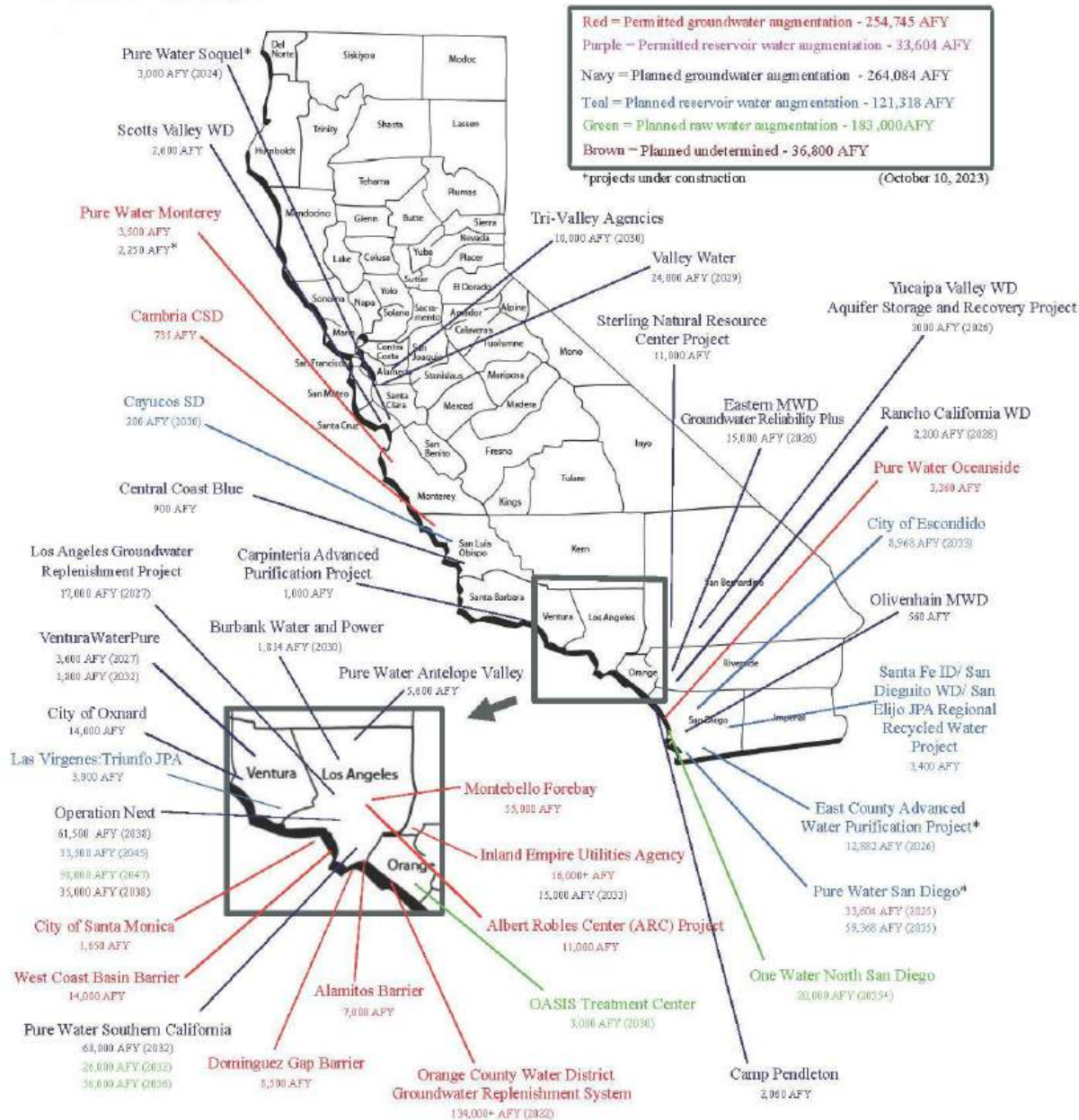
# Key Findings

- 💧 Develop trust
- 💧 Be prepared
- 💧 Be transparent
- 💧 Instill confidence in the quality of water
- 💧 Be consistent with messaging and terminology
- 💧 Provide Potable Reuse information and where it is in use

## **Key Messages – From the WRF 13-02 Study**

- Potable reuse provides a safe, reliable and sustainable drinking water supply.
- Using advanced purified water is good for the environment.
- Potable reuse provides a locally controlled, drought-proof water supply.

# Potable Reuse Projects in California



+ Volume indicated reflects facility online factor and may be less than volume permitted.

# Potable Reuse Projects in United States

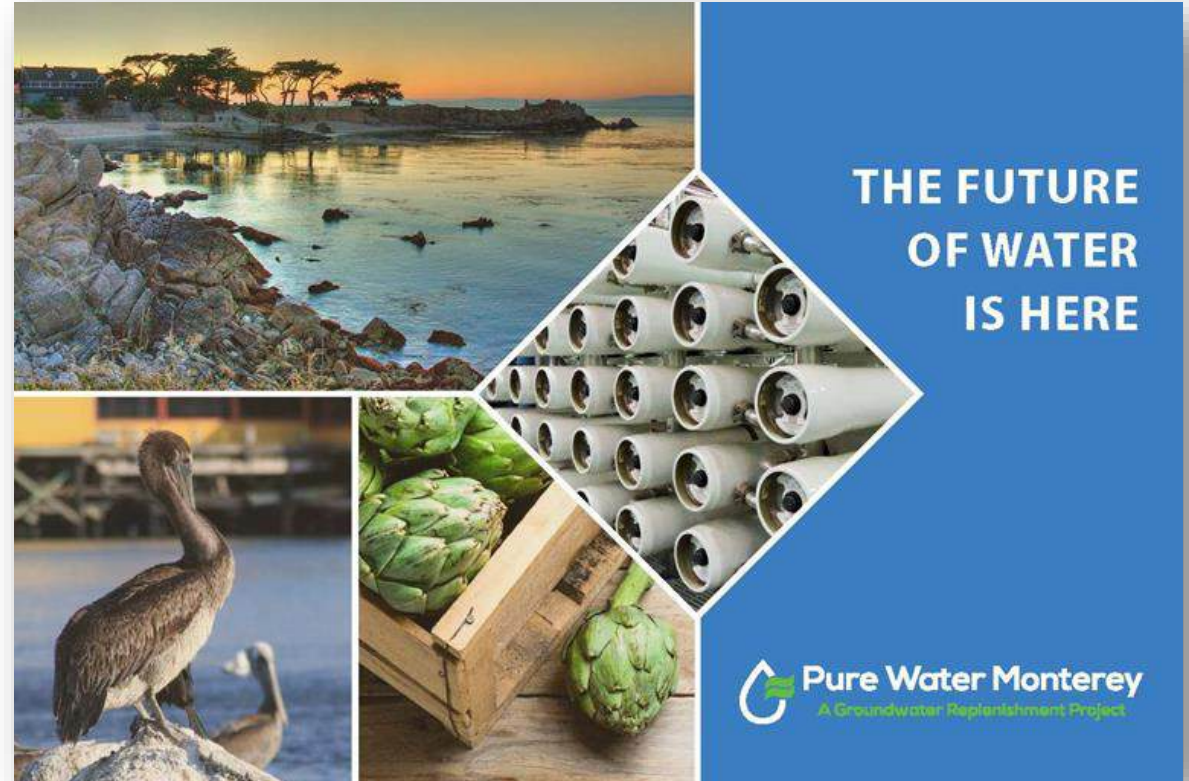


● Indirect Potable Reuse  
● Direct Potable Reuse



# Example Utilities where Potable Reuse is underway

- 💧 Pure Water Monterey (5 - 7.6 MGD)
- 💧 OneWater Nevada (2 MGD)
- 💧 Pure Water Soquel (1.5 - 3 MGD)
- 💧 Albert Robles Center (14.8 MGD)
- 💧 OCWD (100 - 130 MGD)



# Leverage Branding

## PureWater SF

Innovative Research Exploring the Possibilities for Purified Water



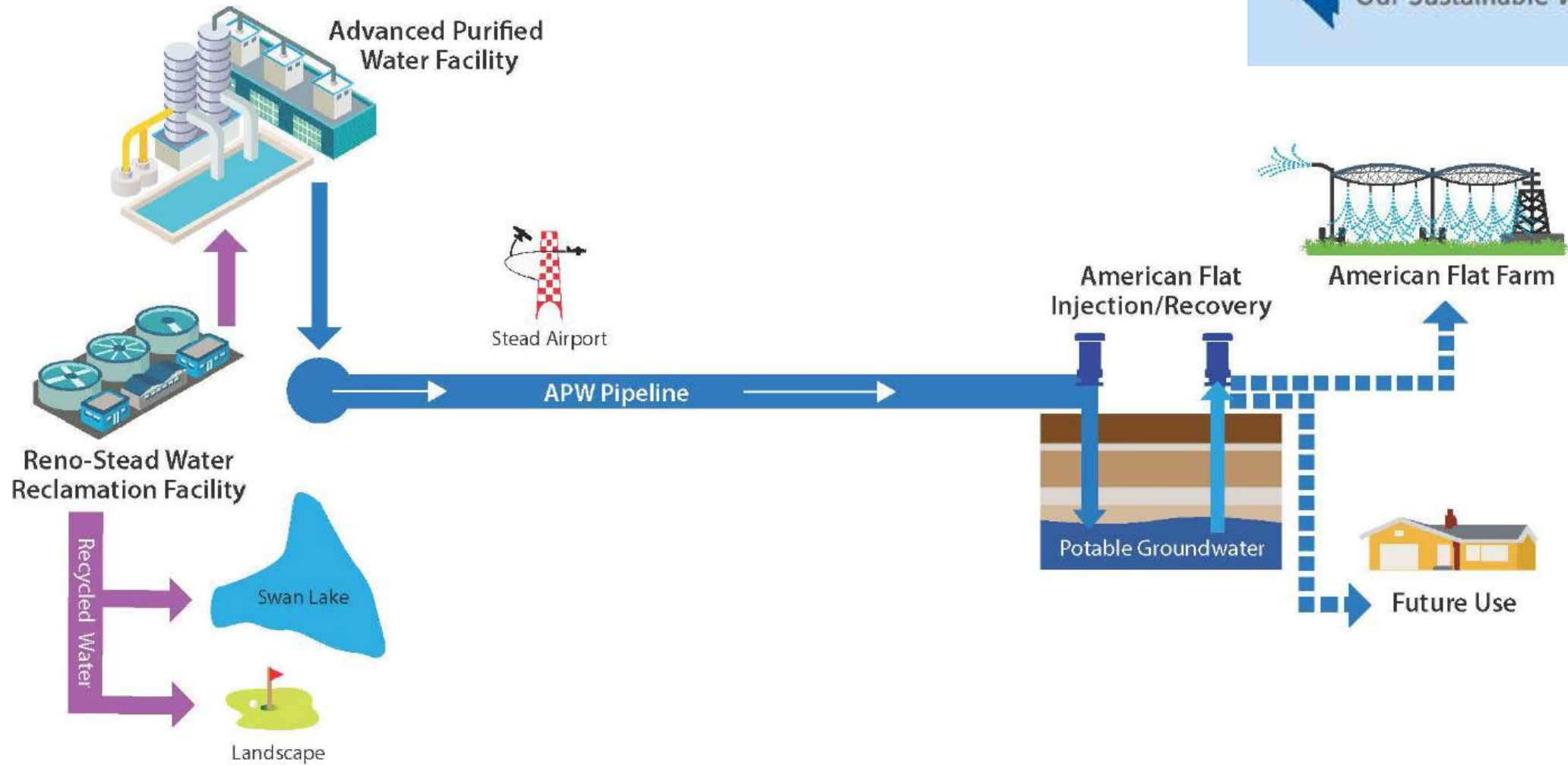
**PURIFIED WATER  
REPLENISHMENT**  
*Groundwater Reliability Plus*



# Example: Reno, Nevada Regional Water Challenges



# How their Advanced Purified Water System Works



# Website with lots of information



## Reports & Documents

- **Fact Sheet: On the Path to Our Water Future – Spring 2022**
- **Reno-Stead Water Reclamation Facility Advanced Purified Water Demonstration Study Final Report – April 2021**
- **Brief Project Overview – Winter 2020** (1 page Handout)
- **Project Overview – Fall 2019** (4-page Backgrounder)
- **American Flat Road Hydrogeologic Investigation Report – August 2019**
- **Researching Advanced Purified Water Treatment Technologies – Winter 2019** (3-fold brochure)
- **Water Research Foundation/Independent Advisory Panel – Final Report – May 2018**

## A+ Water Study

[Home](#)

[Project Technology](#)

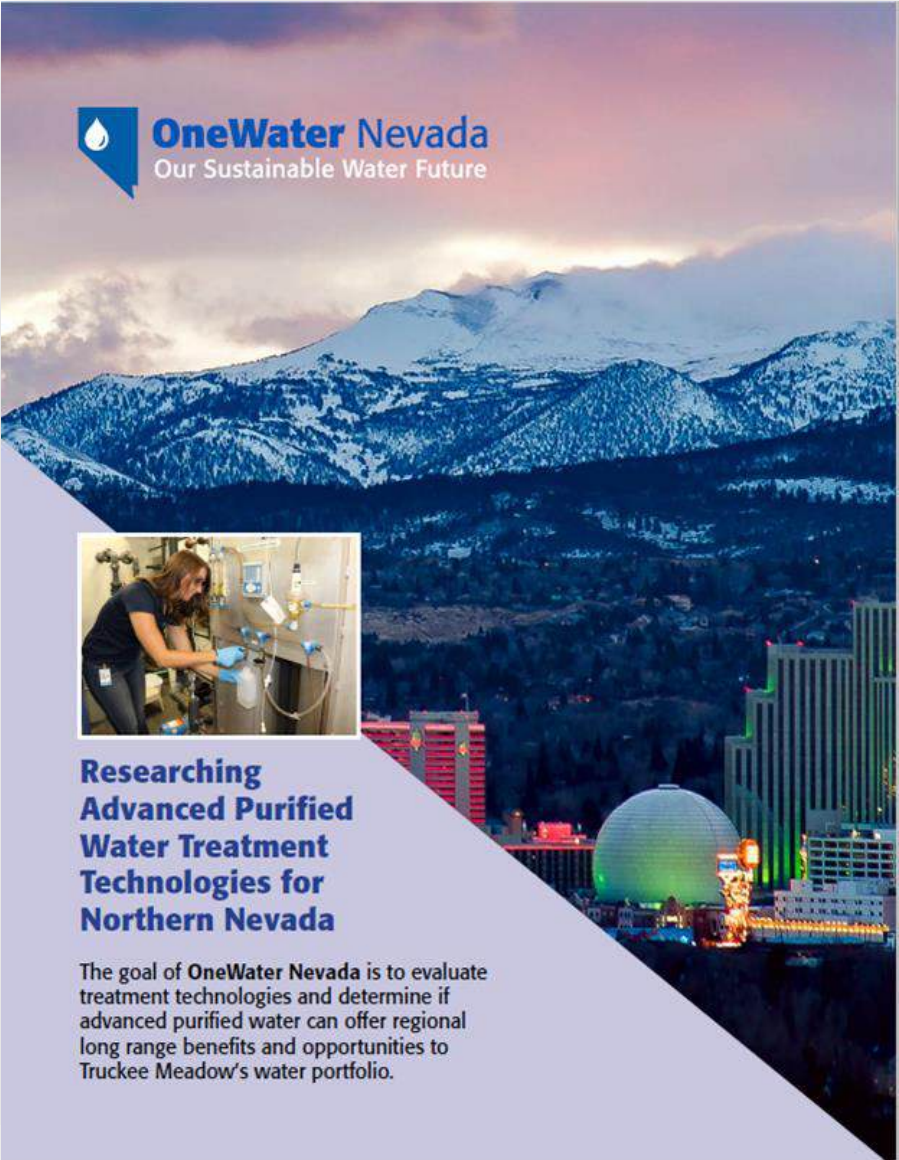
[Project Benefits](#)

[Reports & Documents](#)

[Project Maps](#)

[FAQs](#)

# Detailed project information



**OneWater Nevada**  
Our Sustainable Water Future

## Researching Advanced Purified Water Treatment Technologies for Northern Nevada

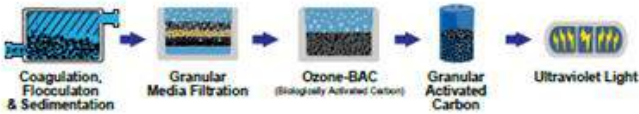
The goal of OneWater Nevada is to evaluate treatment technologies and determine if advanced purified water can offer regional long range benefits and opportunities to Truckee Meadow's water portfolio.



## Demonstration Trailers Will Help to Educate and Inform the Public

The University of Nevada, Reno will lead the treatment technology evaluations and water quality testing and compliance programs. Each demonstration project is envisioned to operate 9-12 months. Multiple trailers will be equipped with advanced water purification technology as illustrated below.

After the advanced treatment process, the purified water will be introduced to local groundwater at a small scale for an extended period of time. This natural filtration of the purified water adds an additional cleaning step.



**Coagulation, Flocculation & Sedimentation:** Chemical coagulant is added causing particles to stick together and form larger "floc" particles. These larger particles then settle to the bottom of the tank as water flows upwards through tubes.  
**Granular Media Filtration:** Small solids are filtered out in this mixed media sand filtration step.  
**Ozone-BAC:** Ozonation with biological treatment removes organic matter and chemicals. Ozone is a powerful oxidant that breaks down organic constituents into smaller, more readily biodegradable molecules. The organic constituents are biodegraded by microbiologic organisms in the BAC filter.  
**Granular Activated Carbon:** GAC is a polishing step to further remove trace amounts of dissolved organic constituents such as bulk organics and disinfection byproducts.  
**Ultraviolet Light:** Ultraviolet light inactivates (kills) viruses and pathogens.

## How the Project Benefits the Area

- Advanced purified water is a local, reliable, drought-proof water source** which provides vital benefits:
- Safe, reliable water supply**  
Advanced purified water uses proven technology that cleans water to a level that meets all federal and state drinking water standards.
- Sustainable water supply option**  
Advanced purified water could help diversify the region's water portfolio by adding an option that is both sustainable and energy-efficient.
- Environmental benefits**  
Advanced purified water could reduce reliance on the Truckee River, leaving more water in the river for aquatic life and recreation.
- Drought-proof water supply**  
Having a safe, sustainable water supply ensures water is available even during periods of drought.
- Independent of weather variability**  
Advanced purified water may enhance the region's water supply resiliency to help address future uncertainties of climate change, such as longer growing seasons, snowpack changes and runoff timing.

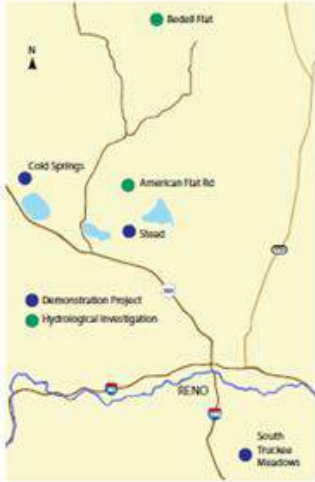
## Project Timeline

The project schedule will be updated as the project evolves.



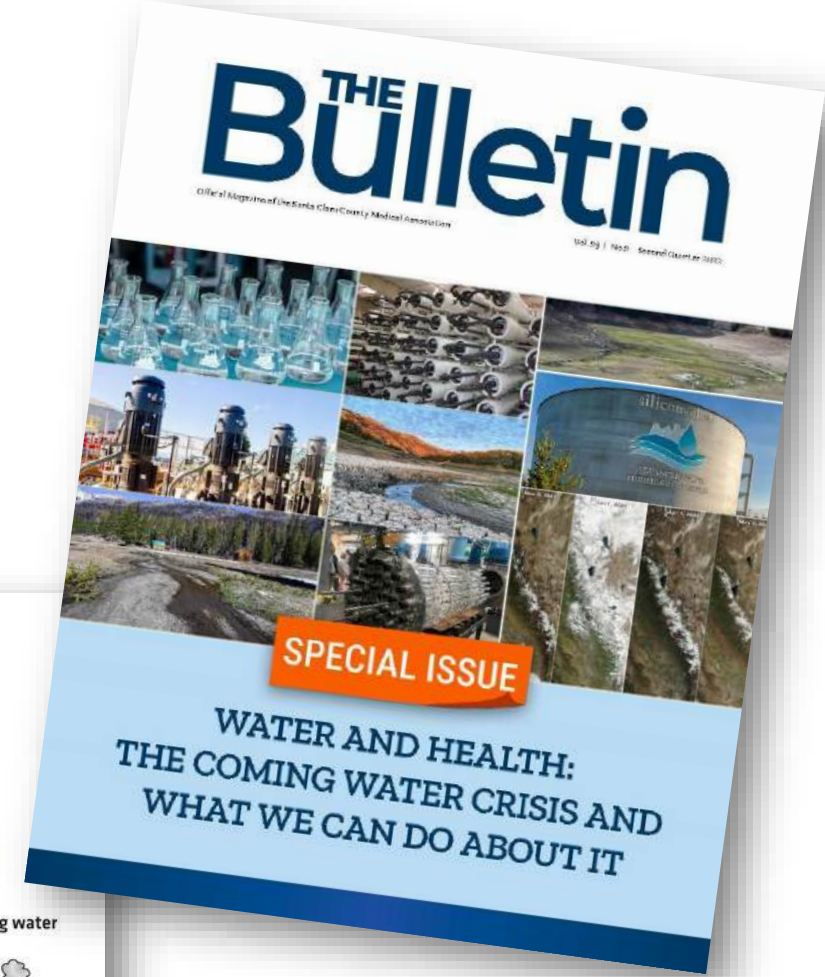
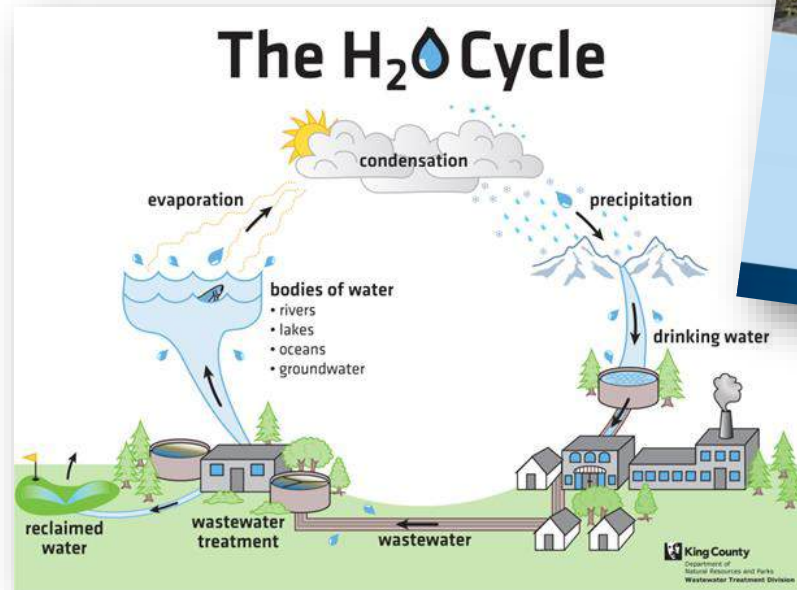
## Potential Project Sites

The sites shown here are demonstration project and hydrogeologic investigation areas.



# Be transparent – Share knowledge

- 💧 Links to Similar Projects
- 💧 Water Quality Info
- 💧 Fact Sheets and FAQs
- 💧 Project Schedule
- 💧 How You Can Participate





# Opinion Leader Outreach

## Goals of Opinion Leader Outreach

- establish or enhance the relationship between the opinion leader and the agency;
- build awareness, trust, and confidence in purified water treatment technology processes;
- inform leaders of water supply demands and shortages and how purified water can meet demands;
- listen to these stakeholders and be responsive to concerns related to purified water project implementation;
- secure written support of purified water projects from strategic community and opinion leaders.

Opinion leaders influence attitudes, beliefs, motivations, and behaviors of others. They influence opinions by raising awareness, persuading others, establishing or reinforcing norms, and leveraging resources. They usually have high visibility and a defined constituency. Opinion leader outreach builds strong relationships and garners third-party involvement in disseminating information to a broader network.

## Identifying Opinion Leaders

Each community will have its own unique set of influencers, which will likely change and grow as the project progresses. Keeping an accurate database of opinion leaders, contact information, preferred communication methods, and other pertinent notes is imperative to a successful outreach program.

It's important to identify the leaders and their staff. Characteristics include: t appointed or elected position, values and traits, competence or expertise, and social position. Opinion leaders can include, but are not limited to, the following (in alphabetical order):

- academic/education leaders
- business organizations
- civic groups
- environmental entities
- media

- medical, public health, and water quality experts
- multicultural and faith-based leaders and groups these leaders/groups may be found within the other audiences listed)
- state and local elected officials and their staff

### Relationship of opinion leaders to other target audiences

The graphic below illustrates the opinion leaders in relation to other community members. As a core group, from which information spreads to other community members, opinion leaders must be made aware of the need to increase water supply sources and should be knowledgeable about purified water as an option.



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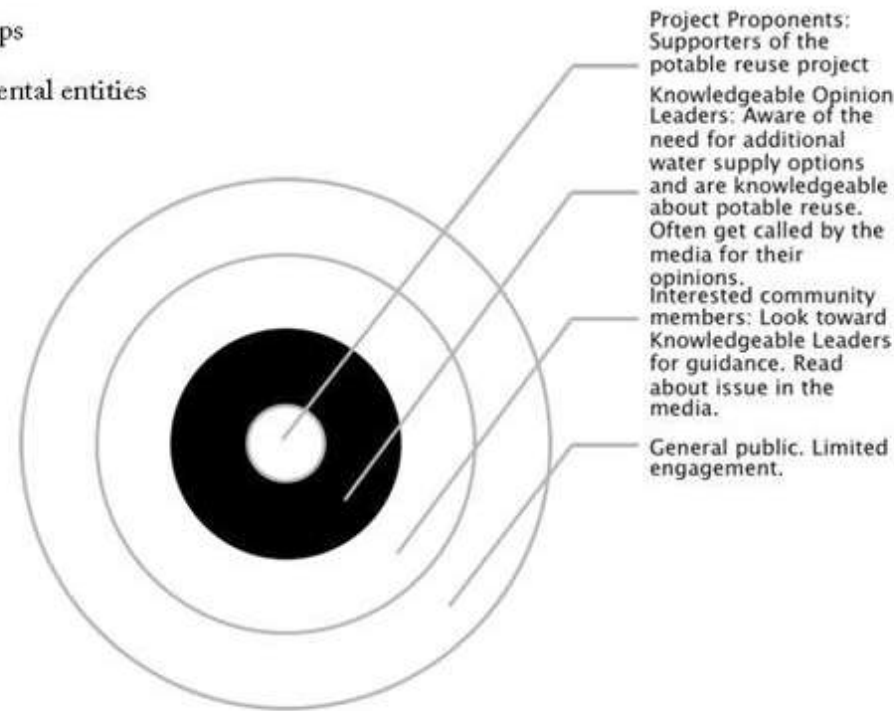
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# Educating Key Stakeholders and Leaders

Seeing treatment trains up close and tasting the water



# Educating customers and your community



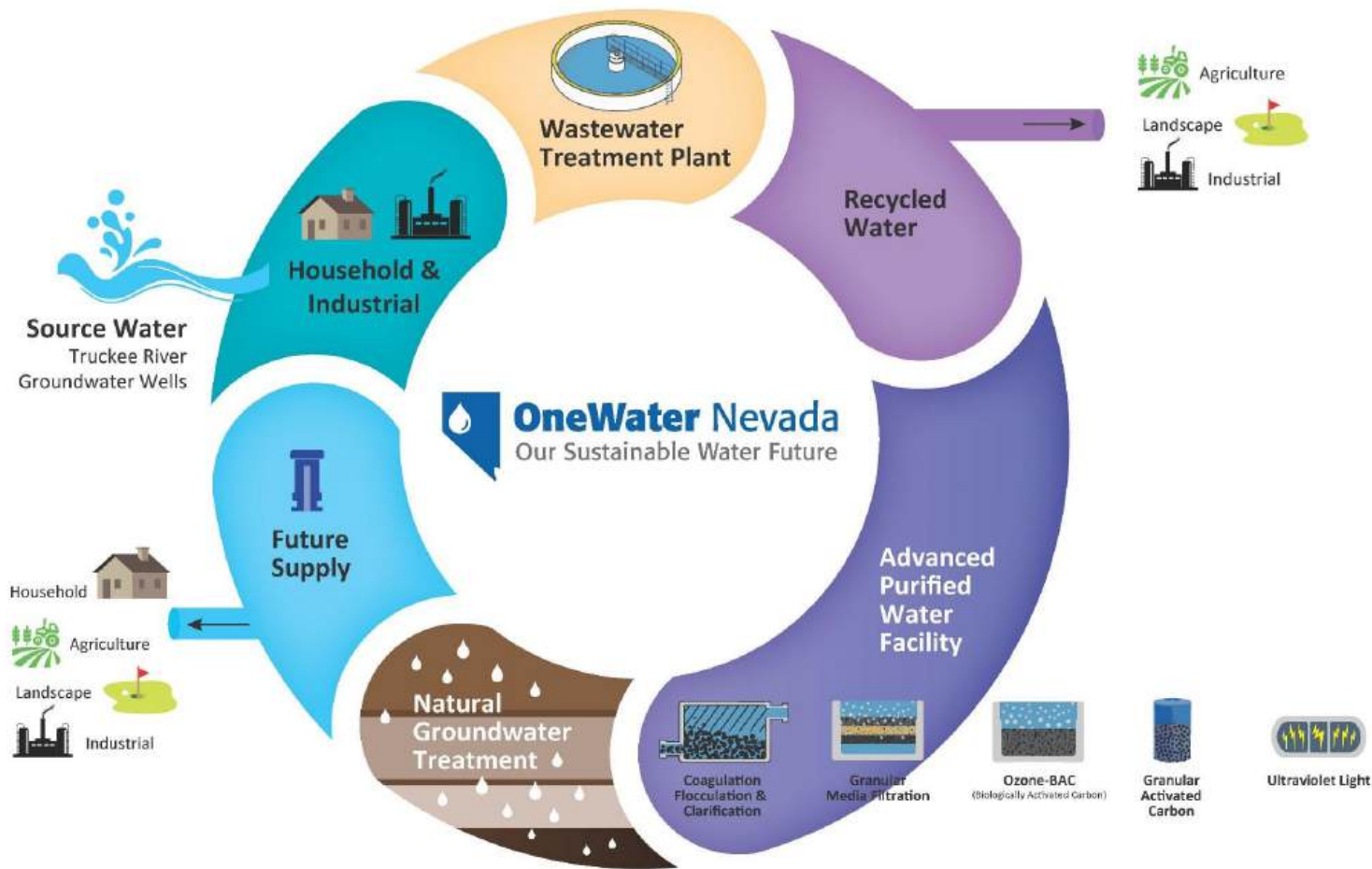
# Provide short videos addressing key concerns

## Topics:

- 💧 Benefits of potable reuse
- 💧 Advanced water purification
- 💧 Groundwater recharge
- 💧 PFAs
- 💧 CECs
- 💧 Is it safe?
- 💧 Regulations



# Conveying your story and messaging using infographics



- Regional solution
- Effluent management
- Aquifer storage / banking
- Future potable resource
- Drought resistant local supply
- Resilient to climate variability

# Educational Mobile Vehicle – Go out to the community



# Participate at Community Events

- Seeing is believing
- Displays with modeled systems to demonstration facilities
- Let people taste the water



# PUREWater Soquel's educational vehicle has won awards



# Shows how water can be purified in the simplest of terms





# Pure Water Monterey – Pilot and Demonstration Site



# Media visits and demonstrating the future: A kitchen faucet brings purified water into your home



# Demonstration sites change minds

The public learns about and tastes the water for themselves



# **Albert Robles Center (ARC): The latest & most advanced**

A fully digital and bilingual water museum with over 30 exhibits.



# The ARC Facility includes three components



# Learning Center and Demonstration Gardens

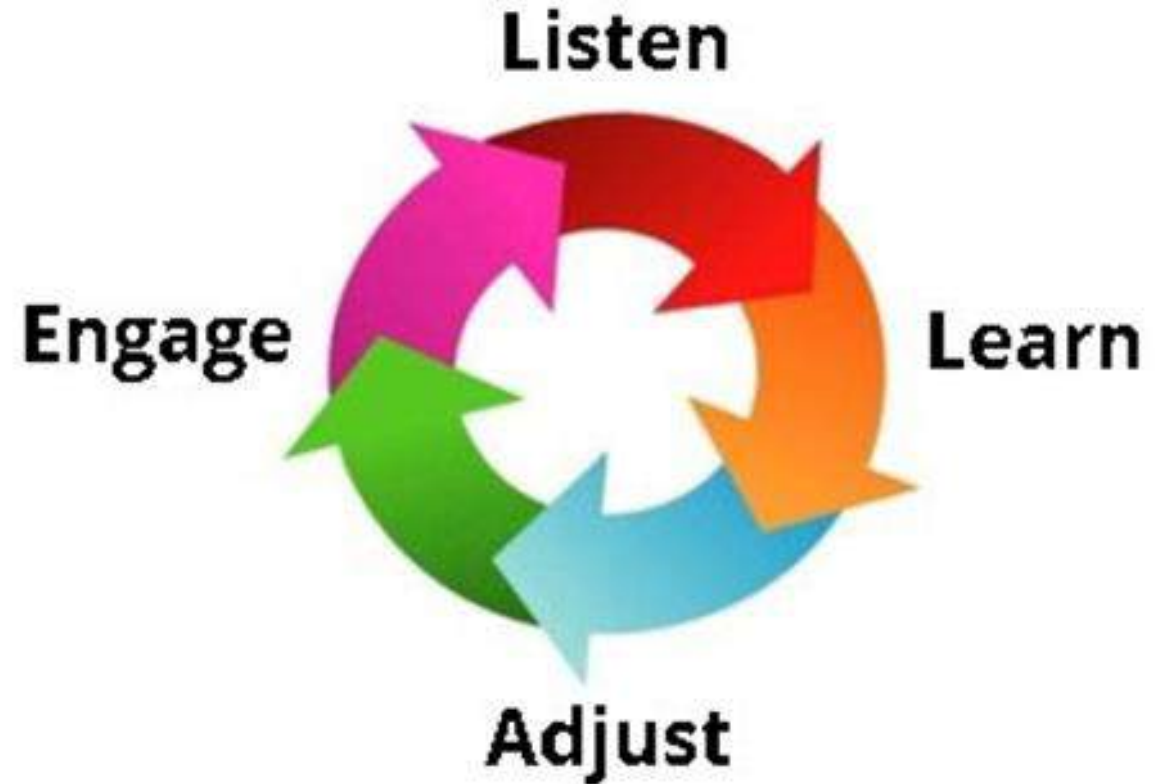


## **Summary of Strategies that have been successful**

- 💧 Conduct community research
- 💧 Develop an outreach and awareness plan
- 💧 Develop the project story – Need for the project
- 💧 Talk early and often to stakeholders and community groups
- 💧 Keep elected officials & regulators in the loop
- 💧 Be transparent: **Transparency Builds Trust**

## Key Strategy

To achieve  
**PUBLIC  
ACCEPTANCE**  
you must develop  
**TRUST**





## Perceptions can change

- 💧 Outreach tactics need to be calibrated and in sync with actual project schedules and planned activities.



**“Perceptions will change, politics will have an impact, situations will arise that may cause you to pivot.”**

- 💧 Being flexible and operating dynamically is a key to success.

# **It's possible to purify water and gain acceptance for its use**

- 💧 The tools and methods described are applicable for any agency, or water purveyor seeking to plan and execute an outreach program.
- 💧 These tools will support the challenges in gaining public awareness and acceptance, and successfully implement potable reuse projects.

## **Acknowledgments**

A special thanks to the co-authors of  
**Model Communication Plans for Increasing Awareness  
and Fostering Acceptance of Direct Potable Reuse;**

**Patricia A. Tennyson**, Katz & Associates, Vice-President  
U.S.A.

**Dr. Shane Snyder**, José Domingo Pérez Foundation Chair  
and Professor @ Georgia Institute of Technology

# **Water Reuse and Public Engagement**

## **A Global Look**

12/12/2024



**Mark Millan**

[millan@datainstincts.com](mailto:millan@datainstincts.com)

# Water recycling and public engagement in the UK

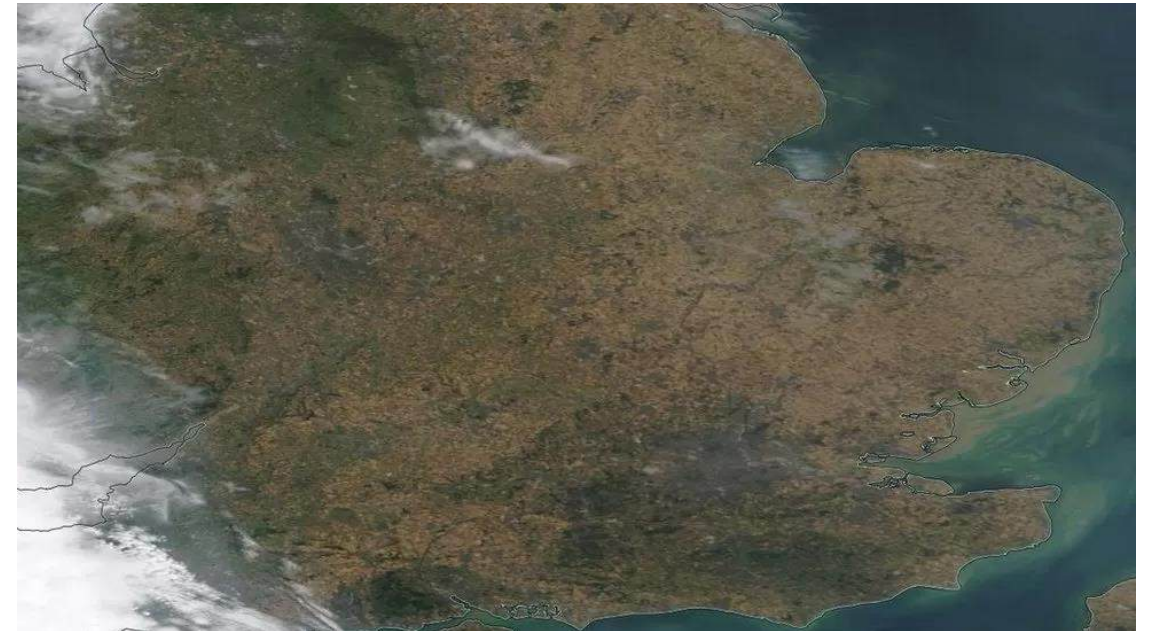
DR HEATHER SMITH, CRANFIELD UNIVERSITY



# CONTEXT

South of England

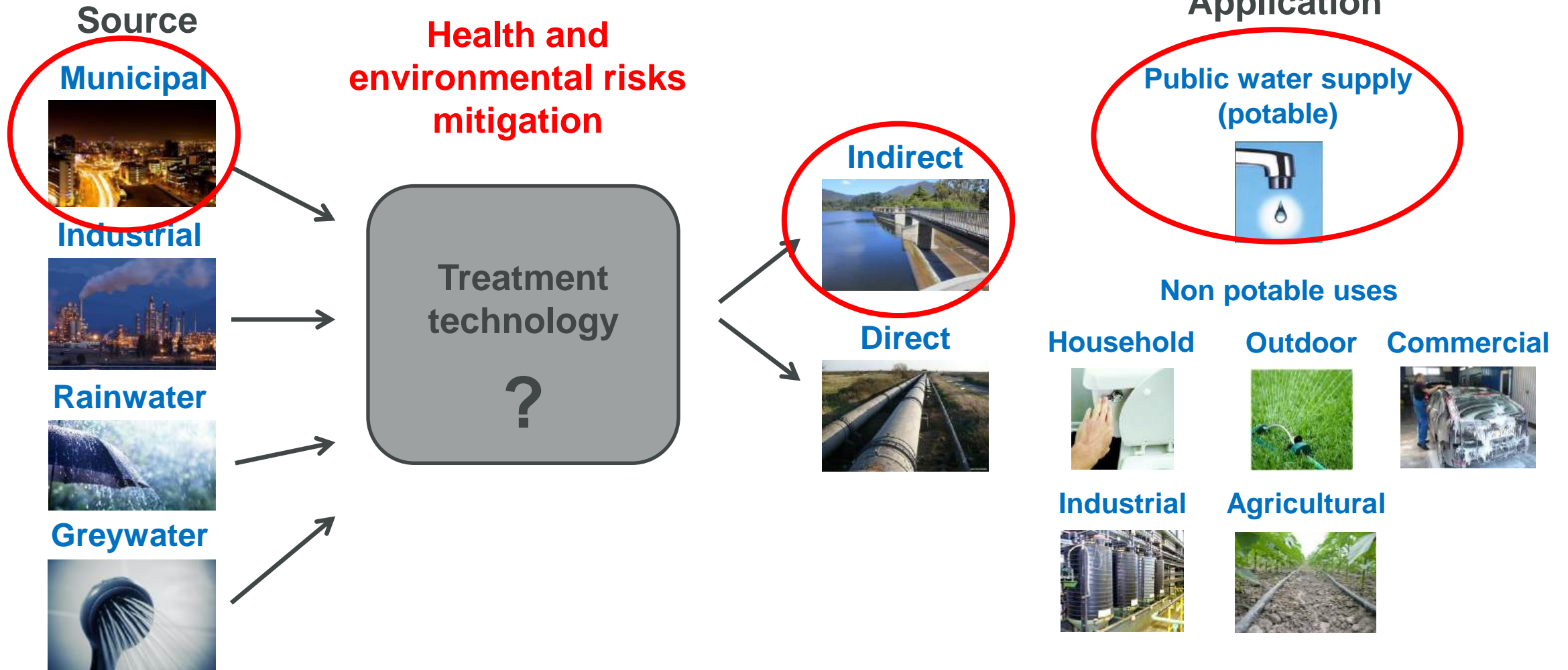
July 2021



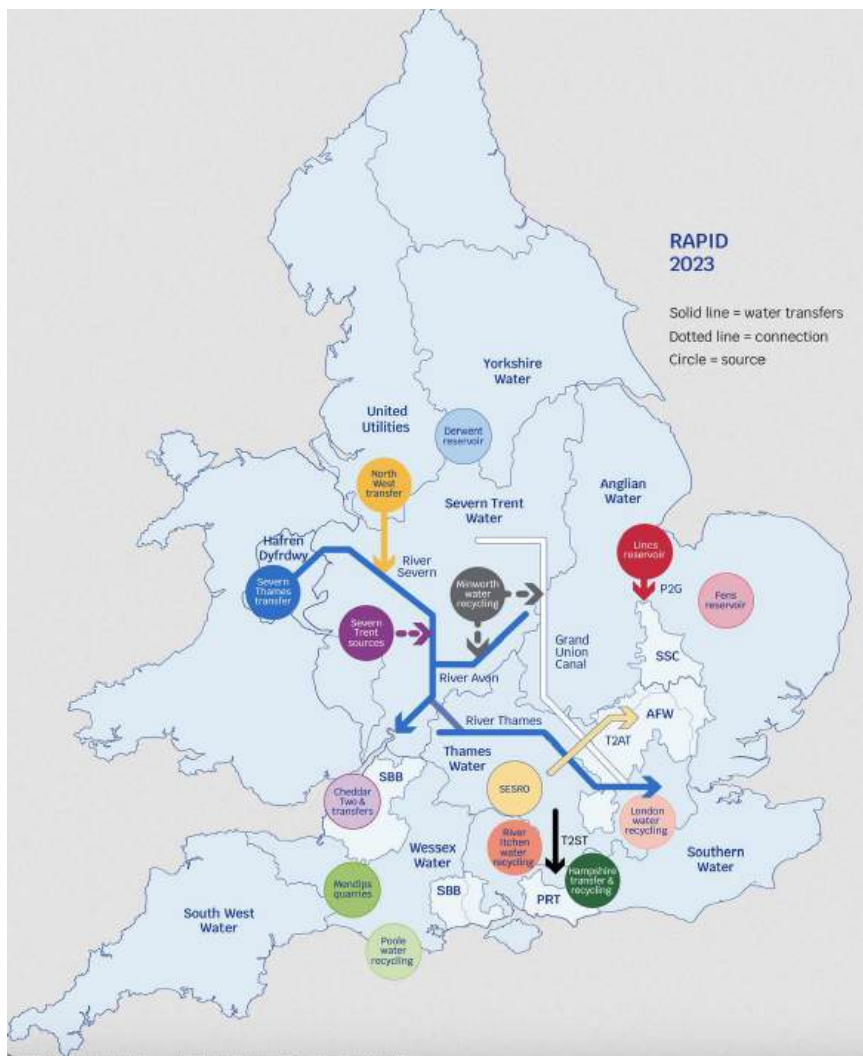
July 2022

Source: NASA (<https://www.lbc.co.uk/news/satellite-images-heatwave-drought/>)

# WHAT IS WATER RECYCLING?



# WHY WATER RECYCLING?



- Current analysis predicts a shortfall of 4,000 million litres per day, by 2050, in England
  - Climate change reducing available resources
  - Current resources under threat from abstraction

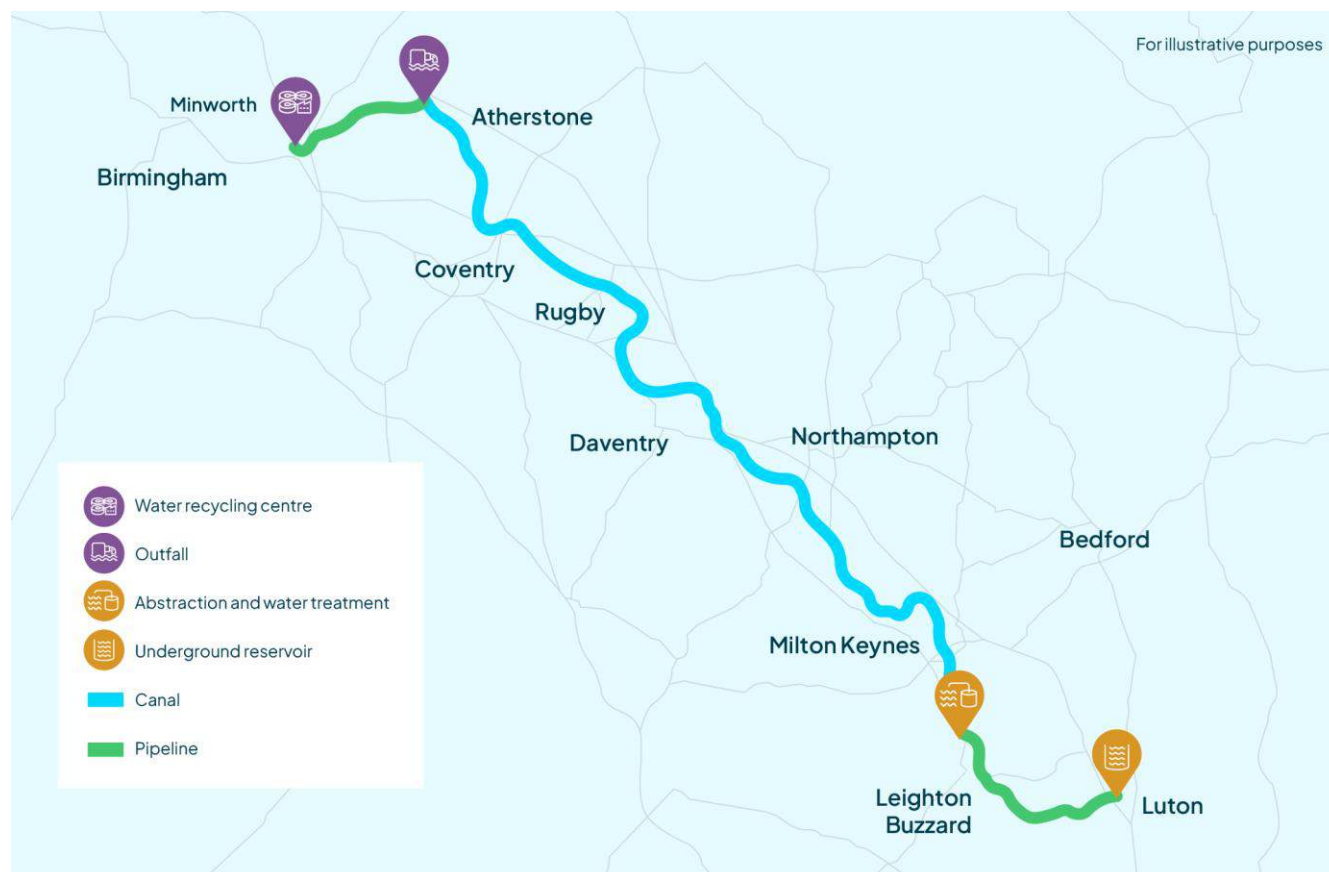
BUT...

- Demand is proving difficult to shift (especially household usage)
- Predicted savings from demand management measures are based on a lot of assumptions

↳ New (alternative) supplies needed



# EXAMPLES OF PROPOSED SCHEMES



<https://guctransfer.co.uk/>

Source: Southern Water web site

# PUBLIC PERCEPTIONS PROJECT

- Understand public perceptions of water recycling for both indirect potable (IPR) and direct potable (DPR) concepts
  - Any difference?
- Explore the impact of
  - Terminology
  - Demographic or social factors
  - Information and education



# LARGE-SCALE SURVEY

Basic (1-2 sentence) explanation of what 'water recycling for drinking purposes' means (n = 1618)

Diagram 1 (IPR)

Diagram 2 (DPR)

Control

Neutral Label

Inflammatory  
Label

Neutral Label

Inflammatory  
Label

IPR & AWP

IPR & T2T

DPR & AWP

DPR & T2T

Control

## KEY SURVEY FINDINGS

- Most respondents said they knew little to nothing about water recycling. However, the majority of respondents agreed that water recycling for drinking water supply happens already.
- 79% of respondents agreed that they supported the use of recycled water for drinking purposes (up from 67% in 2018) while 74% agreed they would be happy to drink recycled water.
- The terminology appeared to have a stronger influence on responses than scheme design – responses in neutral label groups were significantly higher than in inflammatory label groups.
- IPR and DPR results were not significantly different.

# NEGATIVE OPINIONS DO EMERGE

BBC For you Home News Sport Weather iPlayer

## NEWS

Home InDepth Israel-Gaza war War in Ukraine Climate UK World Business Politics Culture

England Local News Hampshire & Isle of Wight

### Campaigners protest treated sewage water plan



Campaigners say Southern Water is ignoring cheaper, more sustainable alternatives

**James Ingham**  
BBC News, South

- A small number of campaigners have voiced opposition to one of the proposed schemes
- Concerns seem more based around environmental impact of treatment systems, and cost, rather than health concerns from drinking water

## CONCLUSIONS

- High general level of support for the idea of water recycling for potable applications (potentially growing)
- Terminology has more effect than scheme type – no apparent aversion to the idea of DPR (vs IPR)
- Localised opposition still emerging
- Strong interest in learning from other countries on broad engagement
- Potential role for demonstration sites in building confidence





WATER SERVICES  
ASSOCIATION OF AUSTRALIA

# Global maps of purified recycled water for drinking

WSAA

12-13 December 2024



# Who is WSAA



**What are demonstration plants?**

Project #4979  
**Potable Reuse Demonstration Design & Communication Toolbox**



Home About us WSAA Shop News Publications



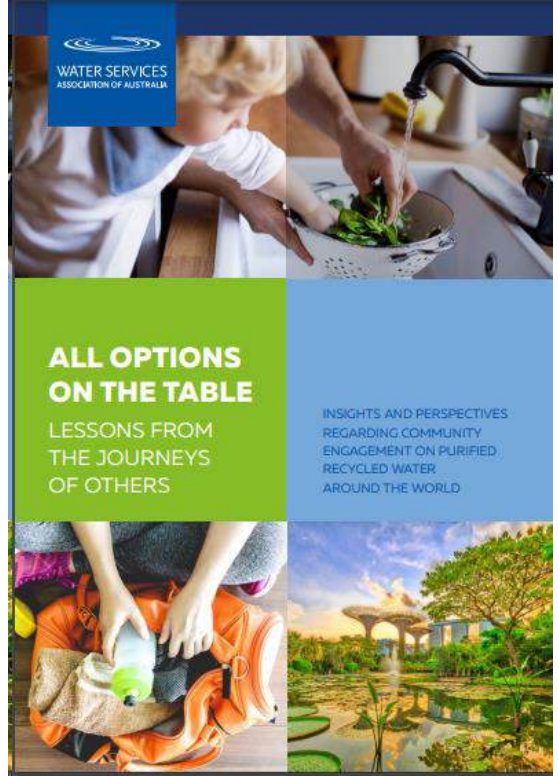
**Peak body for the Australian/ New Zealand water sector**

**Purified recycled water = potable reuse**

Home > All options on the table: Toolkit on purified recycled water for drinking

RI

All water supply options can contribute to water security and other valued



**ALL OPTIONS ON THE TABLE**

LESSONS FROM THE JOURNEYS OF OTHERS

INSIGHTS AND PERSPECTIVES REGARDING COMMUNITY ENGAGEMENT ON PURIFIED RECYCLED WATER AROUND THE WORLD



# Aim of map

To show how many places (ie communities across the world) are served by purified recycled water as part of their drinking water supply, now & in future

- **Help communities understand this is not 'new'**
- **Show stakeholders it's widely practiced & proven**
- **Water sector can learn from other utilities**
  - Similar contexts, treatment trains



California and especially Los Angeles are the busiest parts of the map

# What the map covers

- Purified recycled water (potable reuse) only
  - (Many places also do non-drinking recycling)
- IPR and DPR (WHO definitions)
- Places where the reuse is acknowledged with the community - acceptance
- The whole journey (4 stages):
  - Exploring/education
  - Planned
  - In construction
  - Operating/available



# Terms & translations

## Purified recycled water for drinking = potable reuse

- For drinking
- Not for irrigation/industry
- Advanced treated
- Communities often don't understand term 'potable reuse'

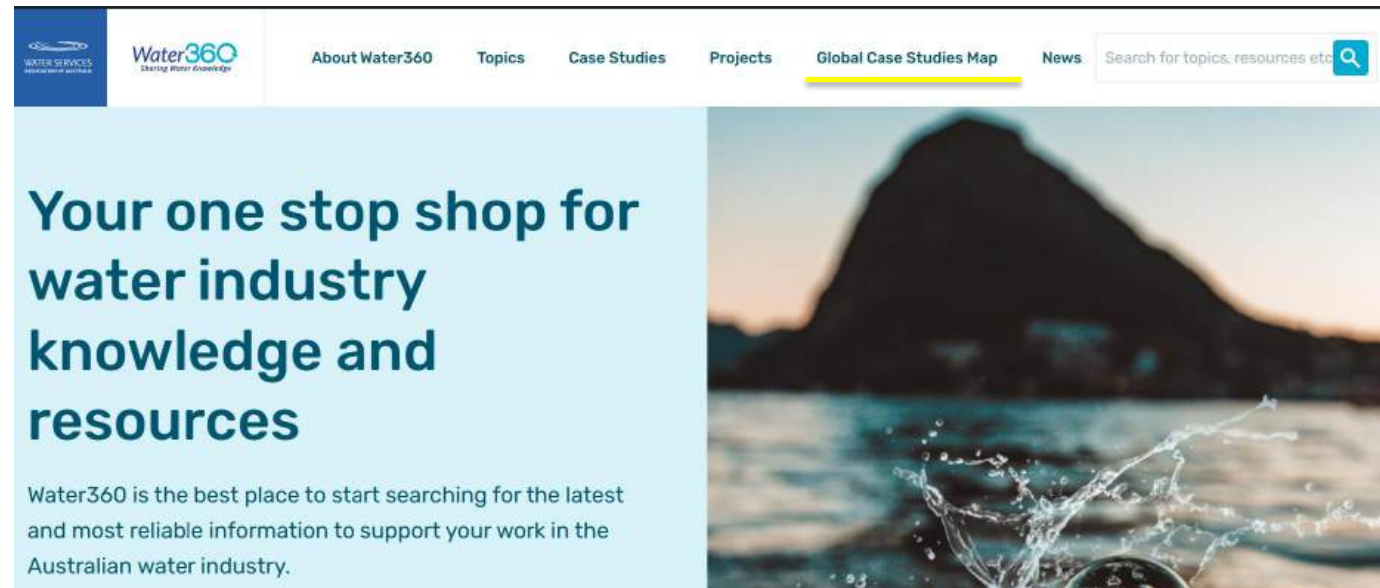
## Units of measure:

- million gallons/day (MGD)
- million litres/day (MLD)
- Acre-foot per year (AFY) not used

## Dot =

- A **city**/place/municipality, + **community**
- **Decision** to adopt (or potentially adopt) **purified recycled water as part of local water supply**
- Dot ≠ plant (1 dot can have several plants)

WSAA's Water360 website where the map lives (Global Case Studies Map)



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Water360  
Sharing Water Knowledge

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## Your one stop shop for water industry knowledge and resources

Water360 is the best place to start searching for the latest and most reliable information to support your work in the Australian water industry.

# Let's take a look

2 formats:

[www.water360.com.au](http://www.water360.com.au)

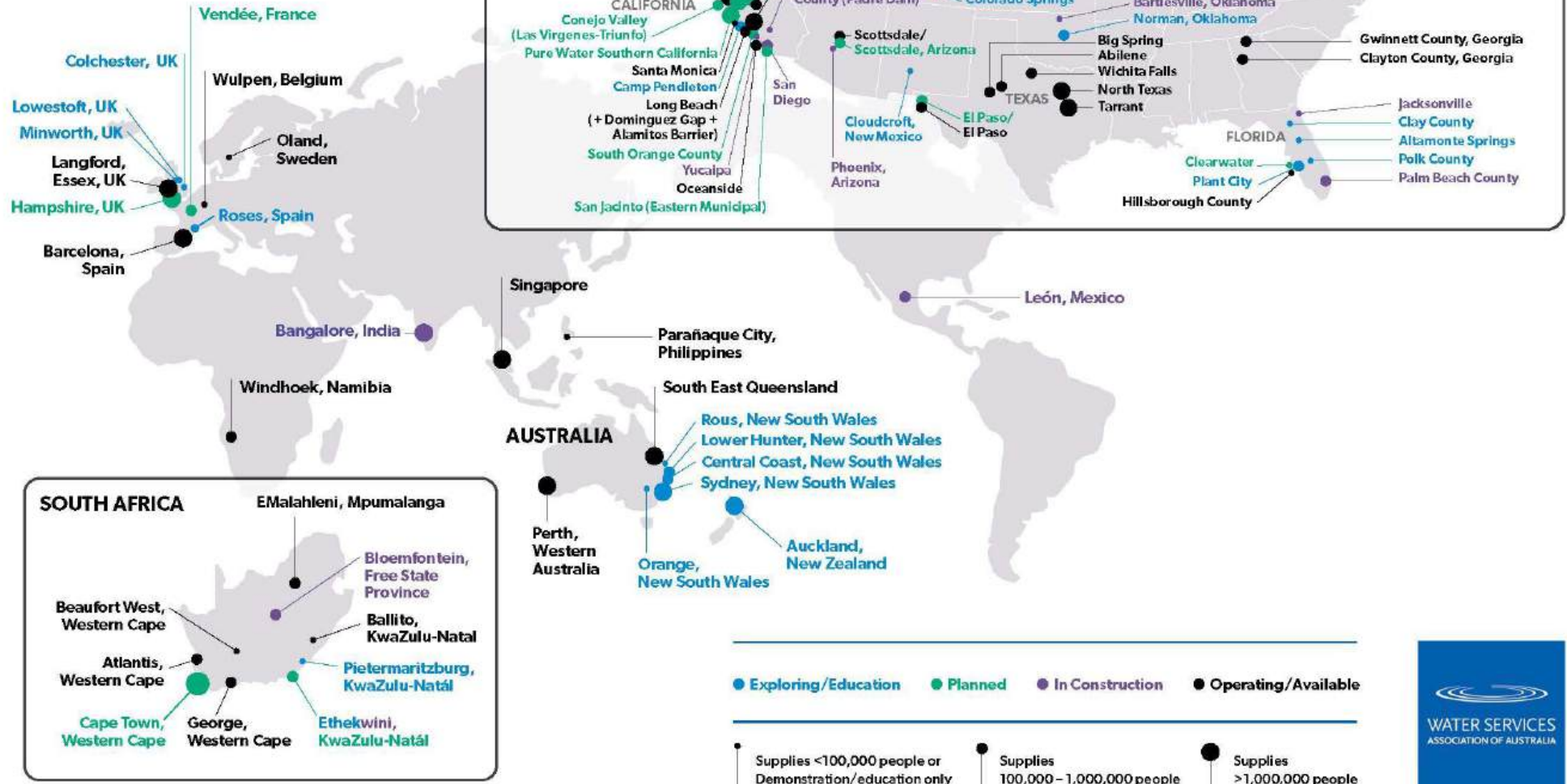
- Interactive map
- Maps on a page (PDFs)

NB on at [www.water360.com.au](http://www.water360.com.au) you can also find hundreds of videos and other resources created during the life of Water360 – go to **Topics** then **Purified recycled water**

# Global purified recycled water locations

2040s/Unknown

241202



# Global purified recycled water locations

## Stage + Augmentation type

241202



- ▼ GROUNDWATER AUGMENTATION
- ☪ RESERVOIR AUGMENTATION
- I RAW WATER AUGMENTATION
- ⌘ TREATED WATER AUGMENTATION
- TBC OTHER/TBC

- Exploring/Education
- Planned
- In Construction
- Operating/Available

- Supplies <100,000 people or Demonstration/education only
- Supplies 100,000 – 1,000,000 people
- Supplies >1,000,000 people

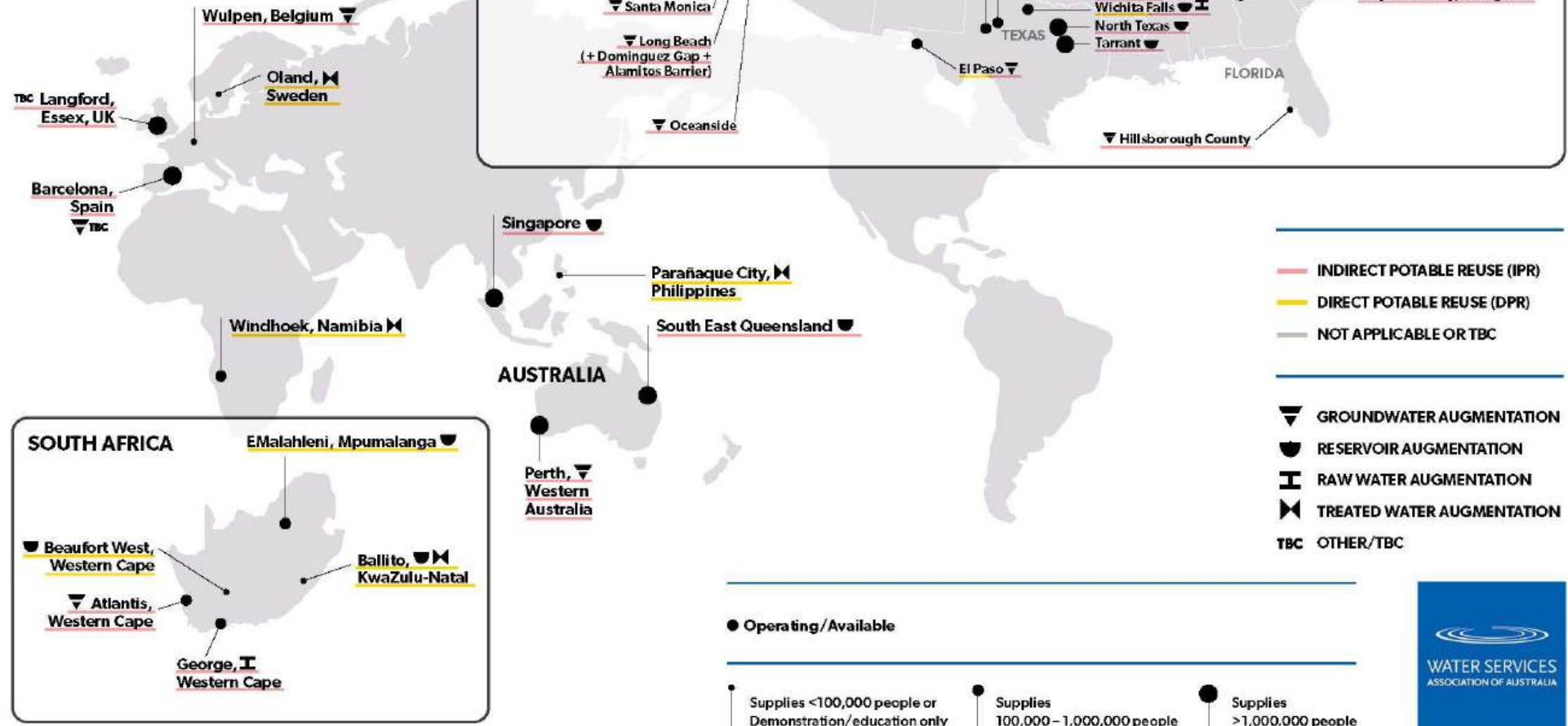




# Global purified recycled water locations

## Operating/Available

241202

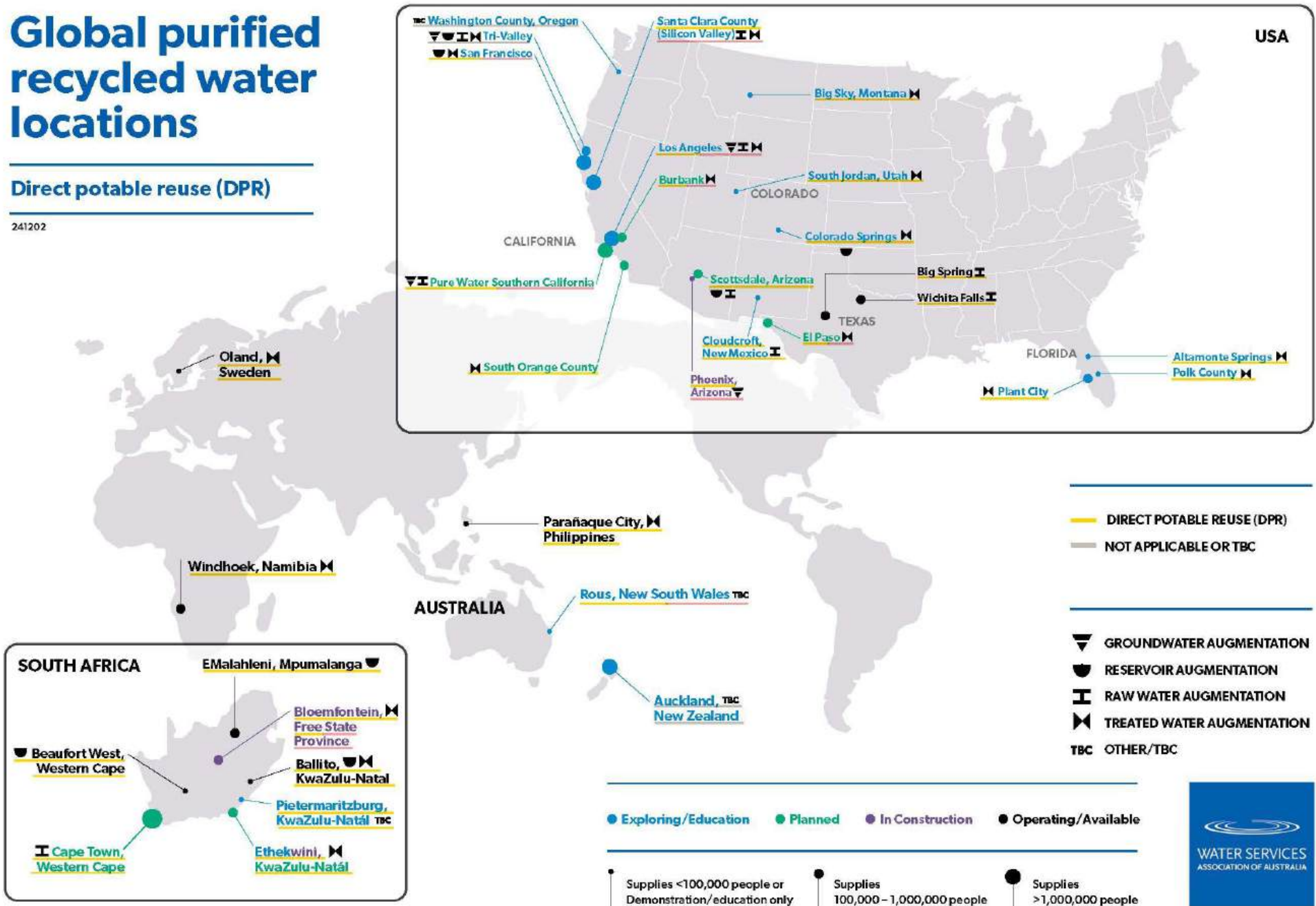




# Global purified recycled water locations

## Direct potable reuse (DPR)

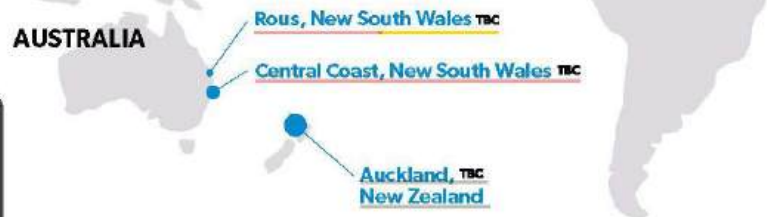
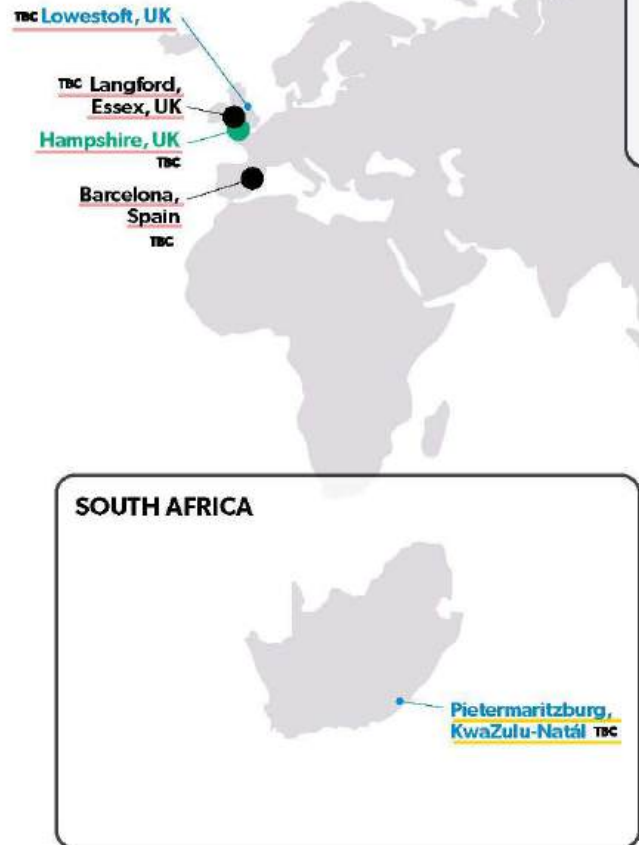
241202



# Global purified recycled water locations

## Other/TBC augmentation

241202



- INDIRECT POTABLE REUSE (IPR)
- DIRECT POTABLE REUSE (DPR)
- NOT APPLICABLE OR TBC

**TBC OTHER/TBC**

- Exploring/Education
- Planned
- In Construction
- Operating/Available

● Supplies <100,000 people or Demonstration/education only

● Supplies 100,000 – 1,000,000 people

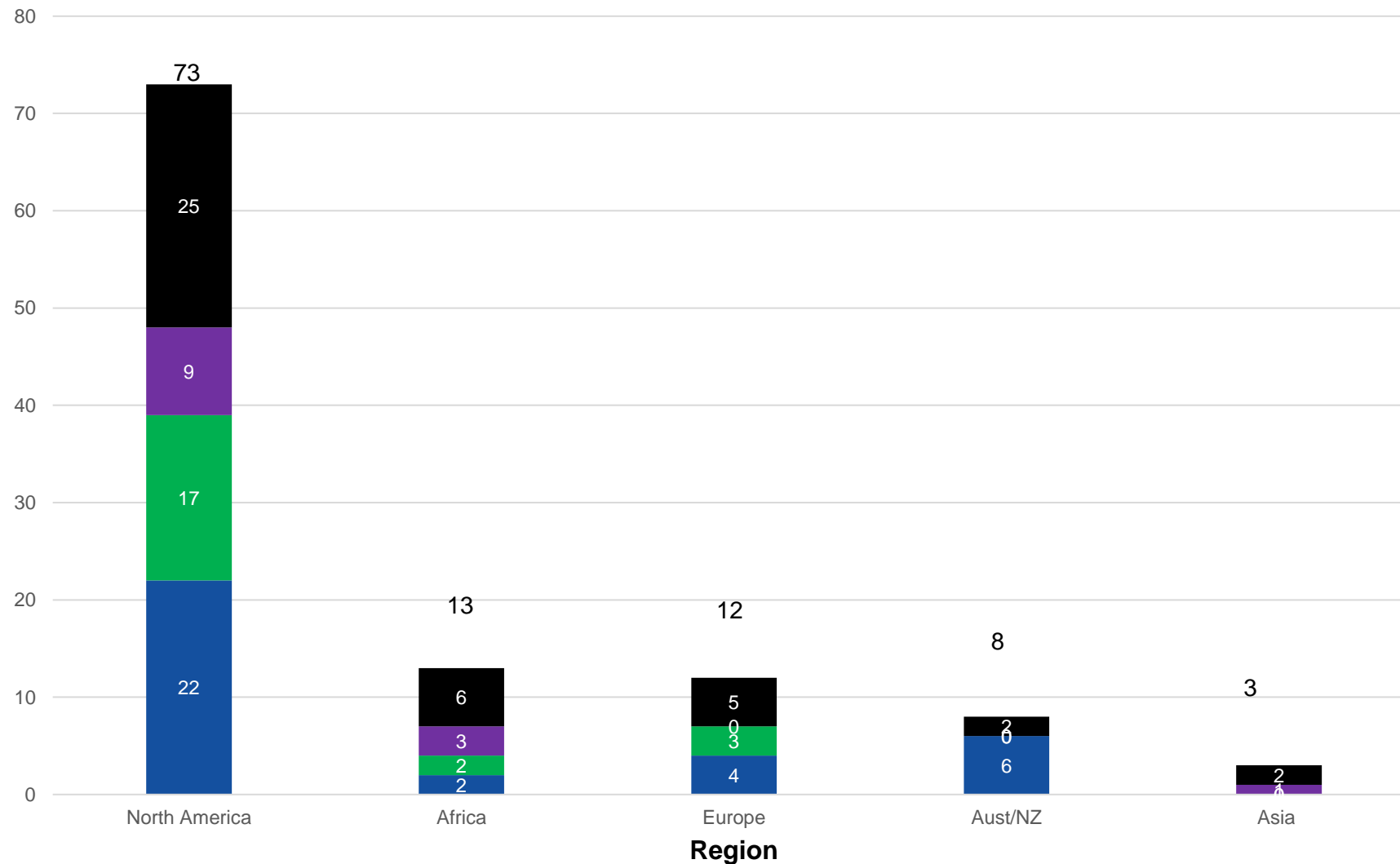
● Supplies >1,000,000 people



# Snapshots

Global purified recycled water locations, by region

■ Exploring/ Education ■ Planned ■ In Construction ■ Operating/ Available



**America is leading, other places catching up**

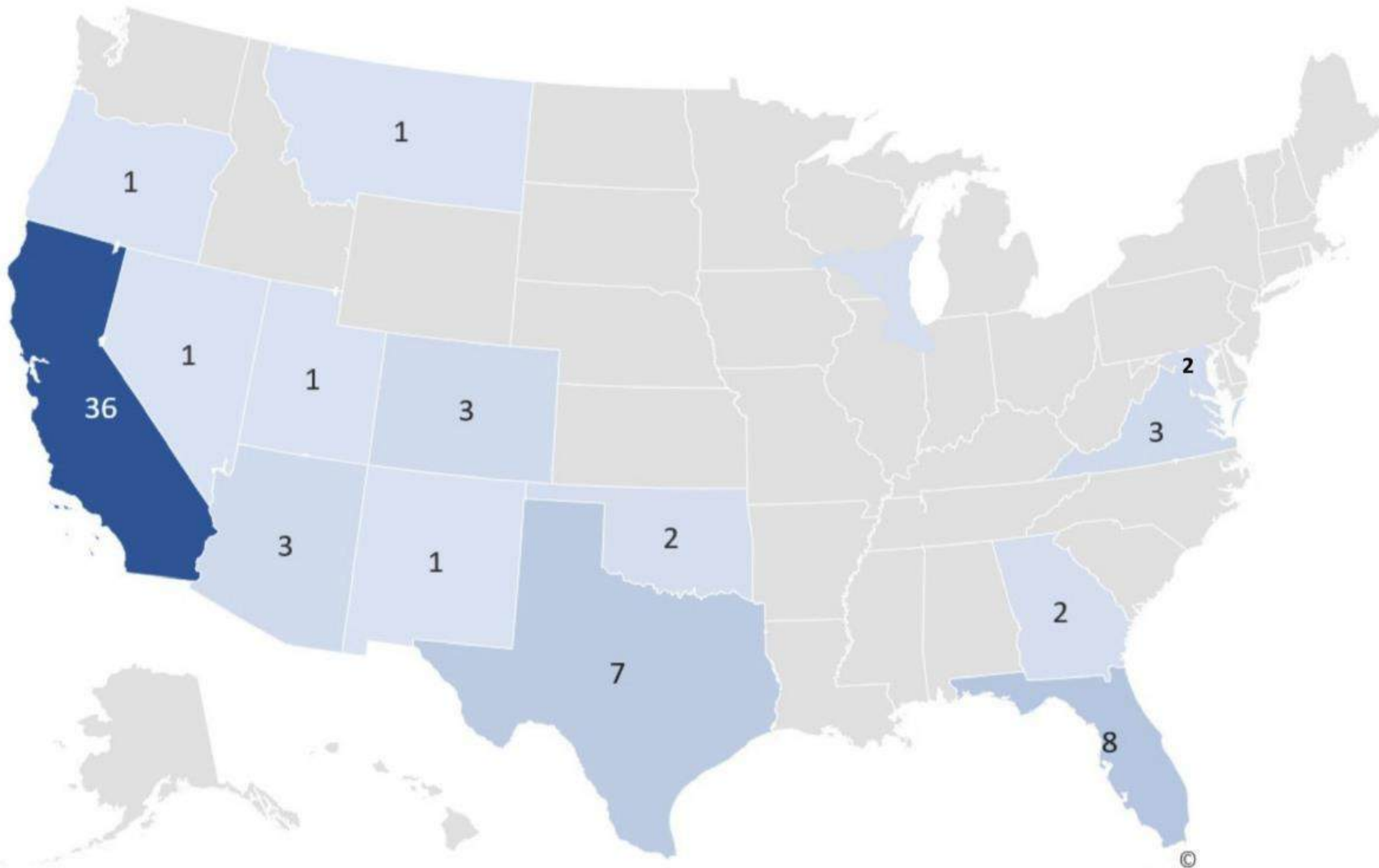
**‘Available’:**

Majority run full time; a few in limited conditions eg drought, tidal, permit limits.

- Eg Langford, South East Queensland, Barcelona seawater barrier, Singapore, Cambria

# US breakdown

US purified recycled water locations, by state



**California has most, then Florida, Texas, Colorado, Virginia**

(Includes all 4 stages)

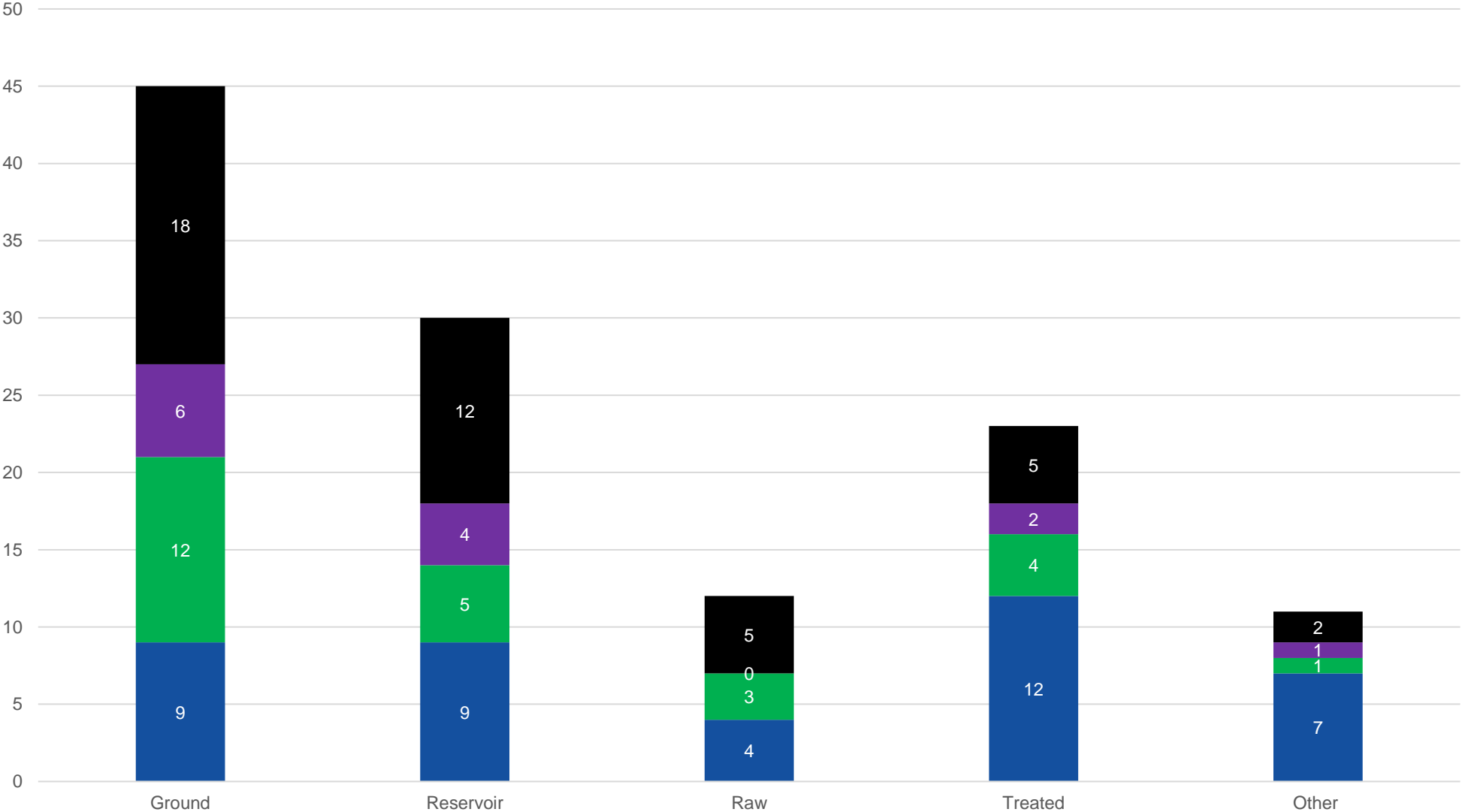


Florida is advancing rapidly, partly driven by a ban on non-beneficial surface water discharges by 2032

# Augmentation types

Global purified recycled water, by augmentation type

■ Exploring/ Education ■ Planned ■ In Construction ■ Operating/ Available



**Operating indirect (groundwater & reservoir) are the largest**

(...how about in 10 years with California DPR regulations?)

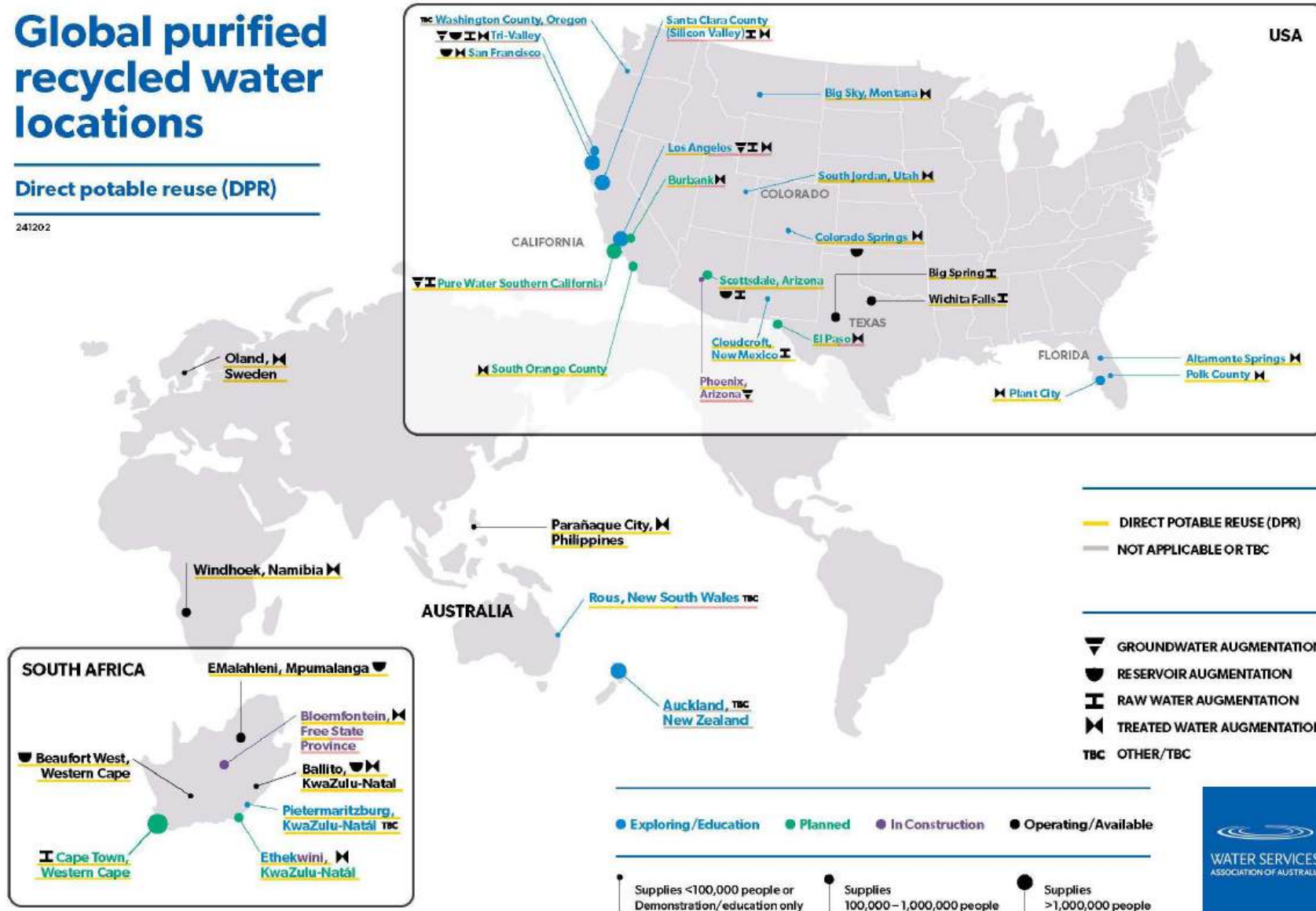
**Other:** River discharge – UK, Spain, Oklahoma

# Direct reuse has a long, proud history

## Global purified recycled water locations

### Direct potable reuse (DPR)

241202



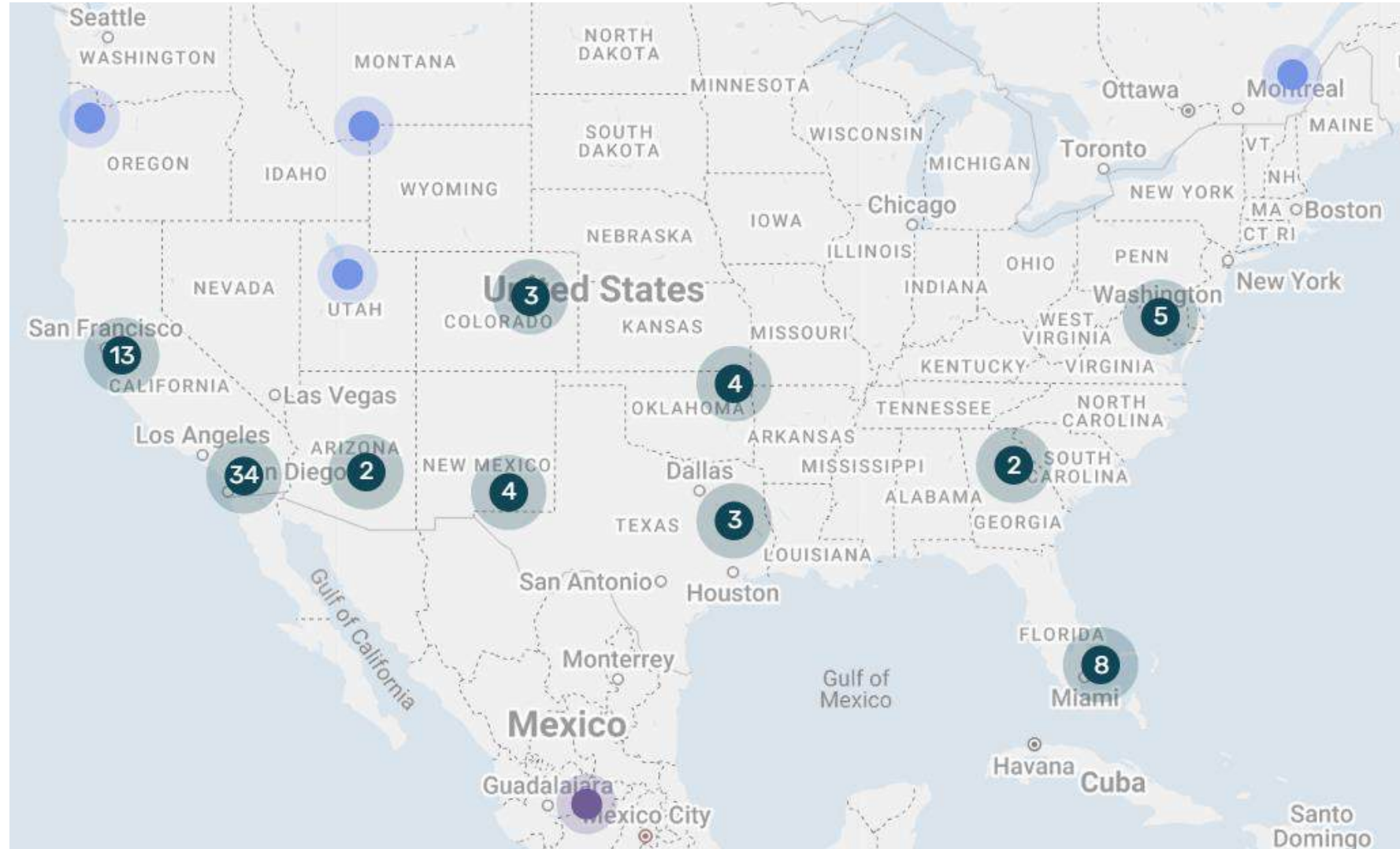
DPR started long before the California regulations:

- 1968: Windhoek
- 2000s: E-Malahleni
- 2010s:
  - Beaufort West
  - Big Spring
  - Wichita Falls
  - Ballito
- 2020s:
  - Oland
  - Manila



# It's not just coastal

Many inland locations as well



# Recycled water isn't the only source

## Examples:

- **Atlantis:** Recycled water + stormwater
- **E-Malahleni:** Acid mine drainage
- **Ethekwini (UMBilo):** Recycled water + stormwater
- **Ethekwini (Remix):** Recycled water + seawater desalination
- **Monterey:** Recycled water + stormwater + agriculture drainage water (crop irrigation) + food packaging processing water (e.g. bagged salad)
- **Oland:** Industrial water (food processing plant)
- **Palm Beach County:** Recycled water + stormwater
- **Santa Monica:** Recycled water + stormwater + urban runoff + brackish groundwater

## Monterey One Water



Monterey One Water, California, USA – Operating Groundwater Augmentation using 4 source waters

The Monterey region is isolated from state and federal water sources and must rely solely on its limited local water supplies (groundwater and surface water). Optimisation of all water resources is critical to meet the needs of our communities, and Pure Water Monterey is a national model for water reuse.



# What does the map tell us?

1. Purified recycled water is well established – not new
2. All water supply solutions are valuable – this one is reaching its time

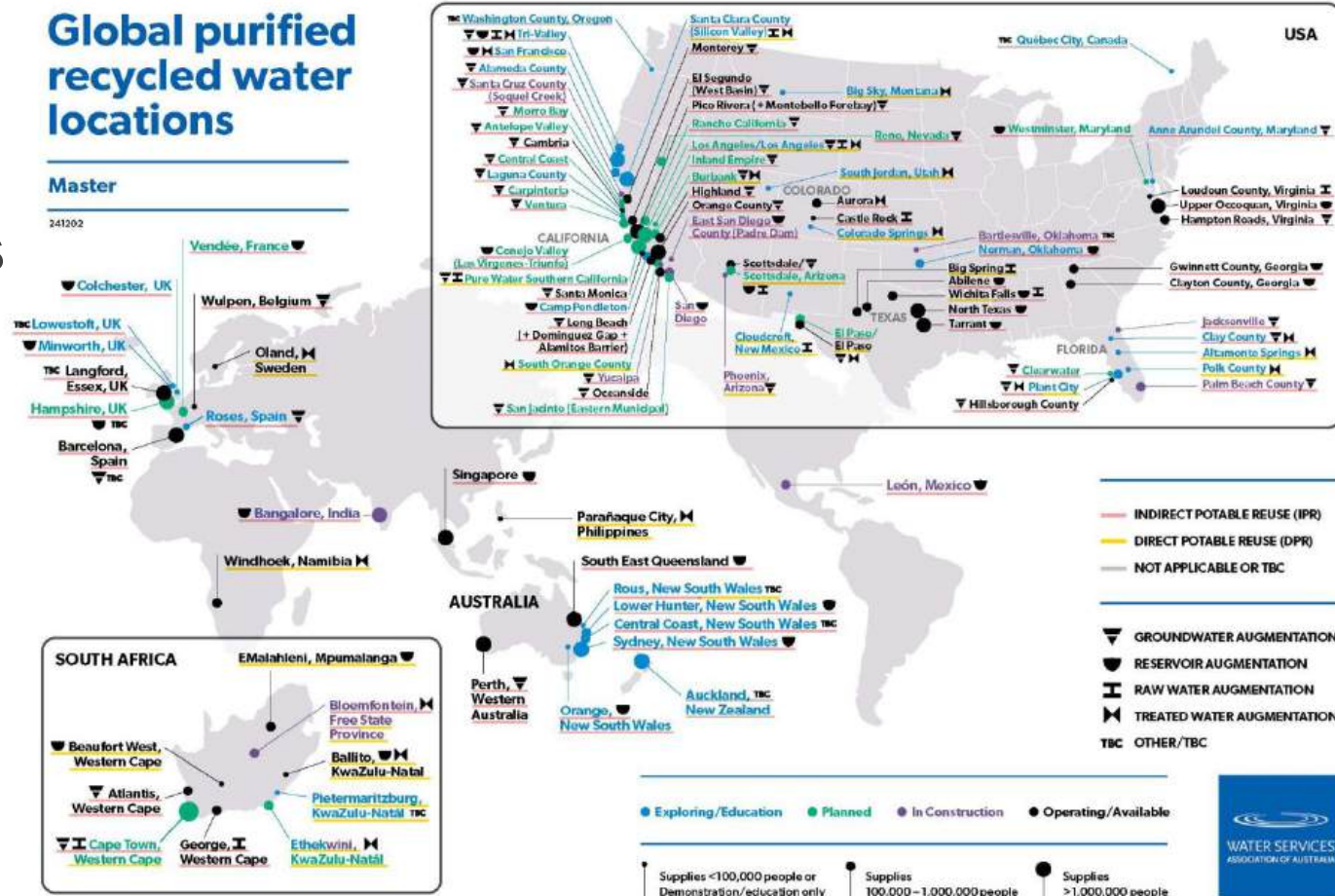
3. The global PRW community is substantial already, and growing

1. Not just places with arid climates

2. Coastal, and inland

3. Not always 'IPR first, then DPR'

- Africa, Texas, Manila



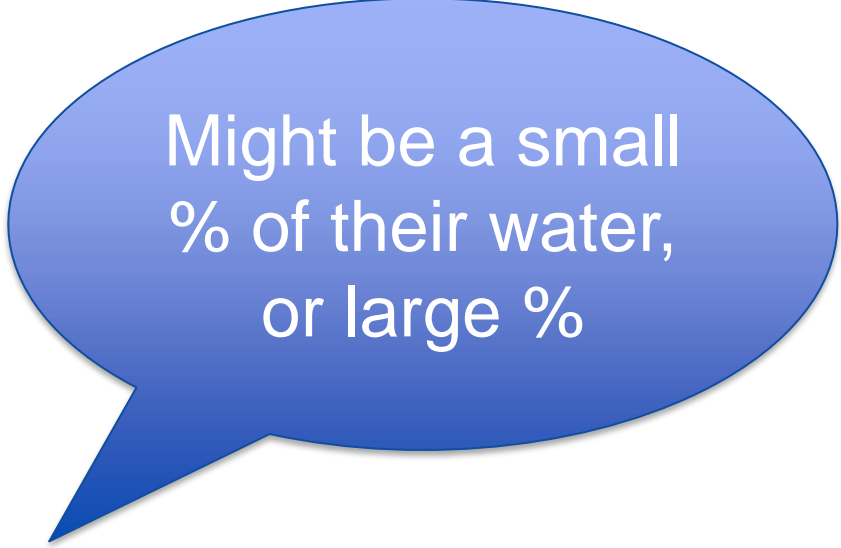
# In people terms

Today, purified recycled water is part of the local supply for

**30 million people**

By 2050, if most of the places on this map are ready, it will supply at least

**55 million people**



Might be a small % of their water, or large %

- Castle Rock – 33%
- San Diego – almost 50%
- Ventura – 20%
- Beaufort West – 20-30%

# Is this all the places doing it?

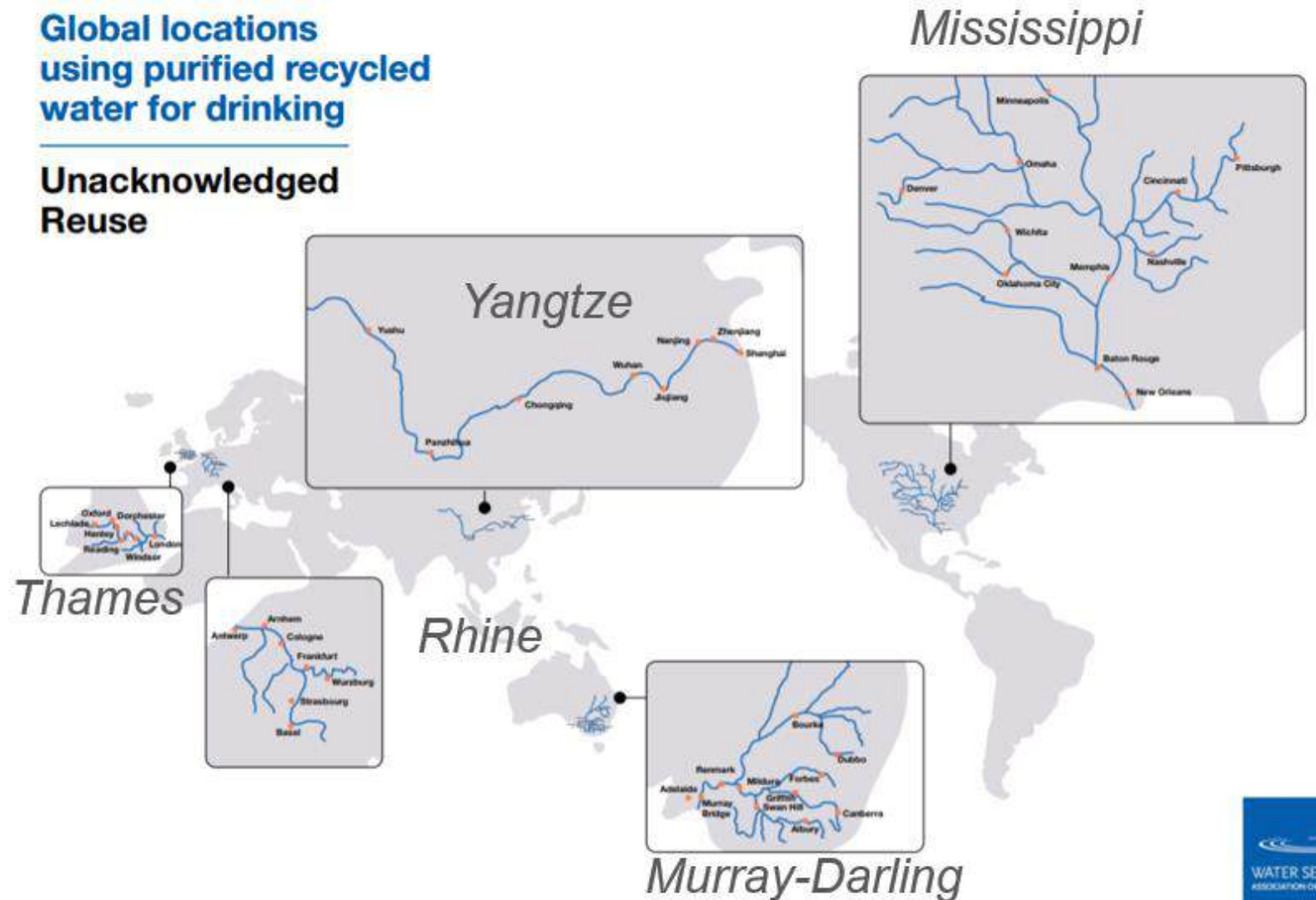
No – various other places may come on soon

Unplanned /de facto / unacknowledged reuse:

- Where an upstream town discharges treated wastewater to a water body, from which the downstream town draws water for drinking
- Long standing, common practice
- Particularly common in river systems serving multiple urban centres
- With appropriate treatment, produces safe drinking water

Global locations using purified recycled water for drinking

Unacknowledged Reuse



Most of us are drinking water used by upstream towns

# Key messages

**All water is recycled: nearly all towns are drinking some water used by upstream towns, even if it isn't always well understood.**

**At least 35 cities/communities around the world have already gained community acceptance to add purified recycled water to their drinking water supply.**

**It's been growing globally since the 1960s.**

**There are over 60 more cities/communities moving towards it. The configurations don't really matter – all produce safe drinking water.**

**By 2050, 100 cities/communities could be using purified recycled water as part of their drinking water supplies.**

**Locations can be big cities, small villages, lakes that supply whole counties, large wholesalers that sell the drinking water to dozens more cities/municipalities.**

**This water is being safely drunk by 30 million people, in hundreds of municipalities, right now – and this could well pass 55 million by 2050.**

# How to use the maps

- [www.water360.com.au/map/](http://www.water360.com.au/map/) (also WateReuse website)
- Link to it on your websites
  - Useful even if you aren't on it
  - Show how widely it's practised
- Visitor centre display
- Encourage new places to join when ready
- Use the charts with your decision-makers – show the global prevalence
- Danielle happy to do presentations



- **This pack will be published as PDF**
  - Email Danielle for ppt/excel versions
  - Always check date stamp
  - Share creations back

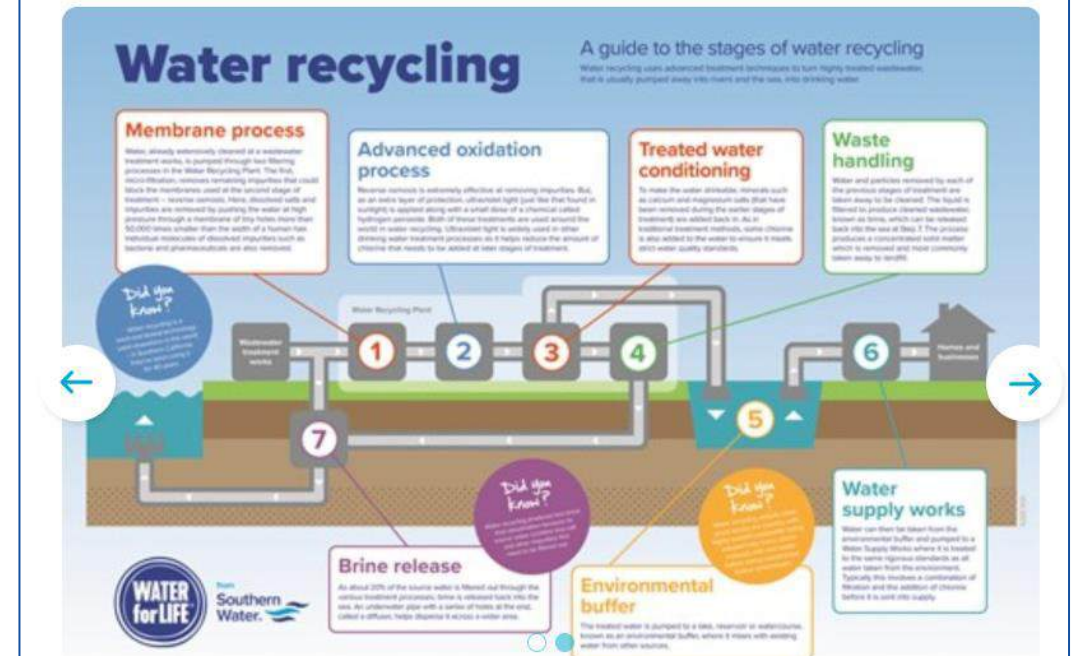
# What's next

## Annual survey:

- Update info
- New topic:
  - % of supply
  - Treatment train (RO, carbon)
  - Intermittency (operate full-time?)

Other layers: Desalination,  
local non-potable, unacknowledged,  
other options eg dams over time

## Portsmouth: Hampshire Water Transfer and Water Recycling Project



Contact [danielle.francis@wsaa.asn.au](mailto:danielle.francis@wsaa.asn.au) for soft copies

# Thanks to all contributors and collaborators

Linda MacPherson (New Water ReSources, USA)  
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Freddie Clayton (Journalist, Spain)  
Slade Smith (Design, Australia)  
Vivo (Web design, Australia)  
**And the many, many others who contributed data, thoughts and goodwill**



# Notes + definitions

1. **This resource contains over 3000 points of data from participating utilities. While all care has been taken to represent it correctly, apologies in advance for any errors or out of date information.**
2. This information is presented in December 2024 and will not reflect any changes since then. Updates will be made periodically. Please always check [www.water360.com.au/map/](http://www.water360.com.au/map/) for the latest version, marked by the date stamp on the PDFs.
3. A 'dot' for a city may mean that part or all of that city is served by purified recycled water as part of the drinking water supply.
4. In this map purified recycled water (or potable reuse) is considered the deliberate addition of treated water recycled from wastewater (including blackwater and grey water) to supplement drinking water supplies, from where it cannot be removed, and where there is some public acknowledgement of this practice. It may be indirect, direct or use a range of configurations over different timeframes. The key criterion is that it goes into a water supply used for drinking. This practice follows the local regulatory frameworks for drinking water quality.
5. Utilities were asked which of these they most resembled, based on the California Water Code:
  - a. Exploring: may be building a demonstration plant or pilot, doing some research, or are working with stakeholders to explore this option for the future
  - b. Planned: a specific project/scheme is planned and is firmly expected to be part of your future supply
  - c. In Construction: designs have been done and it is now being built
  - d. Operating/Available: built and in use, or available for use (*the majority of places operate continuously but a handful operate only in certain conditions eg drought, tidal, permitting context*)
  - e. Groundwater augmentation: blending the recycled water with another water source and percolating or injecting it into groundwater to replenish public water supply aquifers
  - f. Reservoir augmentation: blending purified recycled water into a water reservoir used as a source of drinking water supply for a public water system
  - g. Raw water augmentation: blending purified recycled water into pipelines/ aqueducts that deliver raw water to a drinking water treatment plant
  - h. Treated water augmentation: directly blending purified recycled water into the water distribution system of a public water system
  - i. Other (please specify). *In future, river augmentation may be added as a category – a range of locations specified this option*
6. Different places use different naming conventions and units of measure - the map seeks to offer a metric and non-metric (millions of litres/gallons per day).
7. Based on the [WHO Potable Reuse Guidelines, 2017](#)), typically:
  1. IPR means the planned addition of treated wastewater into water bodies used as sources of drinking-water. The water bodies, which can include rivers, lakes, reservoirs and aquifers, are referred to as environmental buffers. Water containing a proportion of treated wastewater is taken from the environmental buffer and further treated to provide drinking water.
  2. DPR means the introduction of treated wastewater (with or without retention in an engineered storage) into a drinking water supply without prior discharge to an environmental buffer. The treated wastewater may be blended with raw water from a river, lake, reservoir or aquifer immediately before a drinking-water treatment plant; blended with treated water downstream of a conventional drinking-water treatment plant; or introduced directly into a drinking-water distribution system.
8. The estimates of population served by purified recycled water are based on specific data received from utilities and is more precise than the 3 categories of <100k, 100k-1m, >1m people.
9. Dot colours represent the stage a location is considered to be at currently, even on the future maps.
10. Totals across the map formats may vary slightly for the purposes of illustration.
11. Estimates have been calculated with conservatism as a guiding rule.



**Thank you**

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# Q&A Discussion

MODERATOR: KRISTAN VANDENHEUVEL

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