Framework for Regulating Direct Potable Reuse (DPR)

Information Item No. 10
State Water Board Meeting
June 5, 2018

DPR Framework

- DDW thinking on DPR
- Risk across the forms of DPR
- Research to fill knowledge gaps
- New SWA definition
- Stakeholder outreach
- Not a regulatory document
Assembly Bill 574

- Defines “raw water augmentation” and “treated water augmentation”
- Changed SWA definitions
- RWA by December 31, 2023
- Framework by June 1, 2018

Recent & Planned State Water Board Activities Related to Potable Reuse

- Report to Legislature on Feasibility of DPR (Dec 2016)
- Surface Water Augmentation Regulations (Mar 2018)
- Framework for Regulating DPR (Jun 2018)
- Reservoir Water Augmentation Regulations (2019 / 2020)
- DPR Research Raw Water Augmentation Regulations (Dec 2023)
Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- Section 5: Risk management approach
- Section 6: DPR criteria elements
- Section 7: Other considerations
- Section 8: Research status
- Section 9: Revising SWA regulations
Contents of the Framework

- **Section 1: Introduction**
  - Section 2: Types of potable reuse
  - Section 3: DPR scenarios
  - Section 4: Environmental buffer
  - Section 5: Risk management approach
  - Section 6: DPR criteria elements
  - Section 7: Other considerations
  - Section 8: Research status
  - Section 9: Revising SWA regulations

- **Section 2: Types of potable reuse**
  - Section 3: DPR scenarios
  - Section 4: Environmental buffer
  - Section 5: Risk management approach
  - Section 6: DPR criteria elements
  - Section 7: Other considerations
  - Section 8: Research status
  - Section 9: Revising SWA regulations
Types of Potable Reuse

- Indirect potable reuse
  - Groundwater replenishment
  - Surface water augmentation
    (now => Reservoir Water Augmentation)
- Direct potable reuse
  - Raw water augmentation
  - Treated water augmentation

Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- Section 5: Risk management approach
- Section 6: DPR criteria elements
- Section 7: Other considerations
- Section 8: Research status
- Section 9: Revising SWA regulations
DPR Scenarios

- Forms of DPR:
  - “Treated Water Augmentation”
  - “Raw Water Augmentation”
- Challenge – develop appropriate DPR criteria

DPR - Raw Water Augmentation
DPR - Raw Water Augmentation

DPR - Raw Water Augmentation
Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- **Section 4: Environmental buffer**
- Section 5: Risk management approach
- Section 6: DPR criteria elements
- Section 7: Other considerations
- Section 8: Research status
- Section 9: Revising SWA regulations
IPR - Environmental Buffer

- Reliable
- Provide benefits such as:
  - Attenuation of chemical peaks
  - Robust pathogen barrier
  - Response time
Barrier Loss

- Lack of substantial environmental barrier.
- Ensure reliable, robust, redundant, resilient treatment and optimization control.

Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- **Section 5: Risk management approach**
- Section 6: DPR criteria elements
- Section 7: Other considerations
- Section 8: Research status
- Section 9: Revising SWA regulations
HEALTH GOAL
Consistent level of safety as the type of DPR changes

RISK MANAGEMENT
Compensate for the loss of a meaningful environmental buffer

PATHOGEN CONTROL
CHEMICAL CONTROL

Pathogens – Removal Targets

- Reference pathogens
- Worst case wastewater pathogen density
  - Uniform statewide criteria
  - Case–by-case requires method & duration (peaks infrequent)
  - At what point is it OK for pathogens to leak through?
- LRV calculated from ratio of safe density to worst case wastewater density
- Quantitative microbial risk assessment (QMRA) used to verify LRVs meet risk goal
  - Annual or daily risk
Cryptosporidium

Figure 2 Raw sewage and secondary effluent Cryptosporidium concentrations compared reported cases of Cryptosporidiosis

Pathogens - Treatment

- Redundant treatment (extra log reduction capacity) may be required:
  - To compensate for the lack of an effective environmental buffer
  - A tolerable (very low) probability of failure to meet the LRV may be established
- Probabilistic analysis of treatment train performance (PATTP) will be used
  - Use Monte Carlo approach to create a cumulative distribution function for a set of treatment process – a treatment train
Example PATTP - Cryptosporidium

Pathogens - Treatment

- Validate processes and trains
- Determine the LRV a treatment will achieve most of the time (5th percentile)
- Correlate performance with a measurable parameter and identify limits indicating failure
Pathogens - Treatment

- Monitoring and Control
  - Close proximity of wastewater pathogen densities to drinking water for DPR
  - The need for knowledge of water quality and the ability to take corrective action is urgent
  - Provide continuous monitoring of critical processes and fail-safe control
    - Fail-safe is not intended to mean failure proof
    - Fail-safe means the system will revert to a safe condition if a critical component fails

Chemicals

The threat posed by chemicals in DPR is similar to that for IPR in that advanced treatment must be provided to control the potential chronic exposure hazard from a wide variety of unregulated chemicals.

The threat posed by chemicals in DPR is different for IPR in two important ways:
- Without an environmental buffer pulses of low molecular weight chemicals may pose an acute threat
- Without an environmental buffer the urgency of recognizing and responding to treatment deficiencies increases
Chemicals

- The goal:
  - remove chemicals to levels that are below public health concern

- The approach:
  - Enhanced source control and public education
  - Conformance with MCL and Notification Level (NL) requirements
  - Development of additional NLs as appropriate
  - Required advanced treatment
  - Something to deal with pulses of low molecular weight chemicals
  - Rigorous monitoring and treatment control

Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- Section 5: Risk management approach
- **Section 6: DPR criteria elements**
- Section 7: Other considerations
- Section 8: Research status
- Section 9: Revising SWA regulations
**DPR Criteria Elements**

- DPR Permitting Authority
- Addressing Pathogens
- Chemical Control
- Source Control
- Critical Control Point Approach
- Cross Connection

**DPR Permitting Authority**

- Facilities co-located or separate
- Various ownership scenarios
- Regional Board regulatory approvals
- Regional Board authority
- Dual permits
  - Safe Drinking Water Act
  - Clean Water Act
  - Porter-Cologne WQC Act
Addressing Pathogens

- Identify LRVs
- Set LRV compliance criteria
  - Treatment train minimum LRV (using QMRA)
  - Multi-barrier requirements
  - Tolerable excursions (using QMRA)
- Treatment validation criteria
- Treatment train evaluation with PATTP
- Perhaps preapproved treatment train(s)
- Operations plan to assure treatment efficacy

Example PATTP - Cryptosporidium
Chemical Control

Source Control
Critical Control Point Approach

Cross-Connection
Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- Section 5: Risk management approach
- Section 6: DPR criteria elements
- **Section 7: Other considerations**
  - Section 8: Research status
  - Section 9: Revising SWA regulations

Other Considerations

- Potable reuse inspection and supervision program
- Treatment system resilience
- Operations quality control
- Public health protection culture
- Public health surveillance
Inspection and Audits

Treatment System Resilience
Operators

Public Health Minded
Public Health Surveillance

Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- Section 5: Risk management approach
- Section 6: DPR criteria elements
- Section 7: Other considerations
- **Section 8: Research status**
- Section 9: Revising SWA regulations
DPR Research

- QMRA
- Raw wastewater monitoring
- Outbreak data collection
- Averaging
- Unknown-CEC methods

Contents of the Framework

- Section 1: Introduction
- Section 2: Types of potable reuse
- Section 3: DPR scenarios
- Section 4: Environmental buffer
- Section 5: Risk management approach
- Section 6: DPR criteria elements
- Section 7: Other considerations
- Section 8: Research status
- Section 9: Revising SWA regulations
New SWA Definition
### For today’s presentation, Framework, comment & contact info, visit
**SWRCB DDW Direct Potable Reuse webpage**
https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/direct_potable_reuse.html

### For future updates, visit and subscribe to **SWRCB electronic mailing list**
http://www.waterboards.ca.gov/resources/email_subscriptions/swrcb_subscribe.shtml

Drinking Water → “Recycled Surface Water Augmentation & Direct Potable Reuse”

### For more information on 2016 Report to Legislature, visit
**DDW Report to the Legislature webpage**
http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/rw_dpr_criteria.shtml
Contact Us

Randy Barnard, P.E.
Recycled Water Unit, Division of Drinking Water

DDWrecycledwater@waterboards.ca.gov

<table>
<thead>
<tr>
<th>Submit comments on the Framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>By email</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>By mail</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Questions