Division of Drinking Water

# Welcome
# Workshop Rules
# Workshop Overview

Public Workshop – Southern CA

April 26, 2018

# Workshop Overview

**Welcome & Review of Workshop Rules**
Kurt Souza, SWRCB-DDW, Assistant Deputy Director

**Framework for Regulating Direct Potable Reuse**
Randy Barnard, SWRCB-DDW, Chief – Recycled Water Unit
Robert Hultquist, SWRCB-DDW, Recycled Water Specialist

**Conclusion, Schedule, and Additional Information**
Randy Barnard, SWRCB-DDW, Chief – Recycled Water Unit

**Open for Public Comments**

# Workshop Rules

- Please sign in.
- Silence electronic devices.
- Fill out a speaker card.
- Please hold comments until the Q&A sections.
- State name and affiliation before you speak.
- Comment time may be limited due to number of speakers.

Division of Drinking Water

# Framework for Regulating Direct Potable Reuse (DPR)

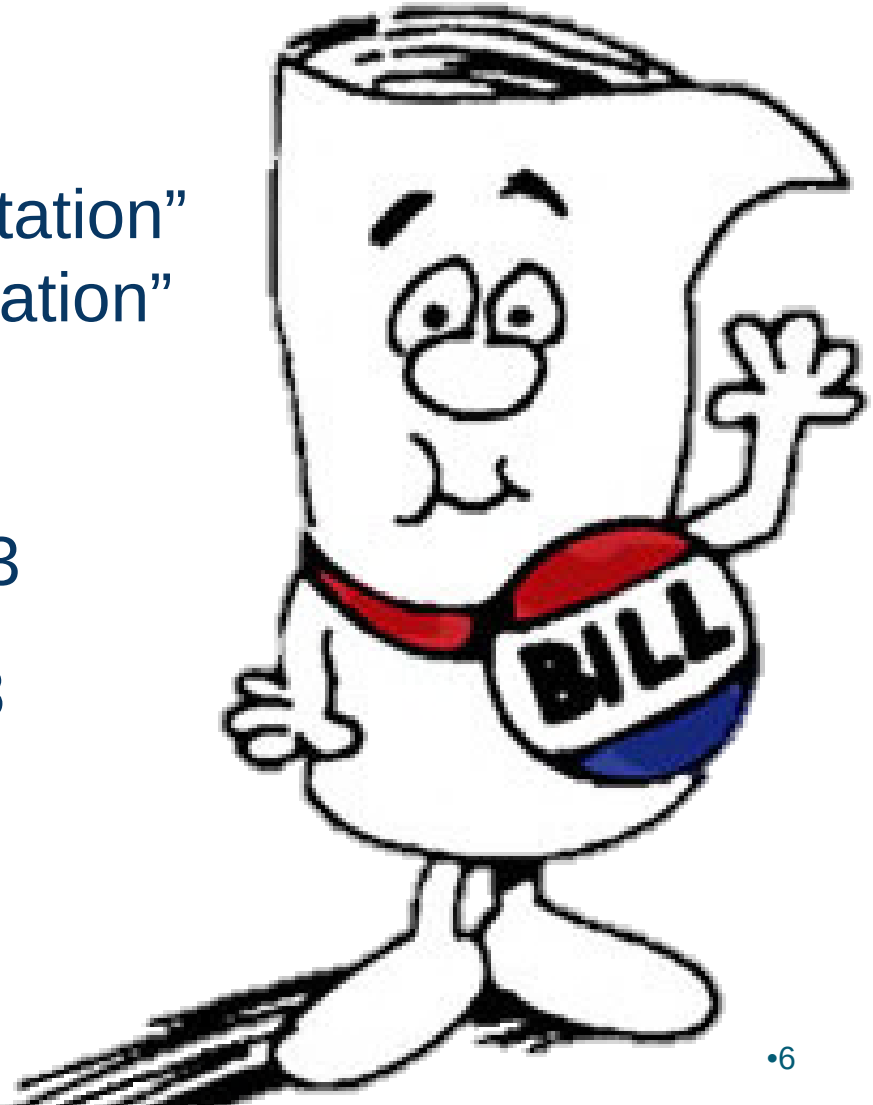
Public Workshop

# DPR Framework

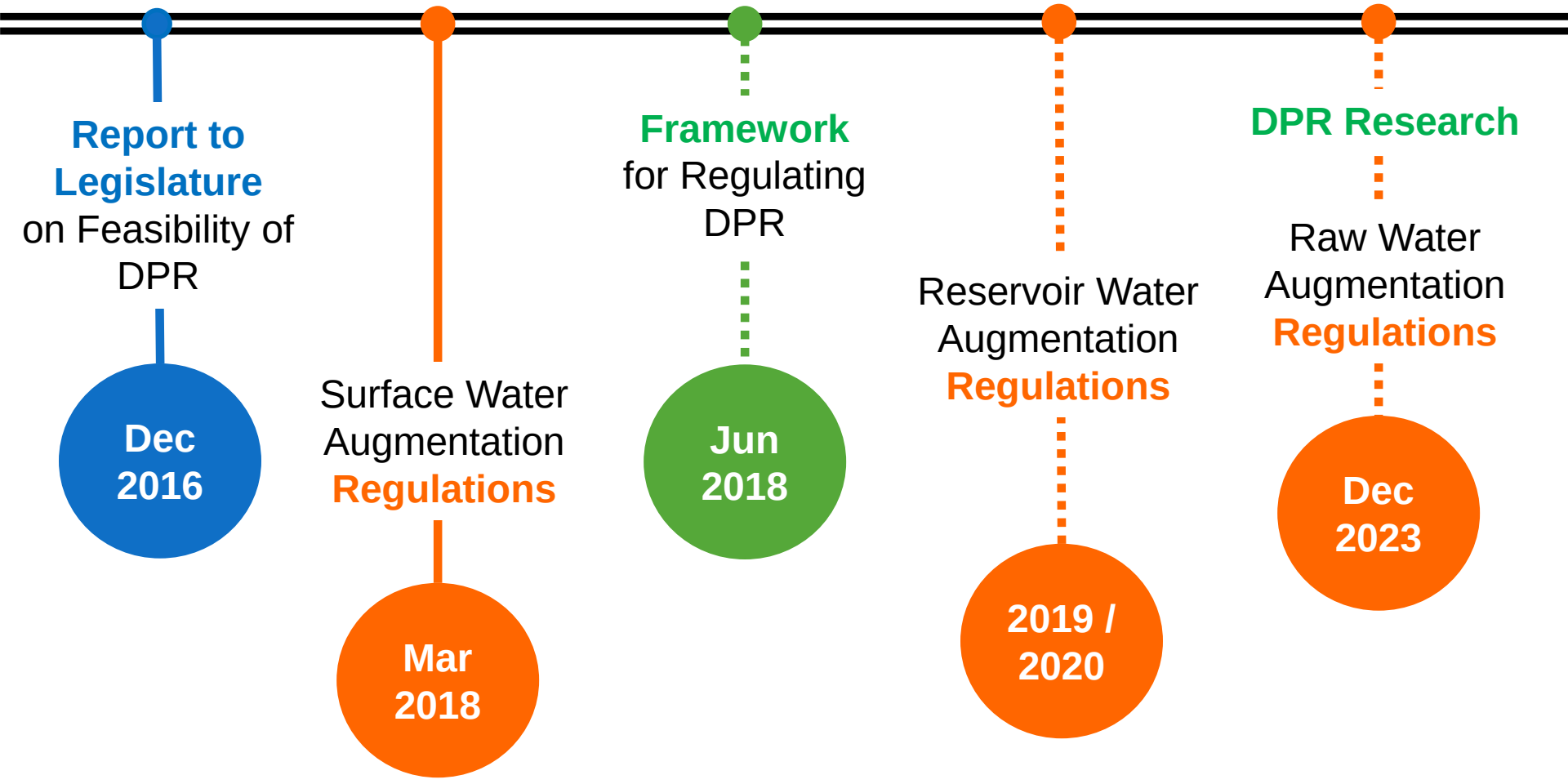
- DDW thinking on DPR
- Risk across the forms of DPR
- Research to fill knowledge gaps
- New SWA definition
- Stakeholder outreach
- Not a regulatory document

# 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



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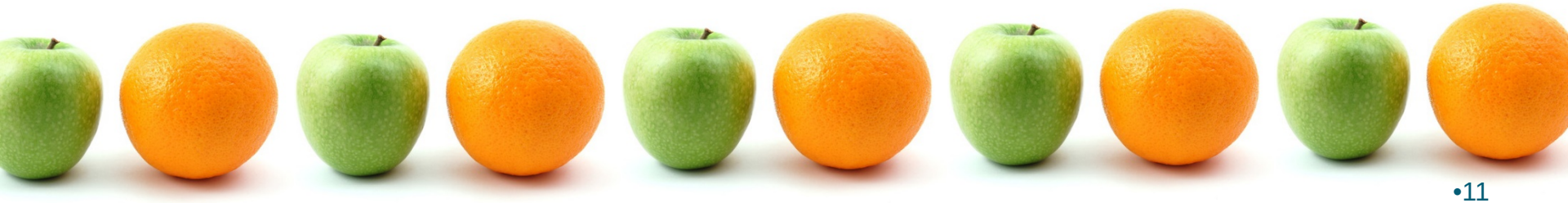
# Types of Potable Reuse

- Indirect potable reuse
  - Groundwater replenishment
  - Surface water augmentation

    (now => Reservoir Water Augmentation)

- Direct potable reuse
  - Raw water augmentation
  - Treated water augmentation



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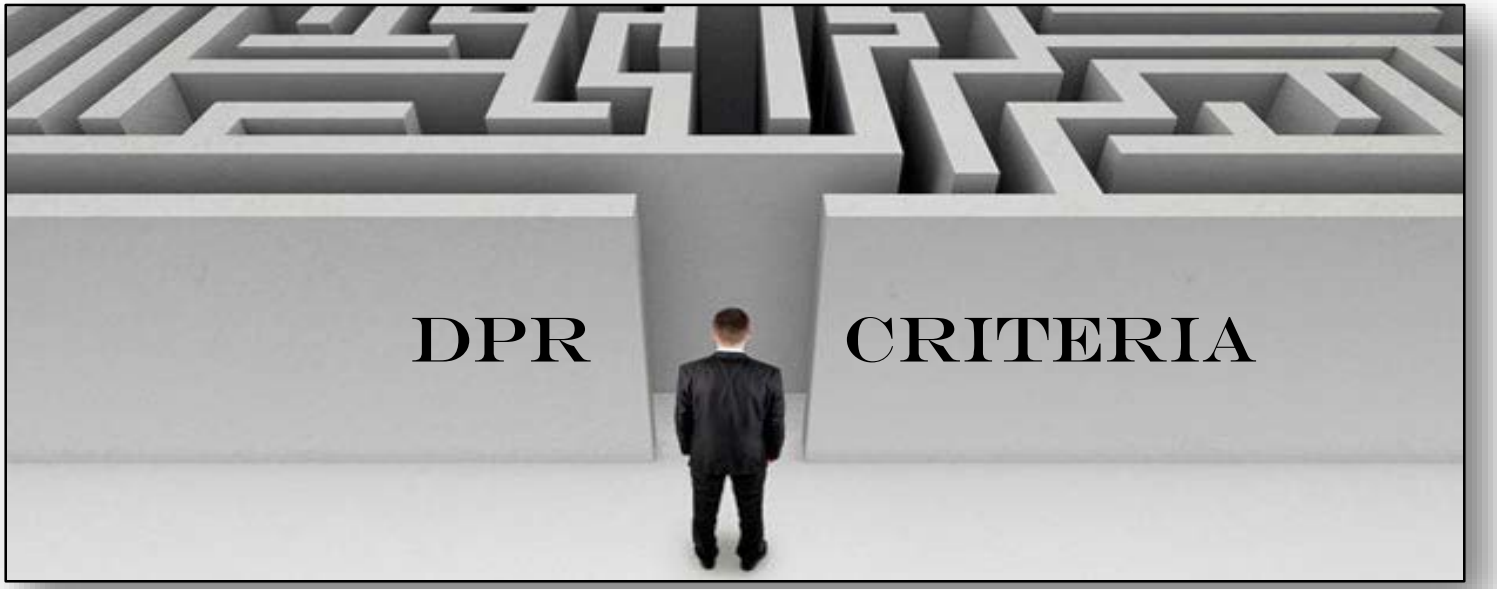
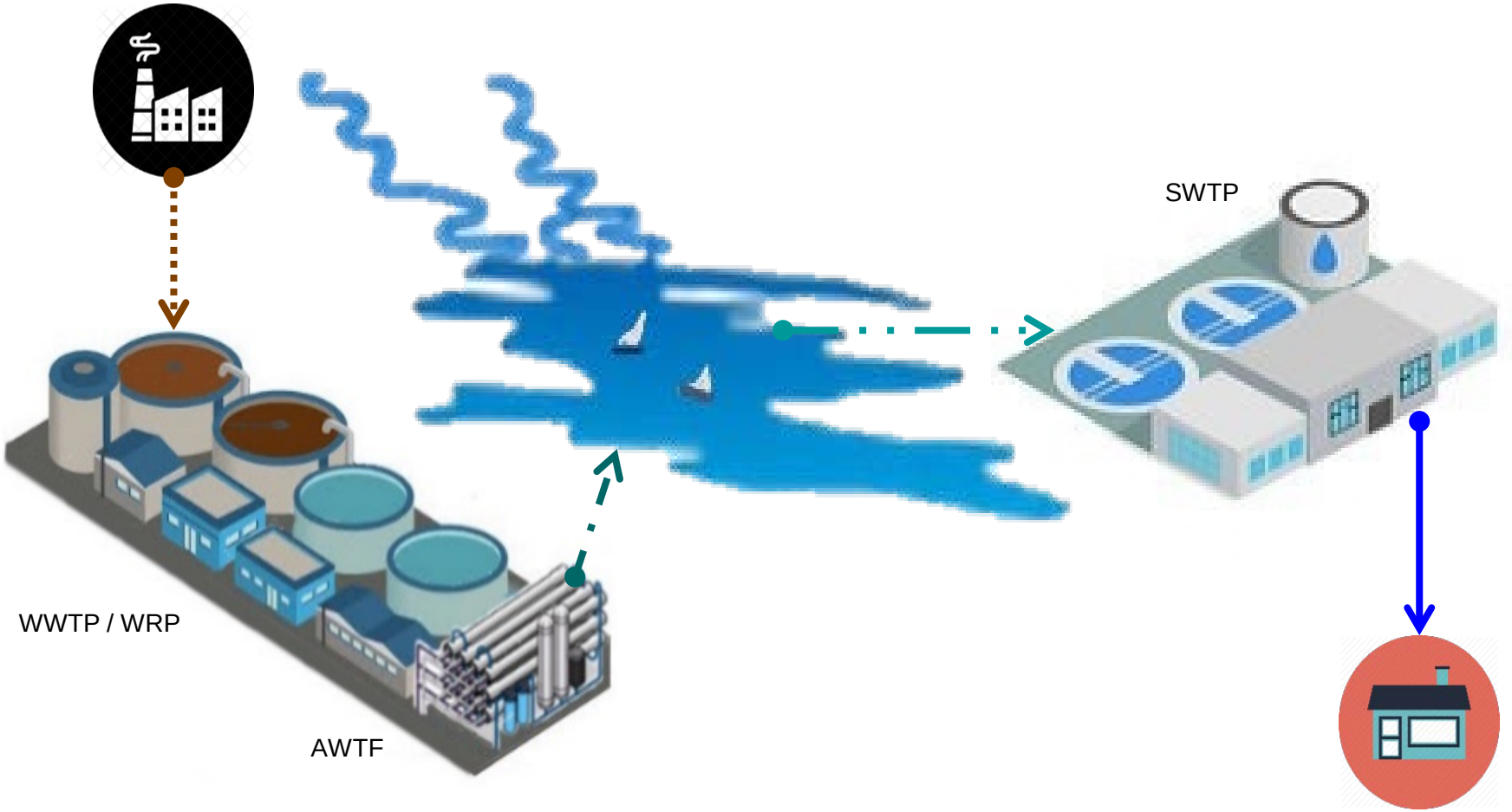
# DPR Scenarios

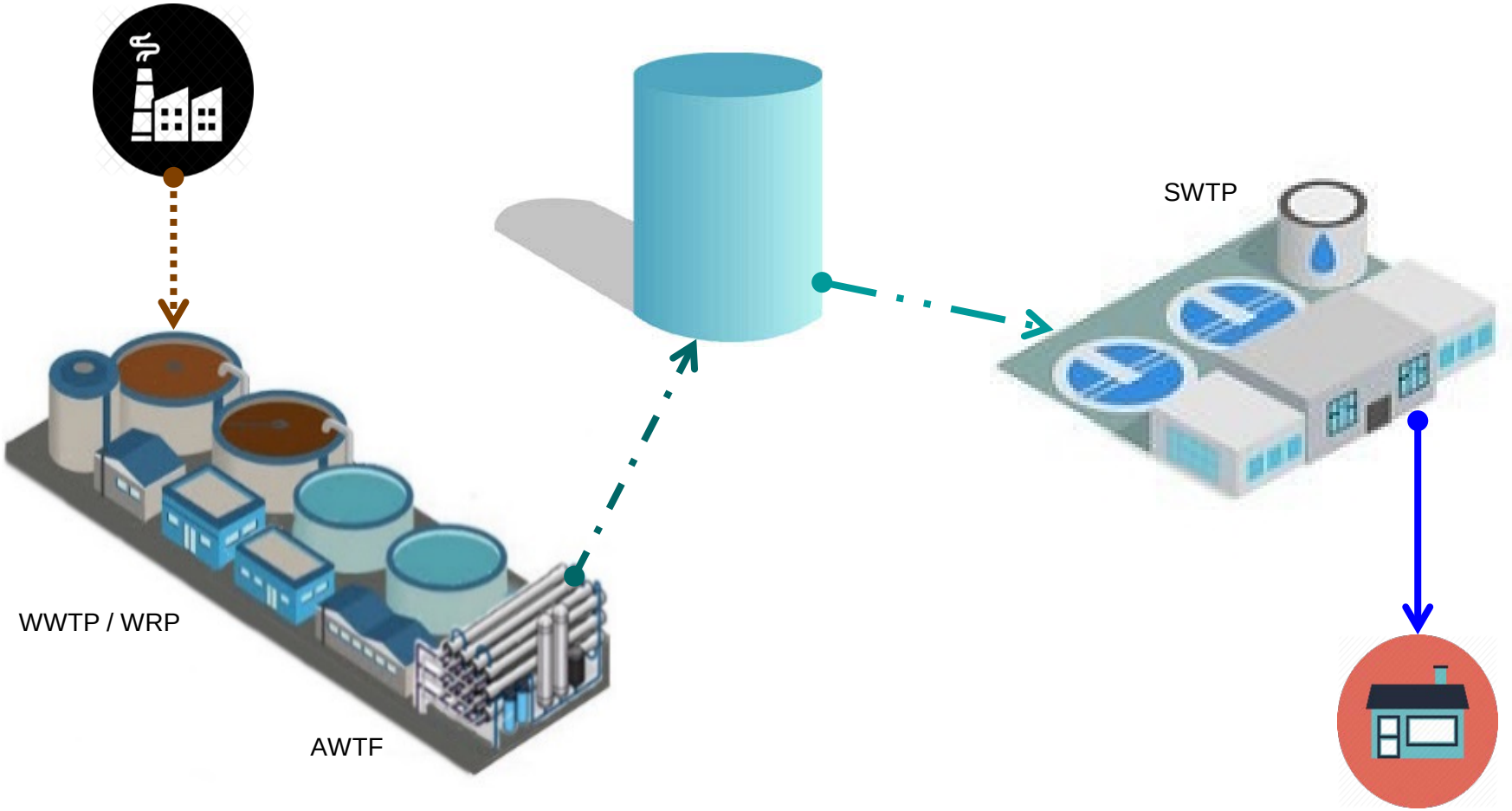
- Forms of DPR:
  - “Treated Water Augmentation”
  - “Raw Water Augmentation”
- Challenge – develop appropriate DPR criteria



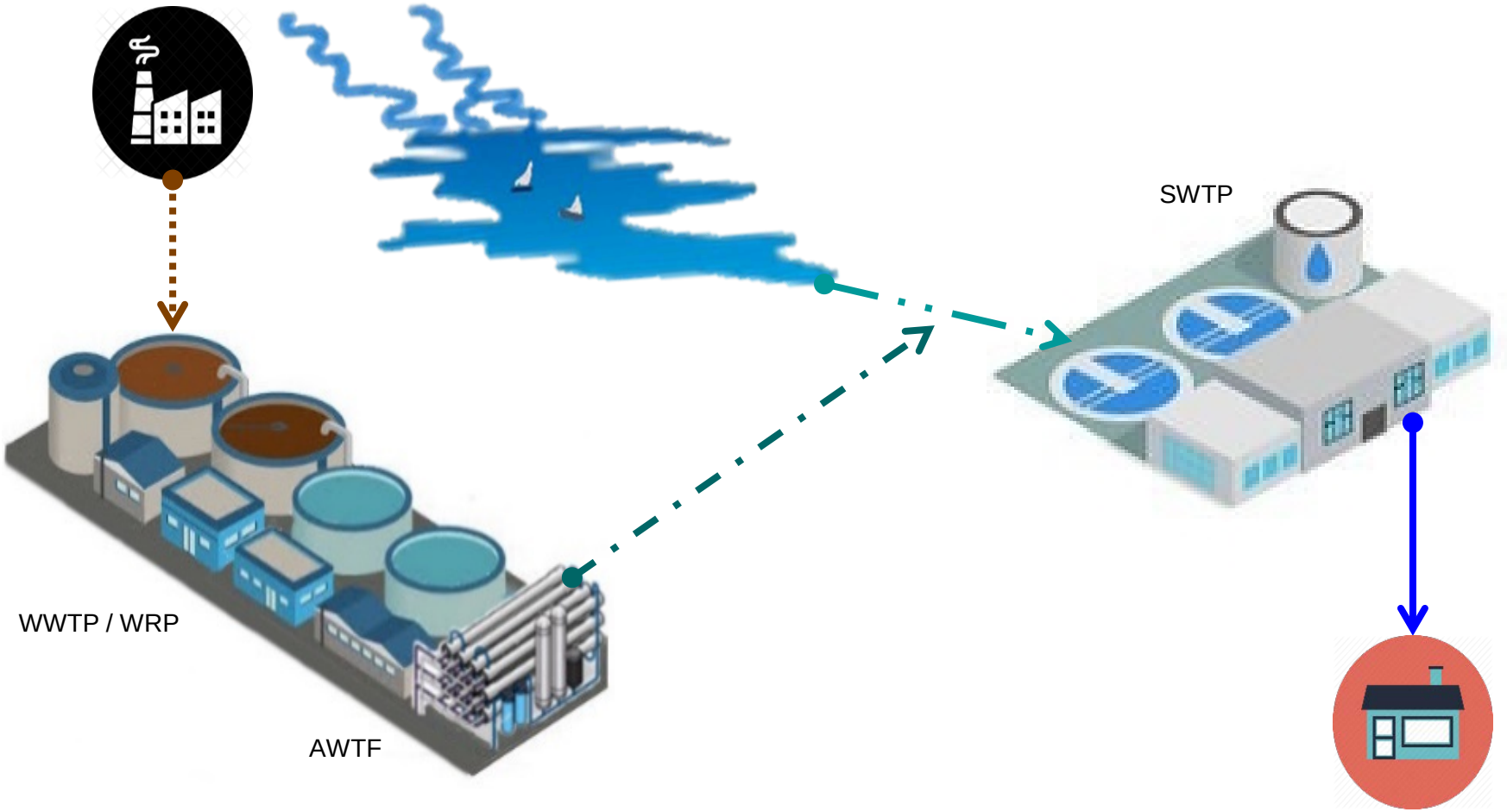
# DPR - Raw Water Augmentation



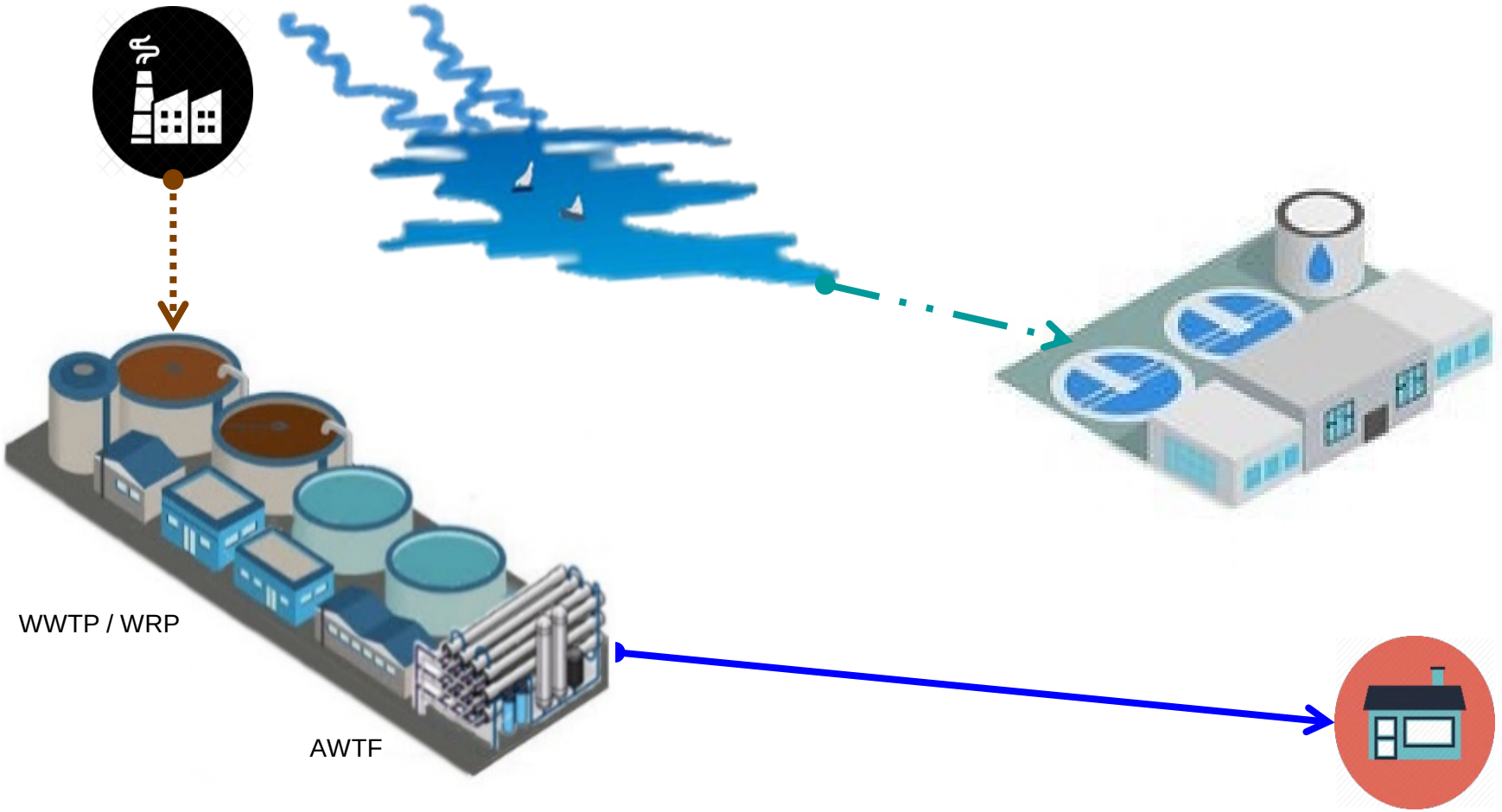
# DPR - Raw Water Augmentation



# DPR - Raw Water Augmentation



# DPR - Treated Water Augmentation



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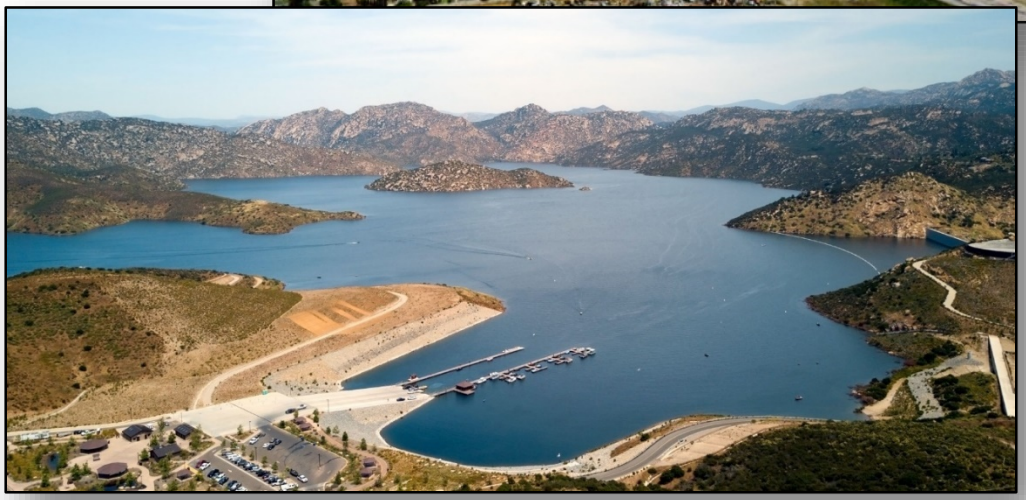
# IPR - Environmental Buffer

- 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.

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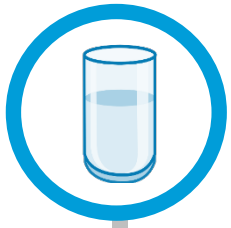
## RISK MANAGEMENT APPROACH

Compensate for the loss of meaningful environmental buffer



## GOAL OF DPR REGULATIONS

Protect public health as the form of direct potable reuse changes

### PATHOGEN CONTROL

**Establish pathogen removal targets to achieve specific health risk goals**

**Engineered treatment**
Redundant treatment;
Measures to ensure reliability and resiliency

**Validate treatment trains to ensure pathogen removal targets and health risk goals can be met**

**Monitoring and control system**
Real time monitoring;
Critical control point (CCP) program

### CHEMICAL CONTROL

**Advanced Treatment to reduce concentrations to safe levels**

**Attenuation of short term pulses of chemicals likely to persist through AWT**
Requirement to mitigate peaks

**Effective source control & public education**
Enhanced industrial source control program

**Use drinking water Notification Levels to address contaminants of concern**
Health based advisory levels addressing unregulated contaminants

**Monitoring and control system**
On-line continuous monitoring with CCP

# 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*

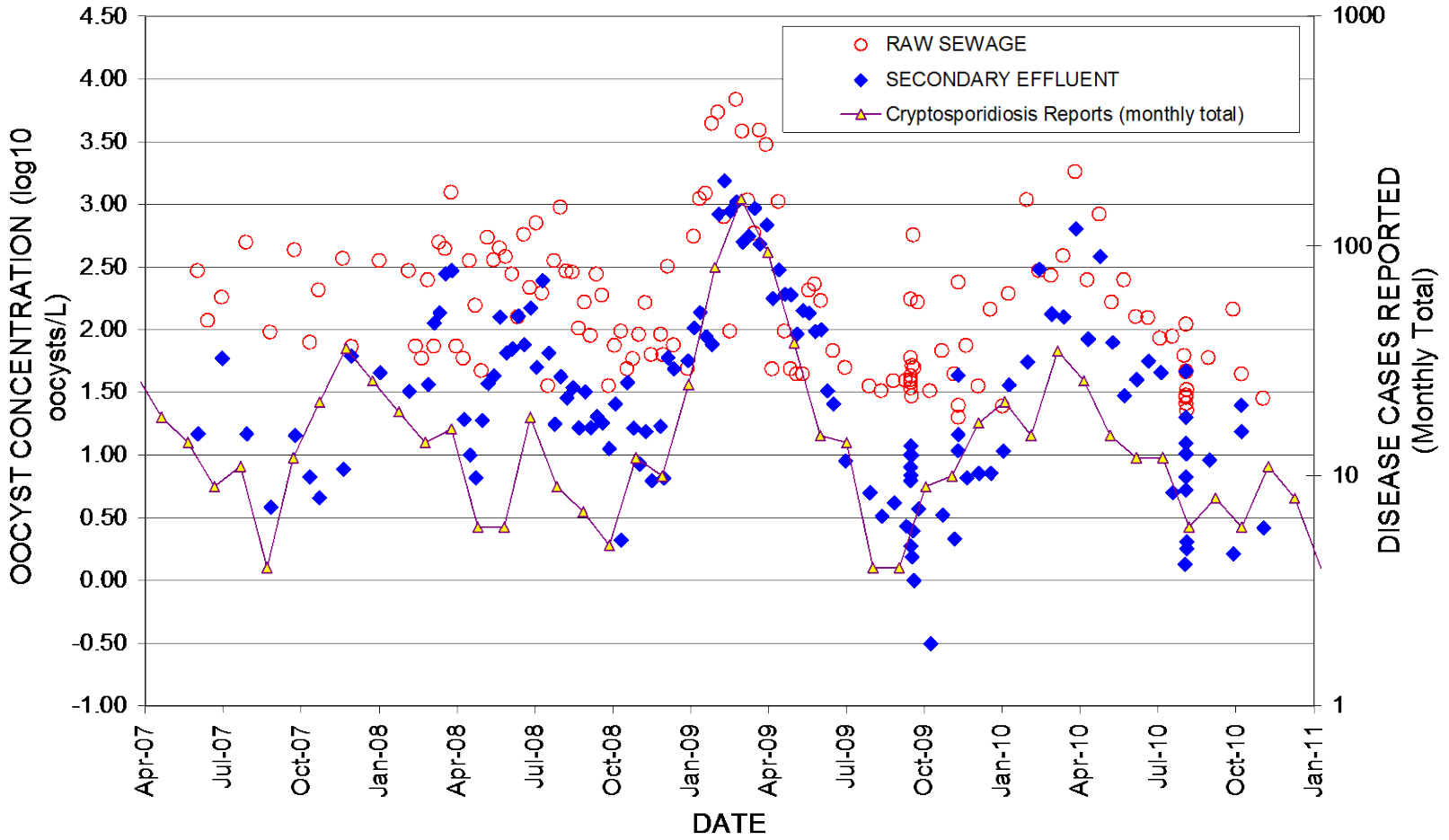
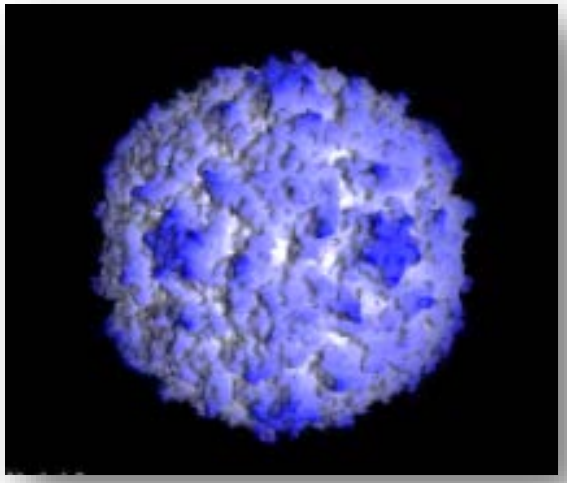



Figure 2 Raw sewage and secondary effluent *Cryptosporidium* concentrations compared reported cases of Cryptosporidiosis

# Analytical Methods

- Research Recommendation #3:
  - To better inform . . .QMRA modeling, … measure pathogens … in raw . . . that provide more complete information on concentrations and variabilities.
- Improved methods should be used that will allow better characterization and improved precision of concentrations of pathogens.
  - Cell culture or molecular methods?
  - See Chapters 5 and 7.



# Quantitative Microbial Risk Assessment

- Research Recommendation #2:
  - ". . .adopt the use of probabilistic QMRA to confirm the necessary LRVs of viruses, *Cryptosporidium,* and *Giardia* needed to maintain a risk of infection equal to or less than $10^{-4}$ per person / year."

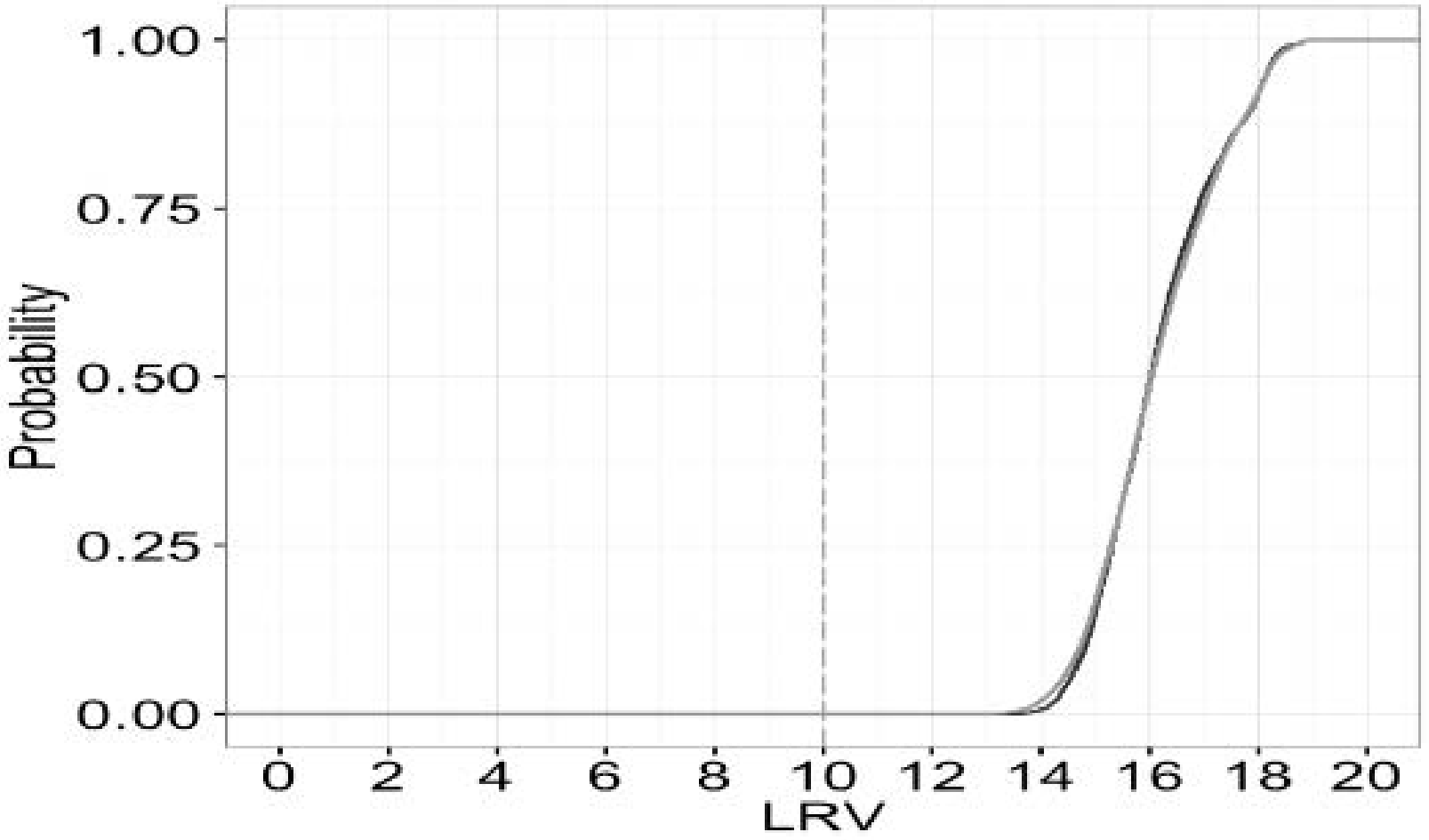
# Quantitative Microbial Risk Assessment

- Regulators should be aware of the various model inputs to the QMRA. Some have wide ranges, including several orders of magnitude:
  - Pathogen concentrations
  - Selection of the target pathogen
    - Which virus?
  - Dose-response models
  - Selection of overall treatment train
  - Treatment process removal effectiveness

# Pathogens - Treatment

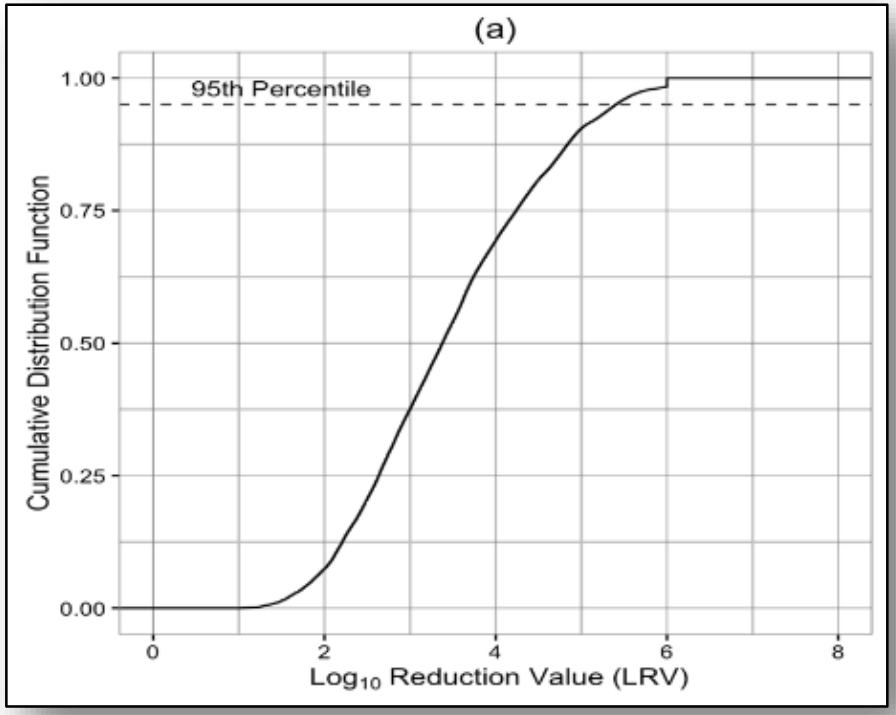
- Redundant treatment (extra log reduction capacity) may be required:
  - To compensate for the lack of an effective environmental buffer
  - A tolerable (very low) probability of failure to meet the LRV may be established
- Probabilistic analysis of treatment train performance (PATTP) will be used
  - 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

# DPR Report Chapter 8 Chemical Unknowns

- Research Recommendation #6:
  - "It is important to focus on non-targeted analysis and .. low molecular weight compounds."
  - "these methods also could address the potential vulnerability of AWTF treatment processes to unintended spills or batch releases of chemicals in the sewershed. See Chapter 3."

# Low Molecular Weight Chemicals Detected

| Chemical | Use or Byproduct | MW |
|---|---|---|
| N-nitrosodimethylamine (NDMA) | Disinfection Byproduct | 74 |
| N-nitrosomorpholine (NMOR) | Disinfection Byproduct | 116 |
| 1,4-dioxane | Solvent | 88 |
| Chloroform | Disinfection Byproduct | 119 |
| Acetone | Solvent | 58 |
| Methyl isothiocyanate (MITC) | Soil fumigant for fungi and nematodes | 73 |

# Problem & Strategy

- **Problem**: DPR –the lack of an environmental buffer that could provide substantial:
  - Attenuation of chemical spikes or peak pathogen levels,
  - Robust pathogen reduction, or
  - Response time
- **Regulatory strategy**:
  - Set protective contaminant control objectives, and
  - Ensure effective, reliable, robust treatment with performance monitoring and controls that enable immediate corrective action or interruption of drinking water production


Questions


TIME FOR A BREAK

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# DPR Criteria Elements

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

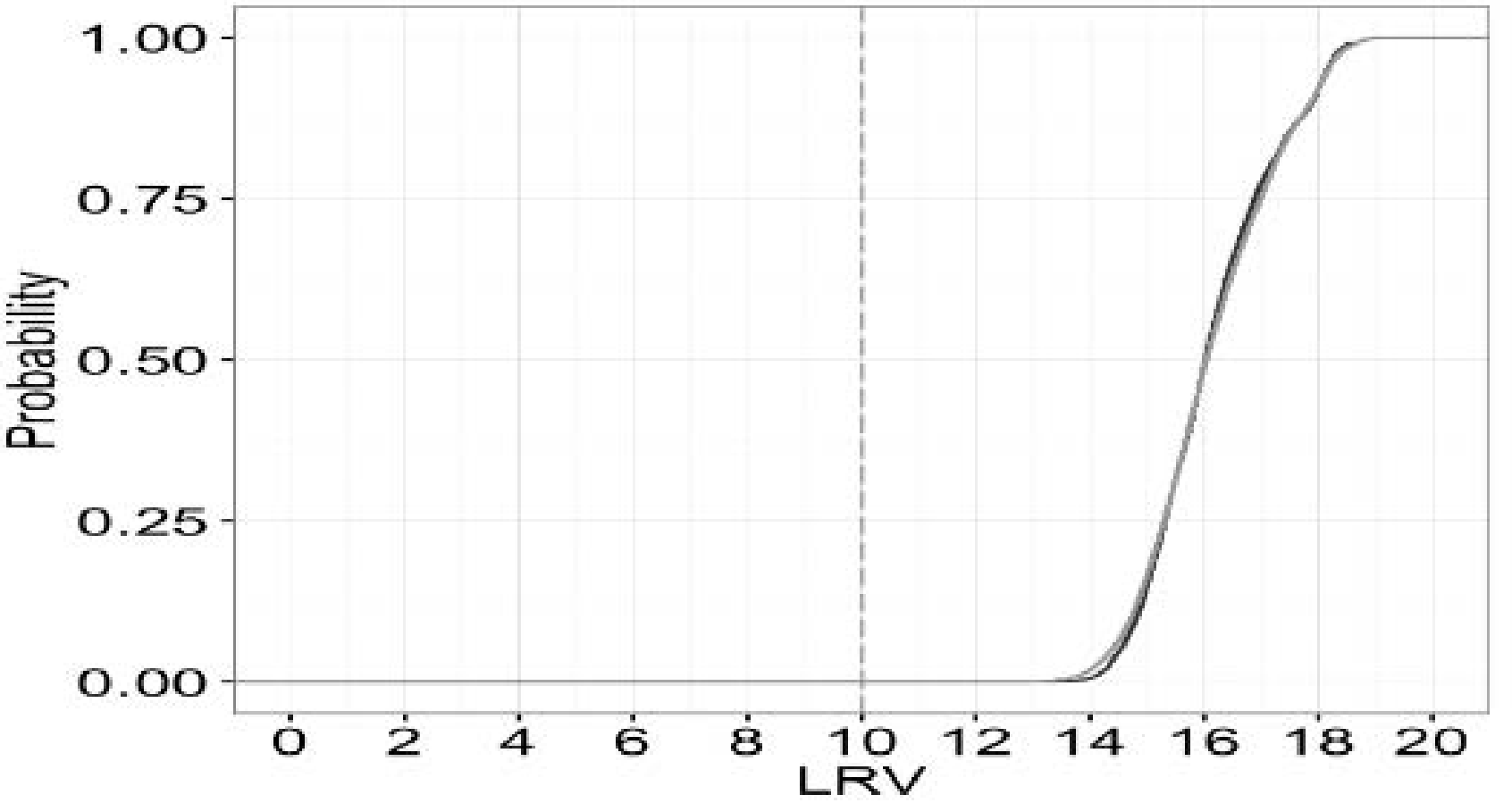
# DPR Permitting Authority

- Facilities co-located or separate
- Various ownership scenarios
- Regional Board regulatory approvals
- Regional Board authority
- Possible dual permits

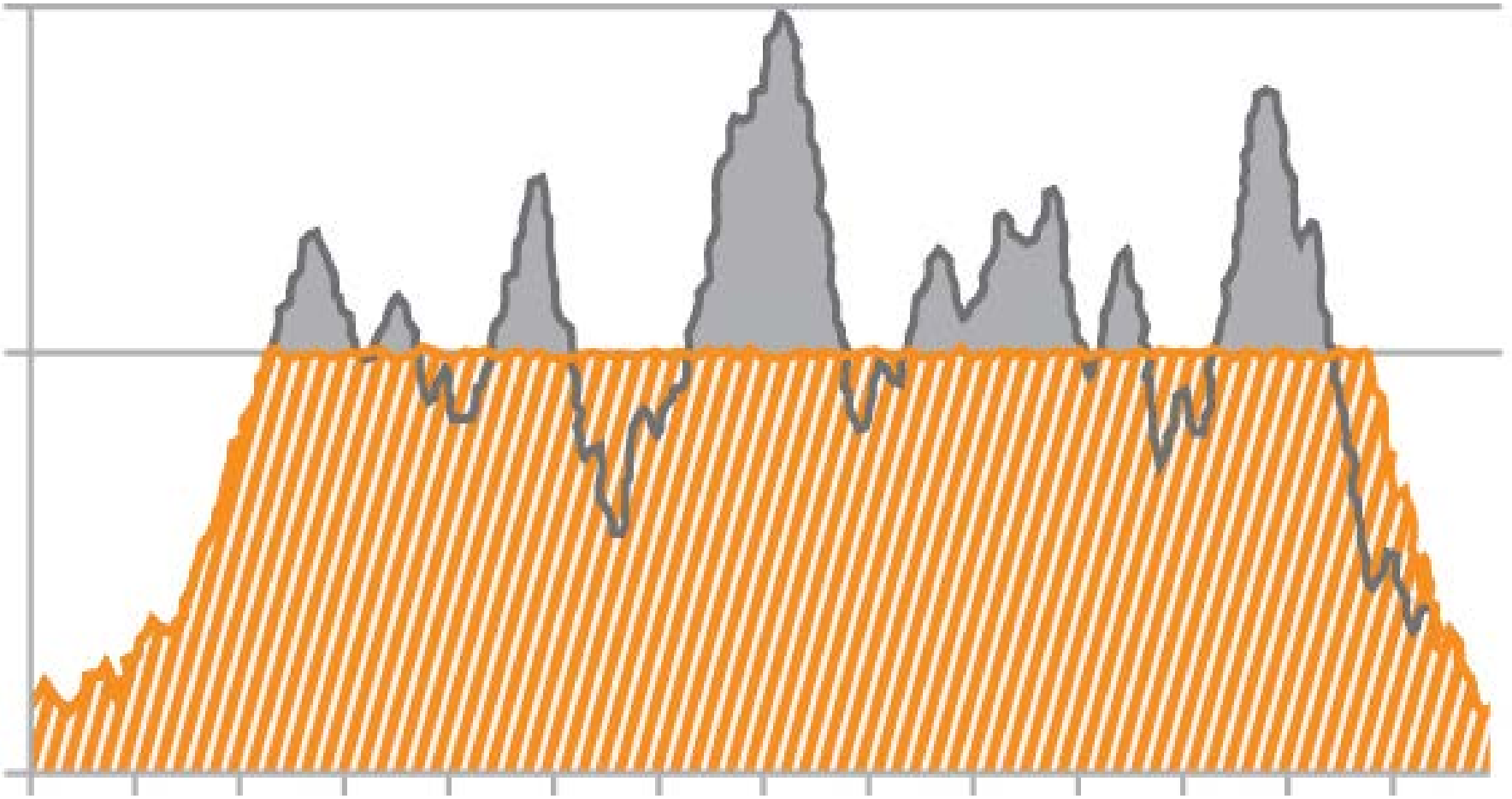
# Addressing Pathogens

- 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*

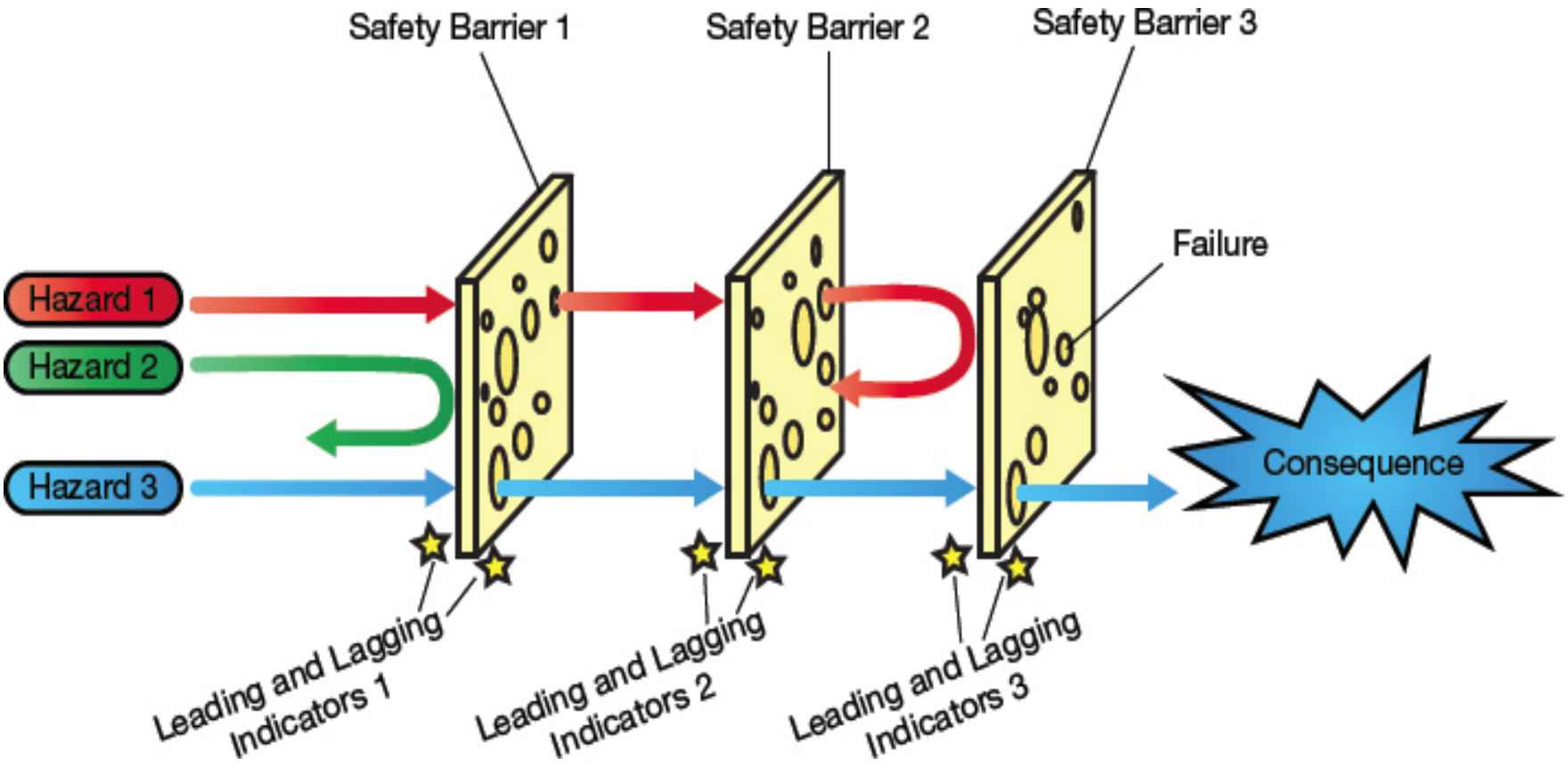


# Chemical Control



# Source Control

# Critical Control Point Approach



# Cross-Connection

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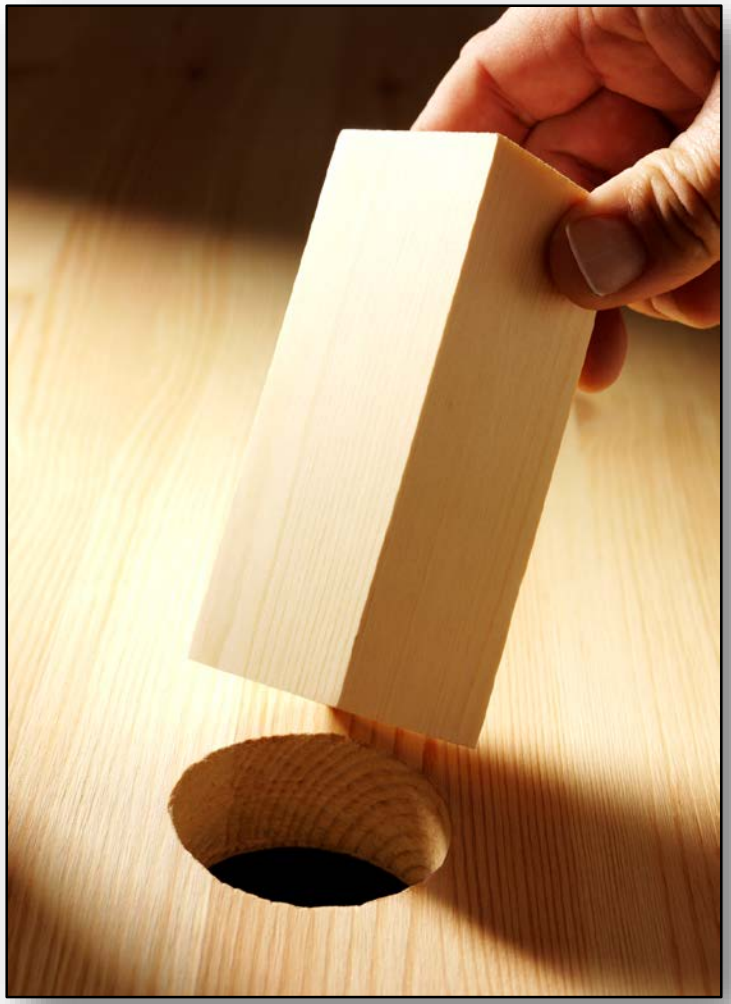
# Other Considerations

- 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

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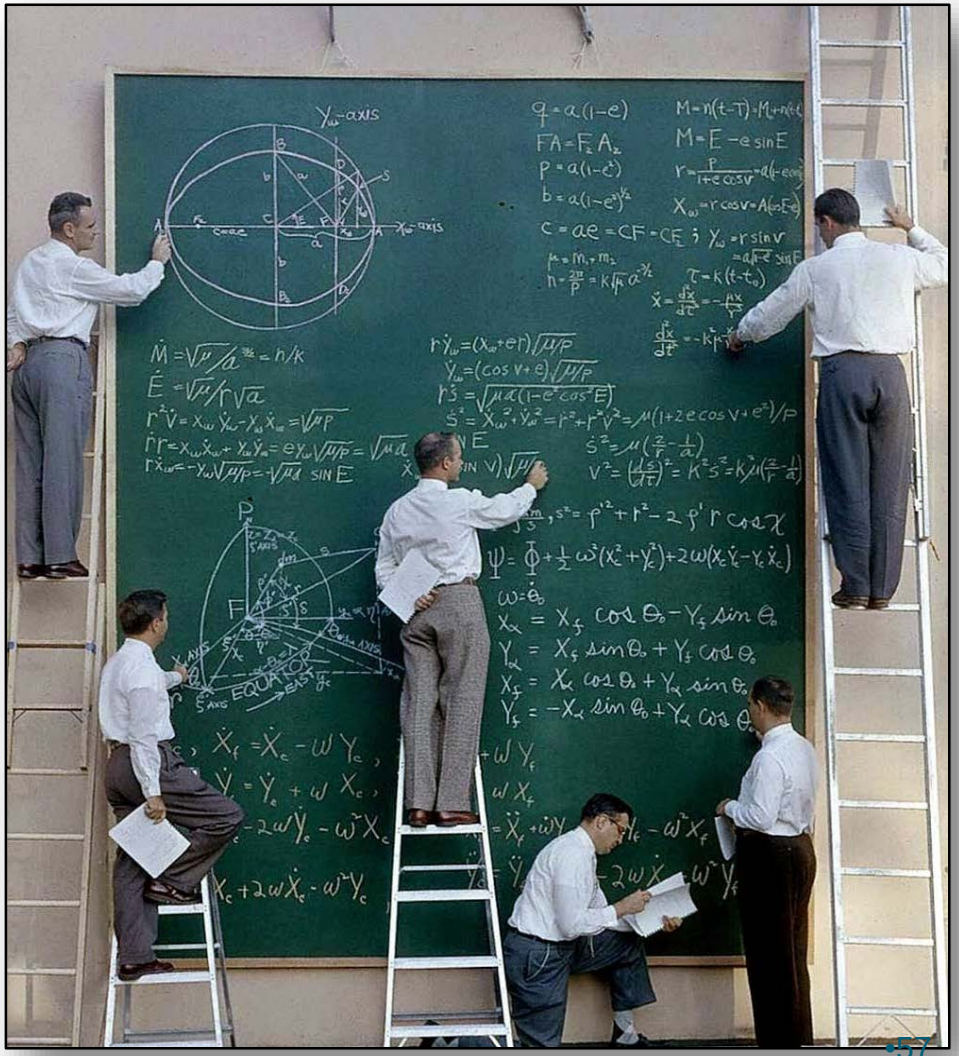
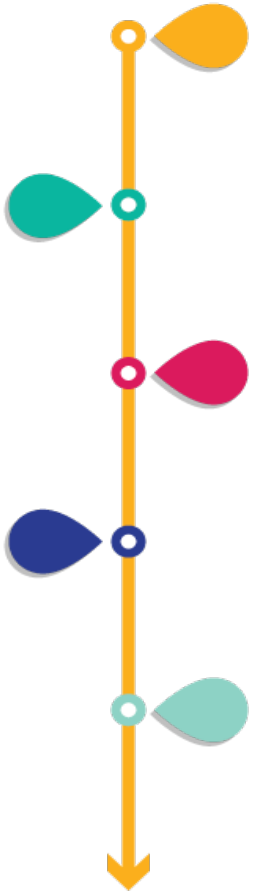
# DPR Research

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



# DPR Research Timeline

- Grant agreement to TWRF executed February 2018 provides funding for 5 DPR research projects
- Grant funding for the benefit of TWRF, not the State Water Board
- DDW role as observer
- Project descriptions being drafted
- Research completion 2021



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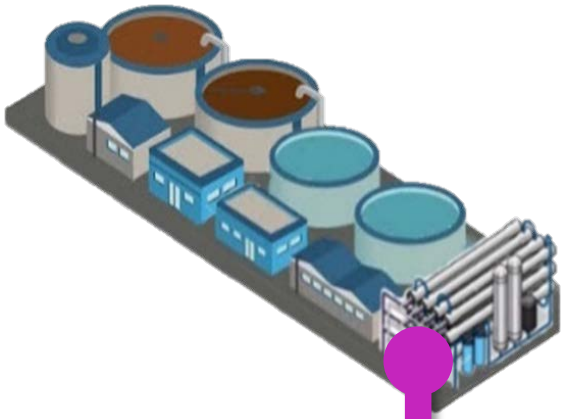
# New SWA Definition



# Tentative Schedule for the Framework for Regulating DPR

| APRIL 19 | APRIL 23 | APRIL 26 | MAY 20 | JUNE 5 |
|---|---|---|---|---|
| Start 30-day comment period | Workshop in Northern California | Workshop in Southern California | End 30-day comment period | State Board info item in Sacramento |

***STATE WATER BOARD CONTINUE ACCEPTING COMMENTS AFTER MAY 20TH***

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**

| Submit comments on the Framework | |
|---|---|
| By email | DDWrecycledwater@waterboards.ca.gov<br>PDF preferred (15 MB max) |
| By mail | Sherly Rosilela, P.E.<br>Division of Drinking Water, Recycled Water Unit<br>State Water Resources Control Board<br>P.O. Box 100<br>Sacramento, CA 95812-100 |


Questions