



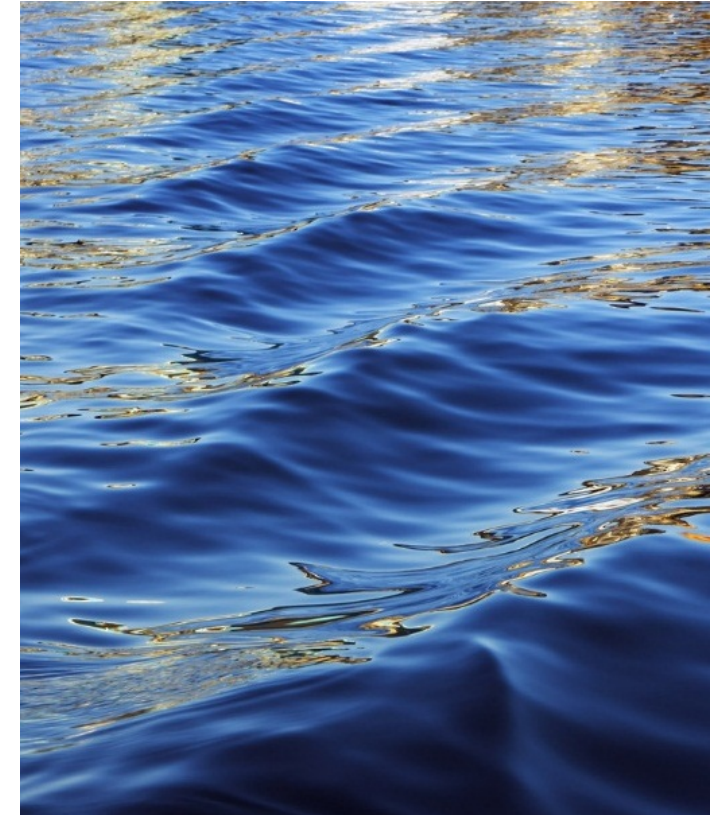
How Research Needs are Driven by the Diversification of Reuse Options

Douglas M. Owen, PE, BCEE

Executive VP and Chief Technical Officer, Arcadis
Co-Chair, Water Environment and Reuse Foundation

WaterReuse AZ

July 26, 2016



Agenda

- What we have accomplished
- Portfolio categories
- The drive towards DPR
- Future needs



What we have accomplished...

\$>30M

Funding from  WATERREUSE



In 2015....

\$2.1 M/6M

in project funding

18 Projects Launched

12 Published Reports

The Research Portfolio

Urban
Irrigation



Potable Reuse



Wetland/
Habitat
Restoration



Industrial
Reuse

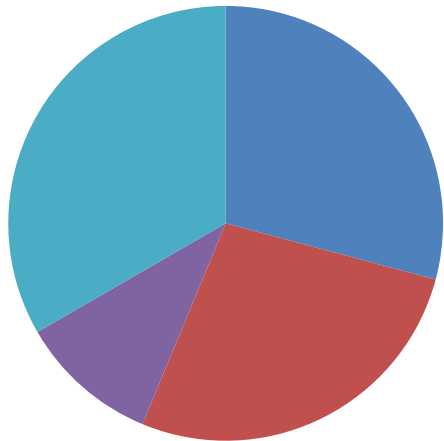
Food Crop
Irrigation



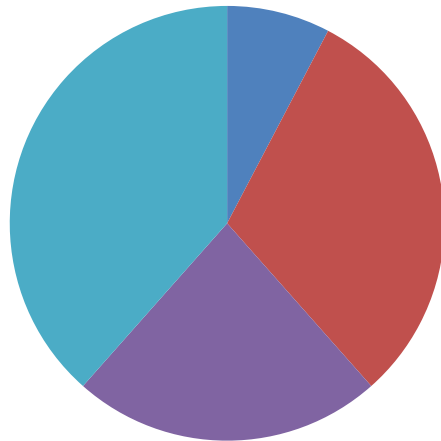
Desalination

WRRF Research Focus Areas Through the Years

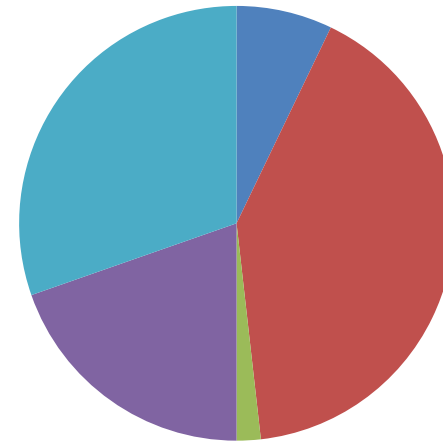
2001 - 2004



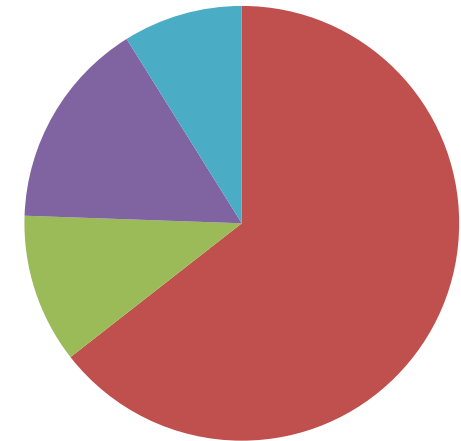
2005 - 2008



2009 - 2012

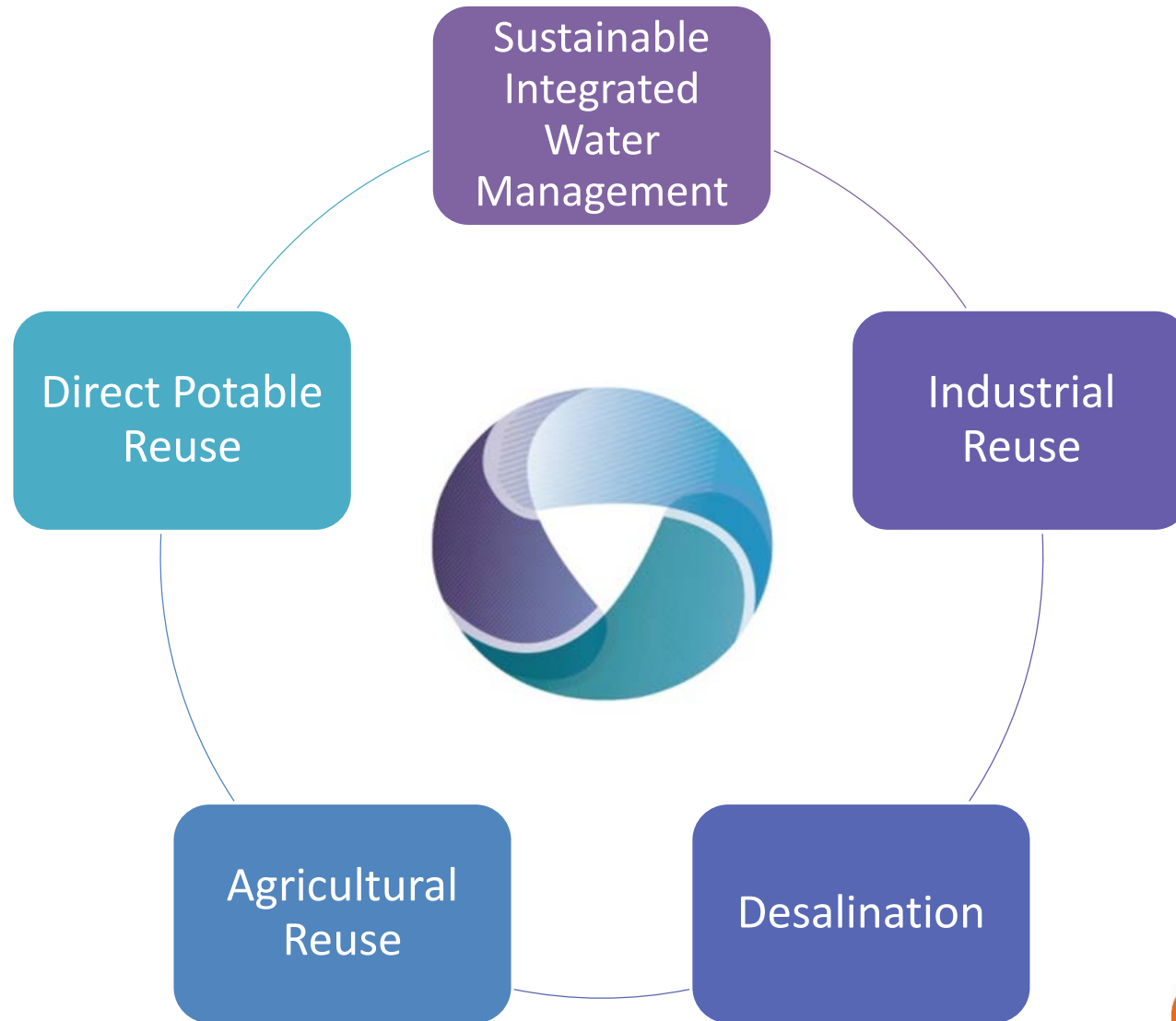


2013 - Present



- Non-Potable Reuse
- Potable Reuse
- Industrial Reuse
- Desal/Salinity Mgmt
- Social Science

Current and Future Research Priorities



Fit for Purpose – Industrial Reuse



Completed and ongoing research to:

- Bridge the gap between business and government
- Identify the similarities and differences between industrial sector and end-use
- Develop a framework for on-site reuse
- Develop a decision support tool for evaluating the economics of on-site reuse

Fit for Purpose – Agricultural Reuse

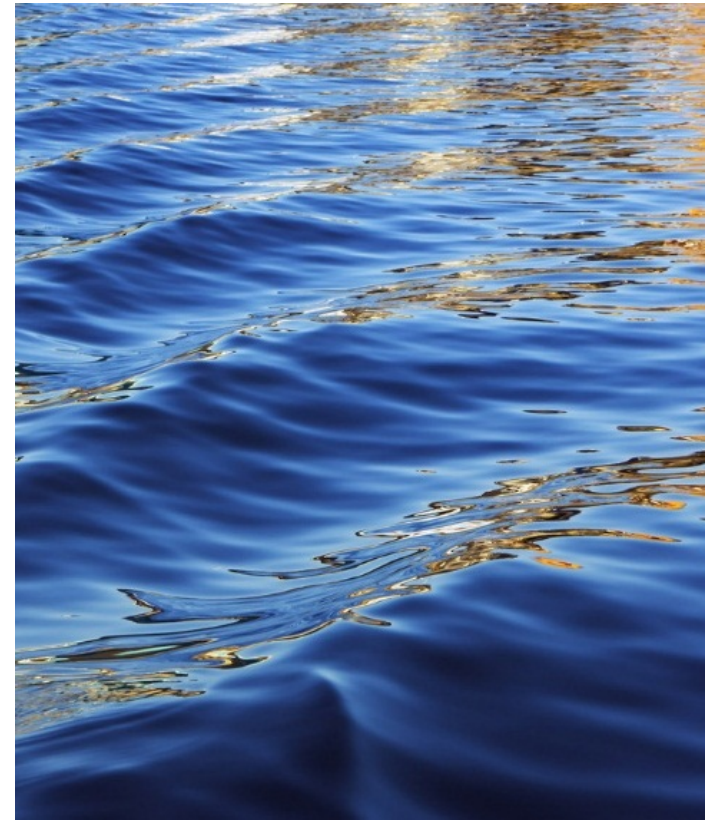
Planned and ongoing research to:

- Identify existing uses and characterize potential
- Develop strategies to overcome barriers and incentivize reuse
- Evaluate existing governance frameworks and develop recommendations



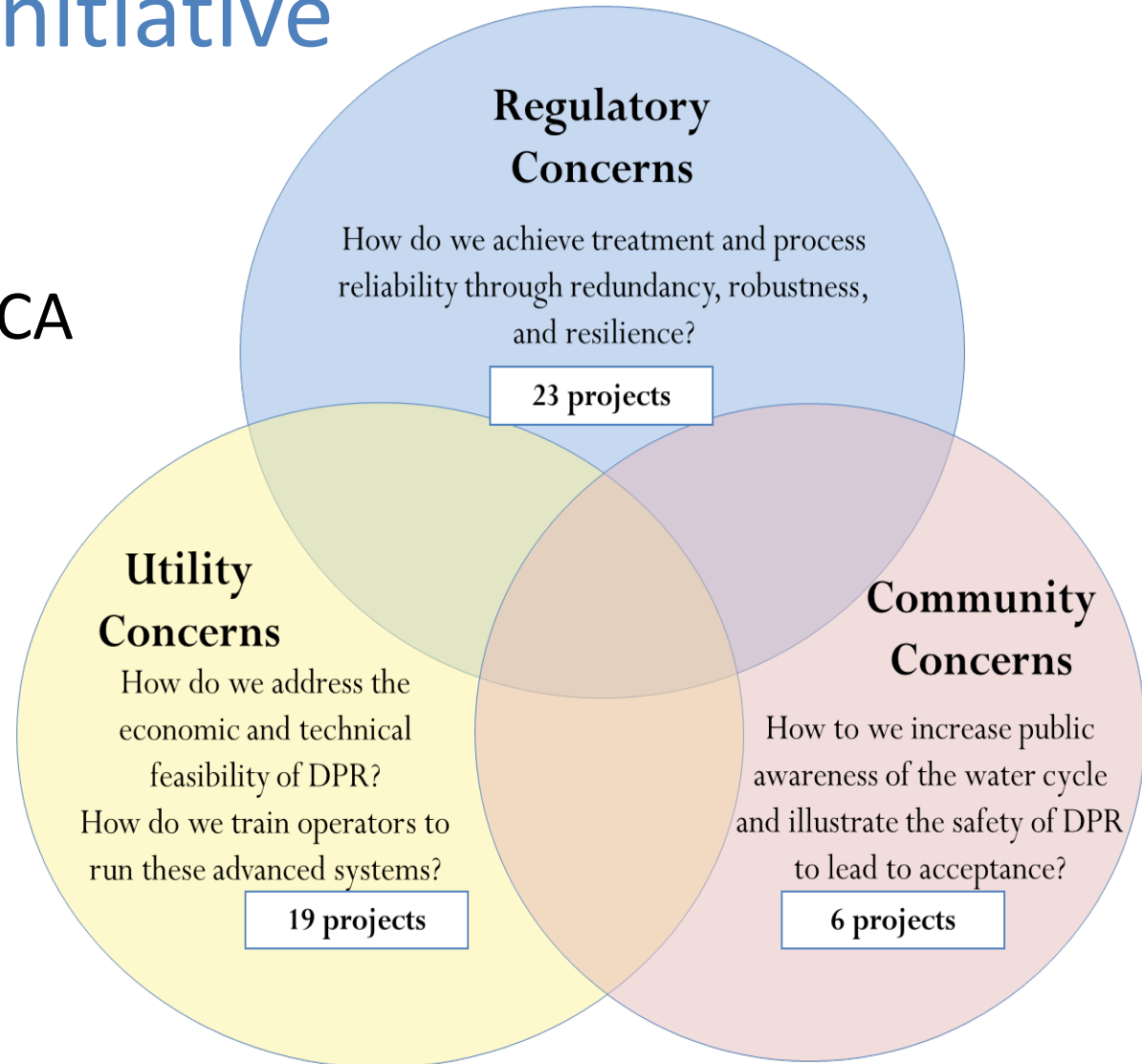


Direct Potable Reuse Initiative

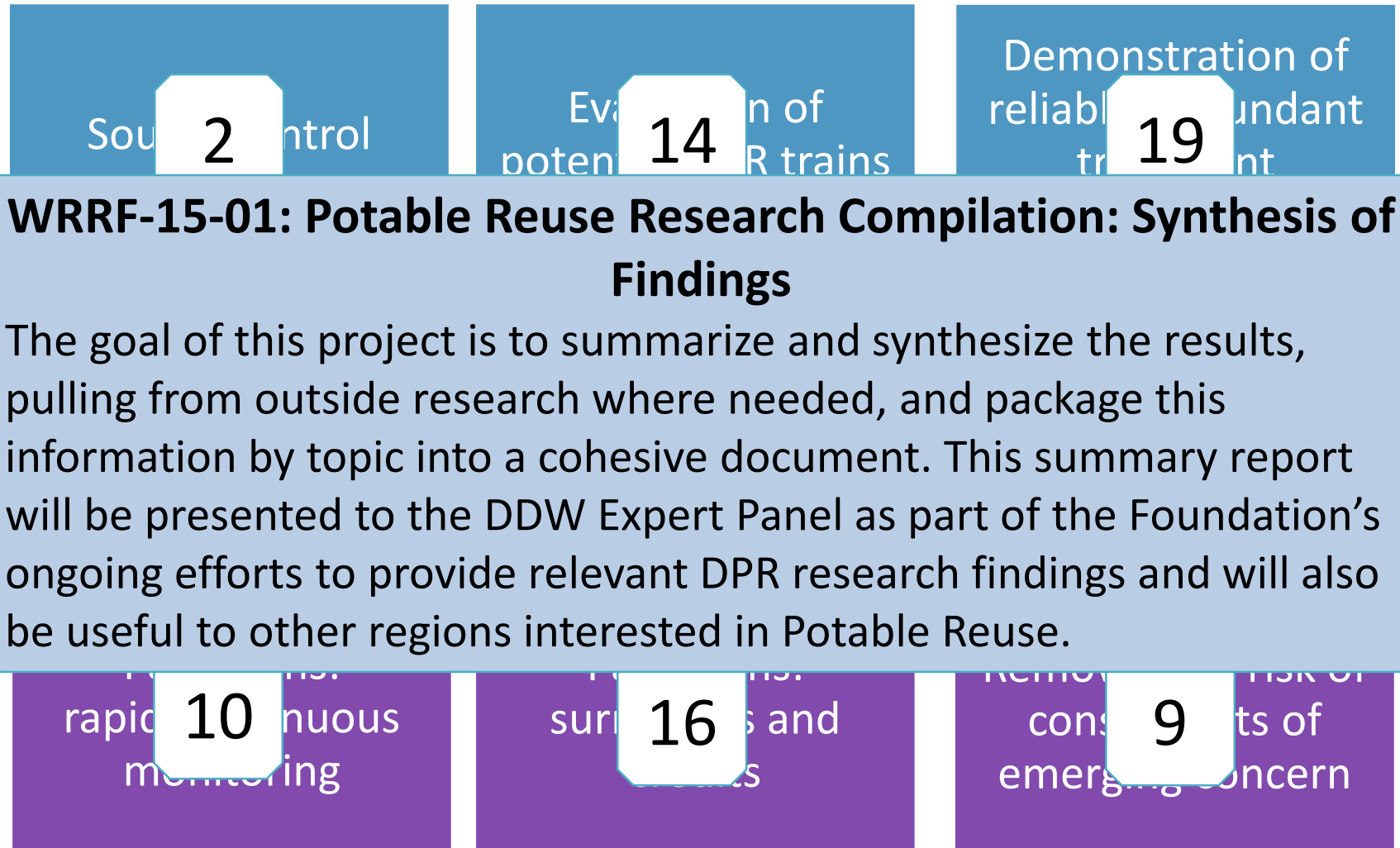


Direct Potable Reuse Initiative

- Partnership of WRRF and WRCA
- Goals
 - Rigorous research (WRRF)
 - Stakeholder awareness & acceptance (WRCA)
 - Regulations for DPR (SWRCB/DDW)
- \$20M DPR research program

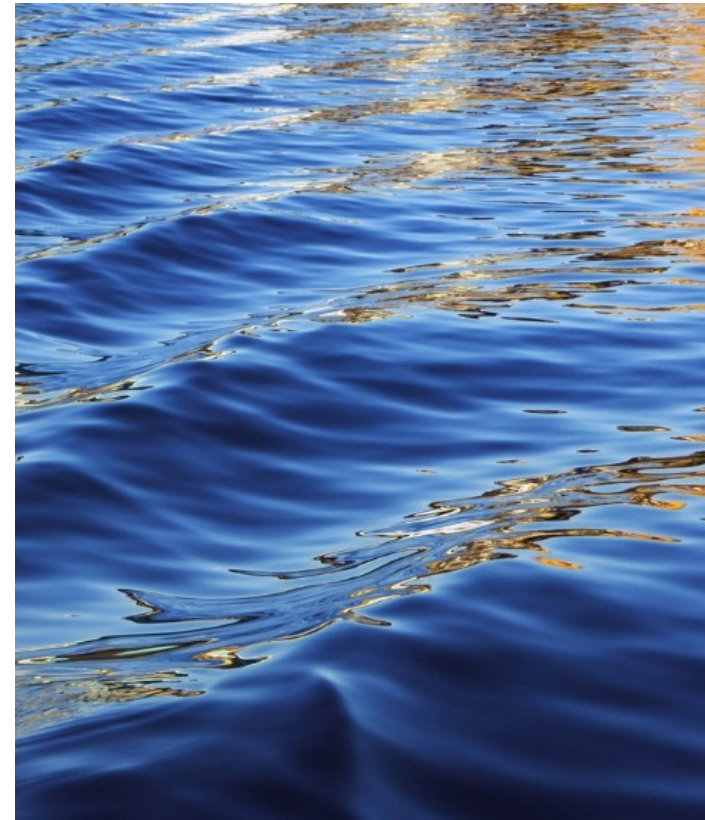


Technical Barriers For Potable Reuse Being Addressed Through Research





Public Acceptance



Research Addresses Reuse Acceptance

The belief that additional [potable] water supply sources are not needed

The perception that water supply deficiencies can be solved solely with conservation

The lack of public understanding of [potable] reuse processes and the associated science

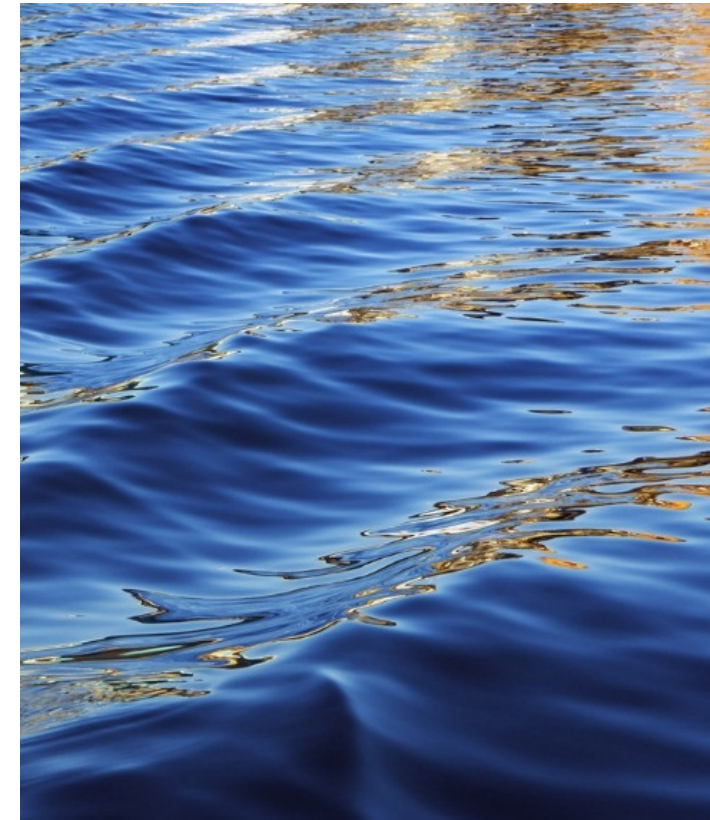
The perception that [potable] reuse is not safe

The sometimes distracting or uncomfortable feelings toward the source of the water

Lack of understanding of the limiting factors associated with other water supplies (energy demand, greenhouse gas (GHG) emissions, cost, and limited availability)



Research Needs and 2016 Program



SWRCB Research Needs Workshop (October 2015)

Goal: to help the State Water Board prioritize research needs associated with characterizing occurrence, assessing health risks, and assessing efficacy of treatment systems for emerging contaminants in water reuse applications.

Participants: representatives from recycled water agencies, wastewater agencies, storm water managers, drinking water utilities, and regulatory agencies.

CA DDW Expert Panel Assessment of Additional DPR Research Needs

The Panel finds that there is no need for additional research to be conducted to establish uniform water recycling criteria for DPR...the Expert Panel is impressed by the research that has been funded by the WaterReuse Research Foundation and supports the continuation of such research.

*NWRI memo from Expert Panel Chairs to DDW
June 30, 2016*

CA DDW Expert Panel Assessment of Additional DPR Research Needs

However, there are some areas of research that would enhance the understanding and acceptability of DPR in the State of California...the Expert Panel believes the State Water Board or other agencies that have expertise in this area should provide oversight and direction for research efforts designed to address these areas.

*NWRI memo from Expert Panel Chairs to DDW
June 30, 2016*

CA DDW Expert Panel Assessment of Additional DPR Research Needs

- Process established by the State to:
 1. Monitor the literature
 2. Establish an external peer review process
- Provide oversight, direction, and funding for probabilistic Quantitative Microbial Risk Assessment (QMRA)
- Improve methods to more precisely characterize pathogen concentrations
- Collect pathogen concentration data for raw wastewater associated with community disease outbreaks

CA DDW Expert Panel Assessment of Additional DPR Research Needs

- Identify suitable options for final treatment processes that can provide some “averaging” with respect to chemical peaks:
 1. Buffer tanks, potentially blended with an alternative water source
 2. Removal of volatile contaminants during a degassing step
 3. Use of biologically-active filter after RO/AOP to further degrade any remaining contaminants
- Focus on non-targeted analysis and low molecular weight compounds
 - Increase the understanding of the make-up of remaining TOC composed of low molecular weight compounds

Leveraging Future Funding



What we have accomplished...

\$>30M

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In 2015....

\$2.1 M/6M

in project funding

18 Projects Launched

12 Published Reports

What we have accomplished together...

\$ > 125M

Funding from



In 2015....

\$6M/15M

in project funding

58 Projects Launched

49 Published Reports

Our Combined Research Staff



Julie Minton, WRRF
Research Director



Mark LeChevallier
WRRF RAC Chair



Raj Bhattarai, WERF
RC Chair



Amit Pramanik, WERF
Research Director



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