How Research Needs are Driven by the Diversification of Reuse Options

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Co-Chair, Water Environment and Reuse Foundation

WateReuse AZ
July 26, 2016
Agenda

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

$>30M  Funding from

$>75M  Leveraged funding for projects

210 Projects funded

50 Active Projects

In 2015....

$2.1M/6M in project funding

18 Projects Launched

12 Published Reports
The Research Portfolio

- Urban Irrigation
- Wetland/Habitat Restoration
- Food Crop Irrigation
- Potable Reuse
- Industrial Reuse
- 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

- Sustainable Integrated Water Management
- Industrial Reuse
- Desalination
- Agricultural Reuse
- Direct Potable Reuse
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

<table>
<thead>
<tr>
<th>Source Control</th>
<th>Evaluation of potential DPR trains</th>
<th>Demonstration of reliable, redundant treatment</th>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>14</td>
<td>19</td>
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**WRRF-15-01: Potable Reuse Research Compilation: Synthesis of Findings**

The goal of this project is to summarize and synthesize the results, pulling from outside research where needed, and package this information by topic into a cohesive document. This summary report will be presented to the DDW Expert Panel as part of the Foundation’s ongoing efforts to provide relevant DPR research findings and will also be useful to other regions interested in Potable Reuse.

<table>
<thead>
<tr>
<th>Pathogen mitigation</th>
<th>Pathogen surrogates and credits</th>
<th>Removal and risk of constituents of emerging concern</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>16</td>
<td>9</td>
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**Pathogens:**
- **surrogates and credits**
- rapid/continuous monitoring

**Operations, maintenance, training/certification**
- Critical control points
- Failure and resiliency
- Evaluation of potential DPR trains
- Removal and risk of constituents of emerging concern
Public Acceptance
# Research Addresses Reuse Acceptance

<table>
<thead>
<tr>
<th>The belief that additional [potable] water supply sources are not needed</th>
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<tr>
<td>The perception that water supply deficiencies can be solved solely with conservation</td>
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<tr>
<td>The lack of public understanding of [potable] reuse processes and the associated science</td>
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<tr>
<td>The perception that [potable] reuse is not safe</td>
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<td>The sometimes distracting or uncomfortable feelings toward the source of the water</td>
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<tr>
<td>Lack of understanding of the limiting factors associated with other water supplies (energy demand, greenhouse gas (GHG) emissions, cost, and limited availability)</td>
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Research Needs and 2016 Program
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 WateReuse Research Foundation and supports the continuation of such research.

NWRI memo from Expert Panel Chairs to DDW
June 30, 2016
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
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 weigh compounds
Leveraging Future Funding
What we have accomplished...

$>30M

Funding from WATEREUSE

$>75M

Leveraged funding for projects

210 Projects funded

50 Active Projects

In 2015....

$2.1M/6M in project funding

18 Projects Launched

12 Published Reports
What we have accomplished together...

>$125M Funding from

$>84M Additional leveraged funding for projects

864 Projects funded

155 Active Projects

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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