

SUMMARY WHITE PAPER: RECYCLED WATER AS DRINKING WATER



OVERVIEW & CONTEXT

In March 2021, the WateReuse Association convened the virtual 36th Annual WateReuse Symposium, which included eight live roundtable discussions with facilitated breakout sessions. Led by WateReuse members and Champion sponsors, the live roundtables were presented in a format that allowed both knowledge sharing and interaction between participants. First, a group of six to ten experts on a given roundtable topic participated in a web-based video panel discussion viewed by several hundred attendees. When the live roundtable discussion concluded, the attendees moved into one of six pre-selected breakout sessions. Each breakout session focused on one aspect of the broader live roundtable discussion. WateReuse member volunteers facilitated the breakout dialogs, with one taking notes that were later used to produce this series of summary white papers.

This paper summarizes the discussions held during the 36th WateReuse Symposium live Recycled Water as Drinking Water roundtable.

LIVE ROUNDTABLE SUMMARY

During the live roundtable, the panel of six experts discussed considerations for purifying recycled water to meet drinking water standards, including treatment technologies, operations, monitoring, public trust, and regional differences. The panel explored advances in technology and treatment, emerging concerns, the role of monitoring and data, and the importance of public acceptance in utilizing recycled water as drinking water in communities around the globe.

Regional differences were highlighted during a discussion of technical challenges for local implementation. As the Florida Department of Environmental Protection undertakes potable reuse rulemaking, for example, local communities consider the technical challenge of integrating a potable reuse program with the existing purple pipe system for non-potable reuse. Similarly, the City of San Francisco noted technical challenges integrating new regulations in potable reuse with existing systems and practices, emphasizing the need for additional operator

SPEAKERS

- DAVID AMMERMAN, Division Director of Water, Wastewater, and Reuse, City of Altamonte Springs, Florida
- MANISHA KOTHARI, Alternative Water Supply Planning Manager, San Francisco Public Utilities Commission
- MIKE MCCULLOUGH, Director of External Affairs, Monterey One Water
- R. SCOTT SUMMERS, Director of EVEN Water Reuse Program, University of Colorado Boulder
- EVA STEINLE-DARLING, Principal Technologist, Carollo (Moderator)
- NICK TURNER, Senior Principal for Strategic Projects, Water Corporation of Western Australia

training and revisions to treatment operation practices. For potable reuse facilities in both California and Australia, seasonal variation and transitions remain a top production and operational challenge. California facilities continually work to find the balance between integrating purified recycled water into the drinking water supply during dryer periods and developing innovative ways to use the water in sectors such as agriculture during the wetter parts of the season. To address water quality challenges that arise from seasonal variations in water flow, Australia's potable reuse facilities work in partnership with their health department to conduct mature risk assessments, identifying indicator species for a variety of molecules.

Paramount to the discussion on potable reuse was the evolution of detection, treatment, and regulation of constituents of emerging concern (CECs). The panel recognized the fluctuating nature of regulating CECs throughout the decades and the difficulty for engineers to design systems that treat water to a "moving target" and the challenge for regulators in finding the line of

cautionary regulations. The panel discussed the potential for establishing toxicity endpoints for engineers to design to in place of playing "catch-up" with each new constituent discovered in water.

Regarding the biggest challenges in advanced purification, the panel felt aligning operations and real-time monitoring of equipment and water quality was the most important. Operating an advanced water purification facility to meet regulations while managing large monitoring data-sets for informed decision making remains a challenge for utilities. There remains a gap in integrating monitoring data into process operations decision making. While artificial intelligence poses an opportunity to integrate monitoring data and operations, data management and operator training becomes a challenge.

The panel concluded with a discussion of the essential non-technical aspects of potable reuse, including developing public trust through transparency and understanding and the financial challenges from the undervaluing of water.



BREAKOUT DISCUSSIONS TAKEAWAYS

Echoing the themes of the roundtable, the six breakout rooms discussed artificial intelligence, carbon based advanced treatment (CBAT), enhanced source control programs (ESCP), membrane bioreactors (MBR), regulatory guidelines development, and the east coast perspective on potable reuse. Breakout discussions included 166 participants, with anywhere from 17 to 32 attendees in each room.



BREAKOUT ROOM 1 **ARTIFICIAL INTELLIGENCE**

This breakout further explored the importance of complimentary human operations and automated monitoring process control noting that each should leverage, but does not replace, the other. For example, in Northern Ireland, a pilot project was created specifically to demonstrate how artificial intelligence could enhance operation data management and would not replace

operator expertise. Demonstration facilities and pilot projects can not only train operators but build public and regulator trust in real-time monitoring. Specific to potable reuse, sewershed surveillance has improved source control programs with integrated process controls. There remains a need to define and detect anomalies utilizing real-time monitoring through fingerprinting, adapting to the rhythms of wastewater characteristics, or establishing parameters.



BREAKOUT ROOM 2 CARBON BASED ADVANCED TREATMENT (CBAT)

Breakout session participants emphasized the need to demonstrate the reliability and robustness of CBAT for CECs and organics. CBAT is often selected for potable reuse when disposing of the brine associated with

reverse osmosis (RO) is not practical. A major challenge of CBAT adoption includes communicating “site-specific treatment” in place of messaging RO as the gold standard. The room discussed the need to increase product water quality confidence, citing the example of side-by-side CBAT and RO treatment in a pilot facility as one way to do so.



BREAKOUT ROOM 3 POTABLE REUSE AND THE EAST COAST PERSPECTIVE

This breakout noted that drivers for water reuse on the East Coast shift from state to state and include water supply, discharge issues (nutrient limits), growth, land subsidence, and groundwater levels. Educating

the public and regulators on the value of water and drivers for water reuse in “water-rich” states is essential. Another powerful tool the group considered is reframing to a holistic water management approach that includes watershed, sewershed, and pretreatment programs that can better address long-term challenges such as water quality.



BREAKOUT ROOM 4 ENHANCED SOURCE CONTROL PROGRAMS (ESCP)

Participants discussed the importance of learning from past programs that have addressed issues such as fats, oils, and grease (FOG), prescriptions, and lead/copper to avoid reinventing the wheel. The room felt previous ESCPs have been most effective at minimizing risk from industries or manufacturers compared to consumer

products (e.g., PFAS). Establishing an effective ESCP can be resource intensive, and therefore difficult for smaller communities. Overall, implementing an ESCP that incorporates a combination of real-time monitoring, discrete monitoring, and sewershed surveillance can be effective in minimizing risk, but there are challenges for broad implementation. In addition, regulatory requirements can become a barrier to potable reuse for smaller communities.

**The City of Altamonte Springs,
Florida’s demonstration facility,
pureAlta, was an opportunity to
educate the public about carbon
based advanced treatment.**





BREAKOUT ROOM 5 **INCORPORATION OF MEMBRANE BIOREACTORS (MBRS) INTO ADVANCED TREATMENT**

This breakout closely examined the challenges of comparing virus log-reduction values (LRV) of an MBR with other membrane treatment because an MBR achieves appropriate LRV by accounting for log reduction from each of the treatment barriers in a system. MBRs are designed and operated with the whole scheme/system and need to be assessed based on that principle. The room discussed opportunities to use MBRs in satellite systems for indirect potable reuse and cited examples of decentralized reuse with MBRs in the wine industry. To increase adoption of MBRs for potable reuse treatment, the group identified the need for improved training and support for



A look at the Orange County Water District's reverse osmosis (RO) facility that houses 21 RO units and 3,150 pressure vessels treating 100 million gallons of water per day.

operators along with cross-training of personnel that operate reverse osmosis systems.



BREAKOUT ROOM 6 **REGULATORY GUIDELINES DEVELOPMENT**

This breakout continued exploring regional differences in regulations given that water reuse is regulated at the state level. The EPA spoke to actively collecting information from different states to develop a database for information sharing on state regulations. Updates on direct potable reuse (DPR) regulatory efforts across the U.S. included: Arizona has partial regulations, California is in the development process, Colorado is in early

stages of DPR development, Florida is expecting the release of DPR regulations later in 2021, North Carolina has legislative language on DPR, and Tennessee and Georgia are moving in the direction of exploring DPR regulations. In states without potable reuse regulations, the typical approach is case-by-case approval from regulatory agencies based on engineering reports. Other states use regulatory guidance from other states instead of starting from scratch. Regardless of the region, breakout room participants agreed communicating with regulators early in the project is the key to success.

CLOSING SUMMARY OF THE DISCUSSION

The concluding remarks weaved together the themes of regional drivers of water supply and water discharge avoidance, challenges in the intersection of operations and monitoring, and regulatory paradigms both regionally and in the face of constituents of emerging concern. The session concluded with a nod to trust as the key to potable reuse projects. The water reuse community will find success through proactive communication and transparency with project partners, regulators, and public stakeholders.

The WaterReuse Association thanks Carollo Engineers for sponsoring and assistance in organizing this live roundtable at the 36th Annual WaterReuse Symposium.