MWD FAF Program Project

• Project
  • “WE&RF DPR Research Initiative”

• MWD Member Agency Sponsor
  • West Basin Municipal Water District

• Project Administer
  • Water Environment & Reuse Foundation’s Solicited Research Program (formally WateReuse Research Foundation)

• Goal
  • Developing research to inform regulations and fostering acceptance of DPR
West Basin Municipal Water District

6th Water Coming Soon!

175 Billion Gallons Since 1995
Project Partners

- Eastern Municipal Water District
- Burbank Water and Power
- City of Torrance
- Western Municipal Water District of Riverside County
- Las Virgenes Municipal Water District
- Upper San Gabriel Valley Municipal Water District
- Three Valleys Municipal Water District
- Municipal Water District of Orange County
Water Environment Research Foundation and WateReuse Research Foundation merged in May 2016

New Focus: One Water

WateReuse brings recycled water, desalination and related topics.

WERF brings wastewater, resource recovery, stormwater, receiving waters, climate change, and integrated water.
Direct Potable Reuse

Urban Use → Wastewater Treatment → Advanced Treatment → Engineered Storage

Water Treatment → Urban Use

Courtesy of Ben Stanford, Hazen
DPR: Key Questions

- Treatment requirements
  - Need for criteria for pathogen and chemical control
- On-line monitoring
  - Performance monitoring
- Treatment technologies
  - Defining reliability
- Source control
  - Managing the collection system
- Operations and operators
- Response time (respond to off-spec water)
- Public Acceptance
WE&RF DPR Research Initiative (2012-2016)

• California SB 918 (2010)
  – “Feasibility of developing criteria for DPR”
  – Established DPR Expert Panel

• DPR Research Initiative
  – $6 million raised to the need to fill knowledge gaps
  – Leveraged to $24 million

• Funded 34 projects on topics
  o Reliability of treatment trains
  o Microbial and chemical water quality
  o Monitoring and operations
  o Public engagement

• Published reports and tools available at: www.werf.org/reuseresearch
## DPR Initiative Projects Funded under FAF

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Research Project Title (Status)</th>
<th>Principal Investigator</th>
<th>Budget (50% from MWD)</th>
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</thead>
<tbody>
<tr>
<td>13-02</td>
<td>Model Public Communication Plan for Advancing DPR Acceptance <em>(Completed)</em></td>
<td>Mark Millan, Data Instincts</td>
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<td>13-12</td>
<td>Evaluation of Source Water Control Options and the Impact of Selected Strategies on DPR <em>(Publication expected March 2017)</em></td>
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<td>$150,000</td>
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<td>13-03</td>
<td>Critical Control Point assessment to quantify robustness and reliability of multiple treatment barriers of DPR scheme <em>(Completed)</em></td>
<td>Troy Walker, Hazen &amp; Sawyer</td>
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Project 1: Model Public Communication Plans for Advancing DPR Acceptance (Reuse 13-02)

- **Principal Investigator:**
  - Mark Millan, Data Instincts
  - Acknowledgement: Provided slides!

- **Objective:**
  - Develop an implementable, strategic communication plan and materials to achieve acceptance of DPR

- **Reports and tools are available at:**
  [www.werf.org/reuseresearch](http://www.werf.org/reuseresearch)
Identify Concerns, Message Development, Message Testing
Refinement at each stage

- Conduct IDIs (In-Depth Interviews)
  - Key audiences:
    - Legislators
    - Regulators
    - Influencers
    - Etc.

- Community Surveys
  - Survey 1-2 communities mirroring California demographics

- Test Messages and Nuances
  - Focus Group 1
  - Focus Group 2

Findings will be used to develop Communication Plans:

- Statewide Model
- Community Model
- Guidance for Community Leaders

Specify appropriate sequencing of Outreach Initiatives for Phases II and III
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?

- **Total Oppose**
  - Initial Support: 54%
  - After Safety Information: 56%
  - After Messages: 59%

- **Total Support**
  - Initial Support: 40%
  - After Safety Information: 39%
  - After Messages: 36%

- **Don’t Know/NA**
  - Initial Support: 7%
  - After Safety Information: 5%
  - After Messages: 5%
Disbelief in the efficacy of the treatment system is the biggest obstacle.

Why would you **OPPOSE** direct reuse of recycled water for drinking in your community?

- Don't trust filtering process/system: 40%
- It would be unhealthy/unsafe to drink: 26%
- Just don't want to/feel comfortable drinking it: 19%
- Don't want to drink “sewer water”: 10%
- Don’t know enough about it: 7%
- Concerned of more chemicals in water (used to clean it): 3%
- “Human factor”; potential for human error/negligence in water treatment: 3%
- No process is 100% effective/Some pathogens/toxins can never be removed (includes medications): 3%
- Lack of available test/study/research results: 2%
- Will taste bad: 2%
- Too expensive: 1%
- Don’t trust city officials to ensure water quality: 1%
Key Messages (1/2)

- 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
Key Messages (2/2)

- **DO use images** to reinforce the effectiveness of the treatment process
- **DO appeal to the broader principles of environmental protection** as rationales for using recycled water
- **DO NOT rely on arguments** that potable reuse will end up reducing rates
- **DO NOT rely** on elected officials, taxpayer advocates or business owners as messengers.
Findings

- Majority support IPR (62%)
- Initially most oppose DPR – but support goes up with information about safety
- Treatment steps alone can build support
- Testing/monitoring enhances support
Project 2:
Evaluation of Source Water Control Options and the Impact of Selected Strategies on DPR (Reuse-13-12)

- Principal Investigator:
  - Alan Rimer, Black & Veatch

- Objectives:
  - Evaluate *upstream wastewater treatment impacts* on DPR source water quality
  - Evaluate *impact of hydraulic control mechanisms*

- Publication
  - Expected **March 2017**
Source Water Control Guidance

• Resources in report include:
  – Summary of desired supply water effluent characteristics for potable reuse AWPF processes
  – Guidance for designers and operators to manage principal factors
  – Management strategies for side streams
  – 4 case studies:
    • OCSD and OCWD (GWRS)
    • LA SAN and West Basin
    • City of San Diego
    • Singapore PUB (NEWater)
Project 3: Critical Control Point assessment to quantify robustness and reliability of multiple treatment barriers of DPR scheme (Reuse 13-03)

- **Principal Investigator:**
  - Troy Walker, Hazen & Sawyer (Provided slides!)

- **Based on:**
  - Hazard Analysis and Critical Control Points (HACCP)

- **Approach involves:**
  - Holistic review/robust methodology
  - Assisting regulators and stakeholders understand and trust the technology

Critical Control Points:

- Points in the **treatment process**
- Designed to **reduce, prevent, or eliminate** a human health hazard
- For which **controls exist** to ensure the proper performance.

7 HACCP Principles

1. Conduct a Hazard Analysis
2. Determine CCPs
3. Establish Critical Limits
4. Establish System to Monitor
5. Establish Corrective Action
6. Establish Procedures for Verification
7. Establish Documentation for Procedures and Records
How A CCP works

- Critical Control Point Management
- Monitor critical limit to validate barrier is intact
- The CCP is the process barrier
- If monitor detects barrier not intact then control action and standard operator response is initiated.
Example of a CCP: Reverse Osmosis
Critical Control Points

Review and Manage Risks to Protect Public Health

Holistic review/robust methodology – source water to distribution

What are the risks?
Contaminants/Hazardous Events

What are the right technologies?
Treatment Barriers

How are we sure they are working?
Monitoring

How do we respond if a barrier fails?
Operating Response
Project 4: Operation and Maintenance Plan and Training and Certification Framework for DPR Systems (Reuse 13-13)

- **Principal Investigator:**
  - Troy Walker, Hazen & Sawyer (Provided slides!)

- **Objectives:**
  - Develop a standard operations and maintenance plan
  - Provide clarity and consistency for future permitting
  - Develop a DPR Training and Certification Framework for operators

- **Report Published (December 2016)** [www.werf.org/reuseresearch](http://www.werf.org/reuseresearch)
  - Elements of a “O&M plan”
Benefits of O&M Study

- Provides a comprehensive review of **operational requirements** in the consideration of a DPR facility.

- Provides an **operational framework** that can be used to inform and support operational planning for potable reuse facilities.

- Supports **designers, operators, and regulators** in ensuring the appropriate level of design and operational planning requirements.

- **Operations and training certification information** supports consideration for the development of certification and training programs.
Available Now!

Potable Reuse Research Compilation: Synthesis of Findings (Reuse 15-01)

- Summarized and synthesized key results of **34 research projects** in DPR Imitative
- Published in **December 2016**
- Principle Investigators:
  - NWRI
  - George Tchobanoglous
  - 9 sets of **authors for each chapter**

Available at: [www.werf.org/reuseresearch](http://www.werf.org/reuseresearch)
Synthesis of Findings (Reuse 15-01) “Chapters”

- Demonstration of reliable, redundant treatment performance
- Critical control points
- Operations, maintenance, training/certification
- Pathogens: surrogates and credits
- Pathogens: rapid/continuous monitoring
- Failure and resiliency
- Removal and risk of constituents of emerging concern
- Evaluation of potential DPR trains
- Source control
California DPR Update!

- SWRCB Feasibility Report (released Dec. 30, 2016)
- Advisory Group Report (July 2016)

“The Expert Panel is impressed by the research that has been funded by [WE&RF] and supports the continuation of such research.”

- Letter to SWRCB/DDW from Expert Panel Chairs (June 30, 2016)

www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/rw_dpr_criteria.shtml
Research Partnership: WE&RF is working on a grant under Prop 1 from SWRCB for potable reuse research

WE&RF research process: WE&RF Water Reuse Issue Area Team meets in March 2017 to develop multi-year research agenda