# Direct Potable Reuse
## Regulation Development & Overview of Proposed Criteria

DPR Criteria Expert Panel Meeting 1

August 24-25, 2021

CALIFORNIA
Water Boards

Division of Drinking Water

# DDW Speakers

**Randy Barnard**

Chief, Technical Operations Section

**Kurt Souza**

Chief, Southern California Field Operations Branch

**Brian Bernados**

Senior Sanitary Engineer

**Jing Chao**

Senior Sanitary Engineer

**Robert Hultquist**

Principal Engineer (ret)

**Saeed Hafeznezami**

Water Resources Control Engineer

# DPR Regulation Development

Randy Barnard, PE
Supervising Engineer
Technical Operations Section

CALIFORNIA
Water Boards

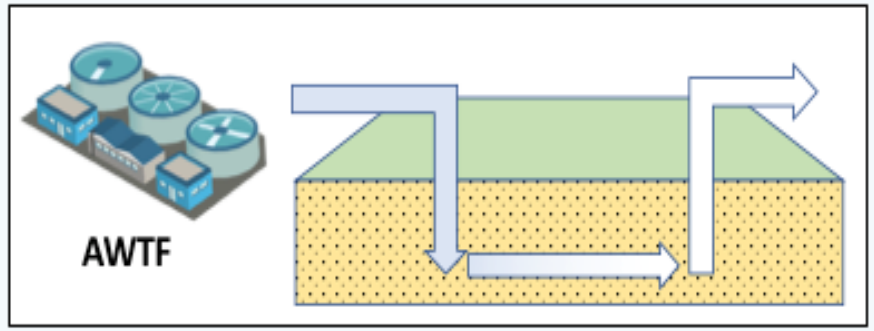
Division of Drinking Water

# Introduction

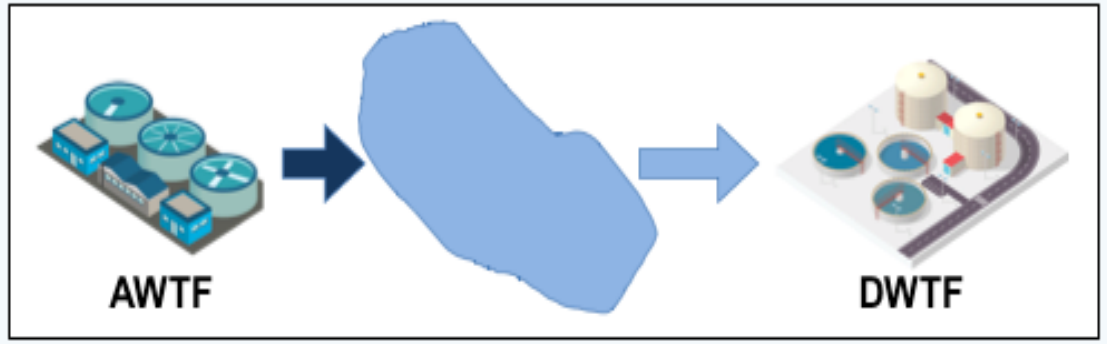
- Short history of Potable Reuse regs
- Summary of the DPR reg development
- Regulation adoption process in general

# History of Potable Reuse

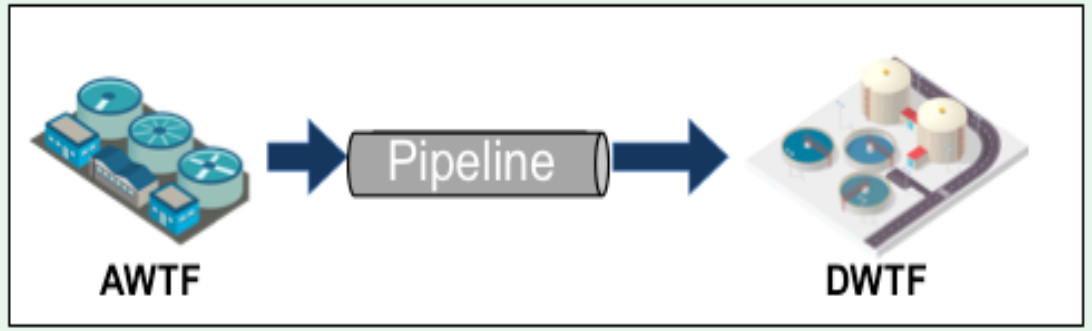
Groundwater Recharge



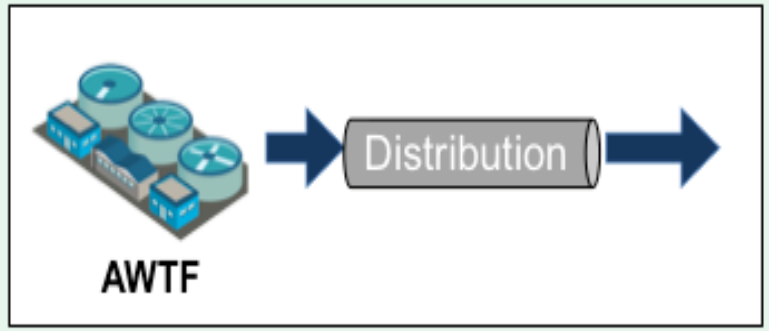

Surface Water Augmentation

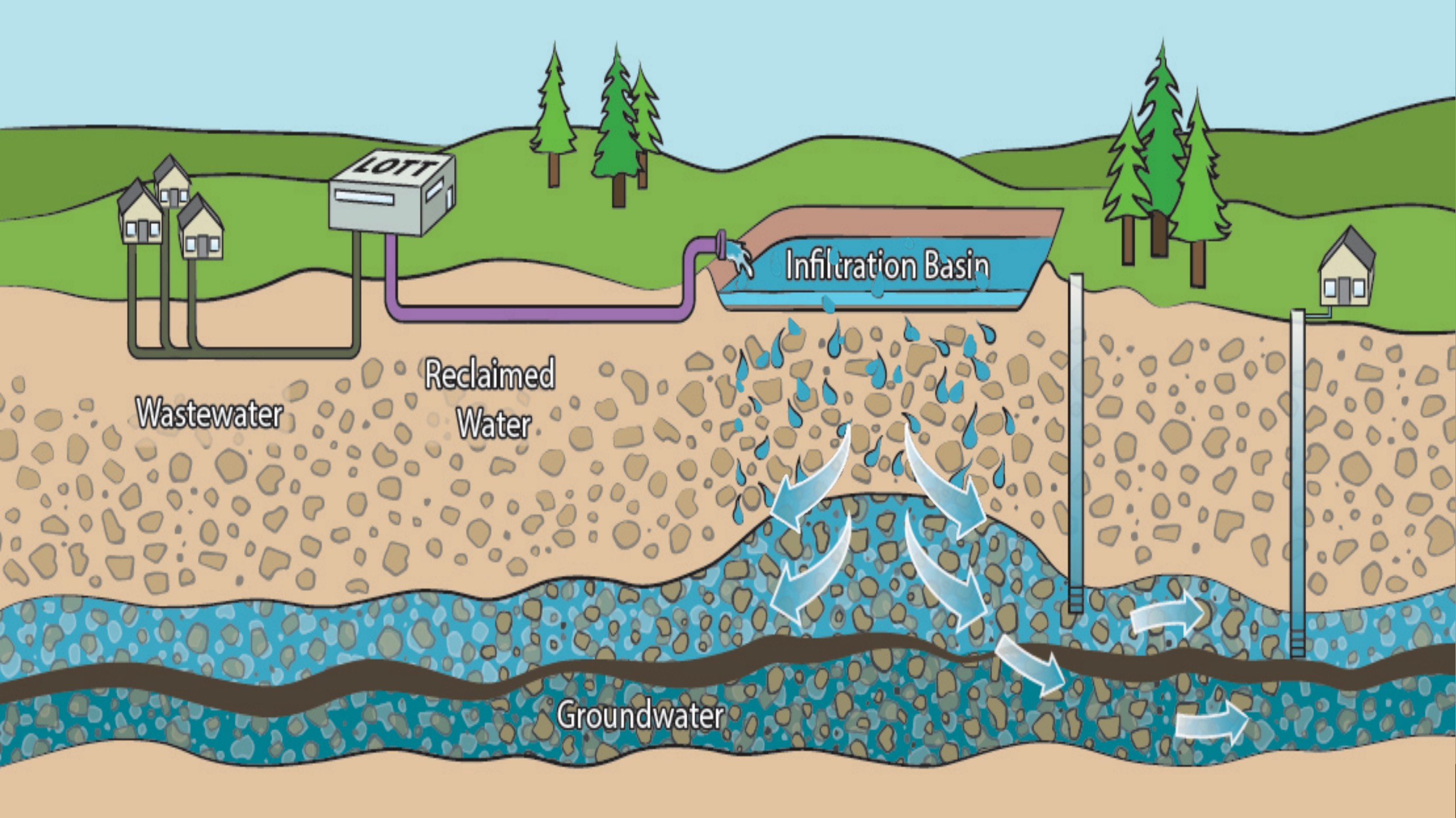



Raw Water Augmentation

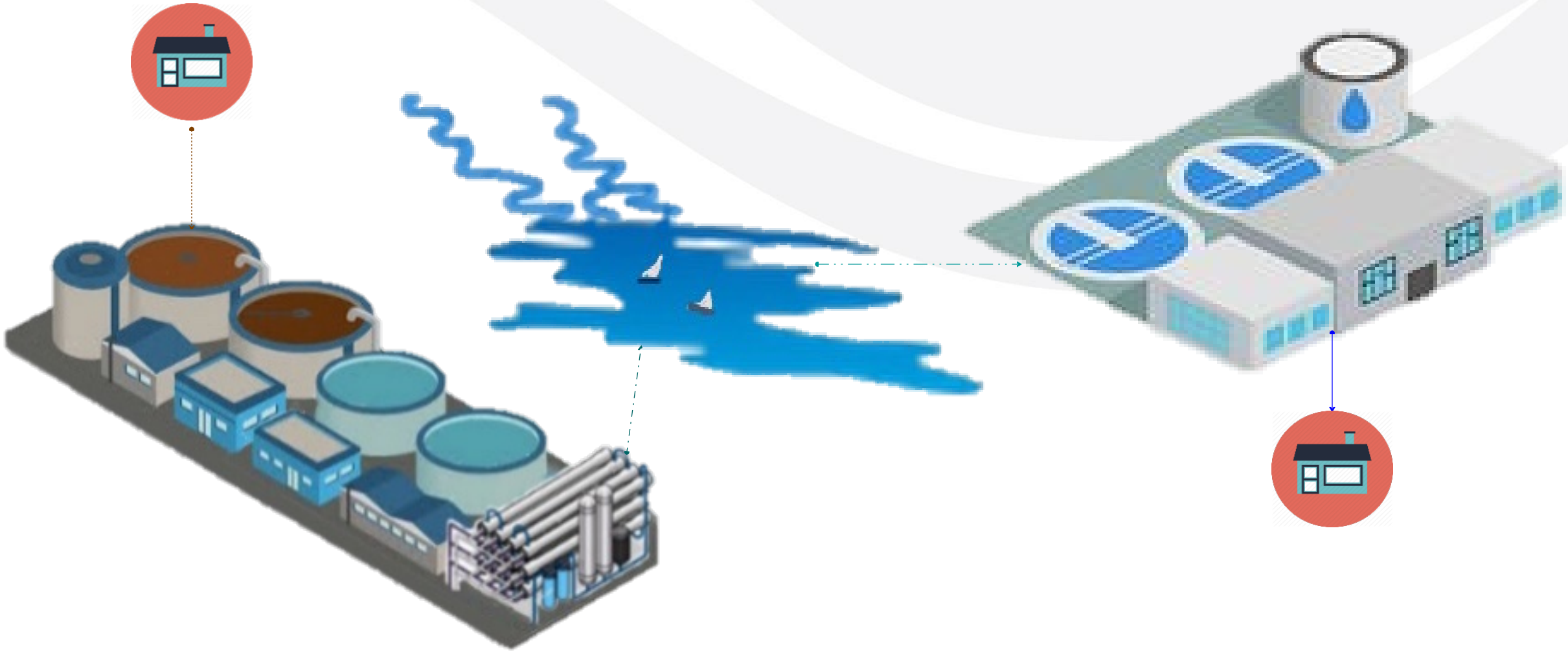



Treated Water Augmentation

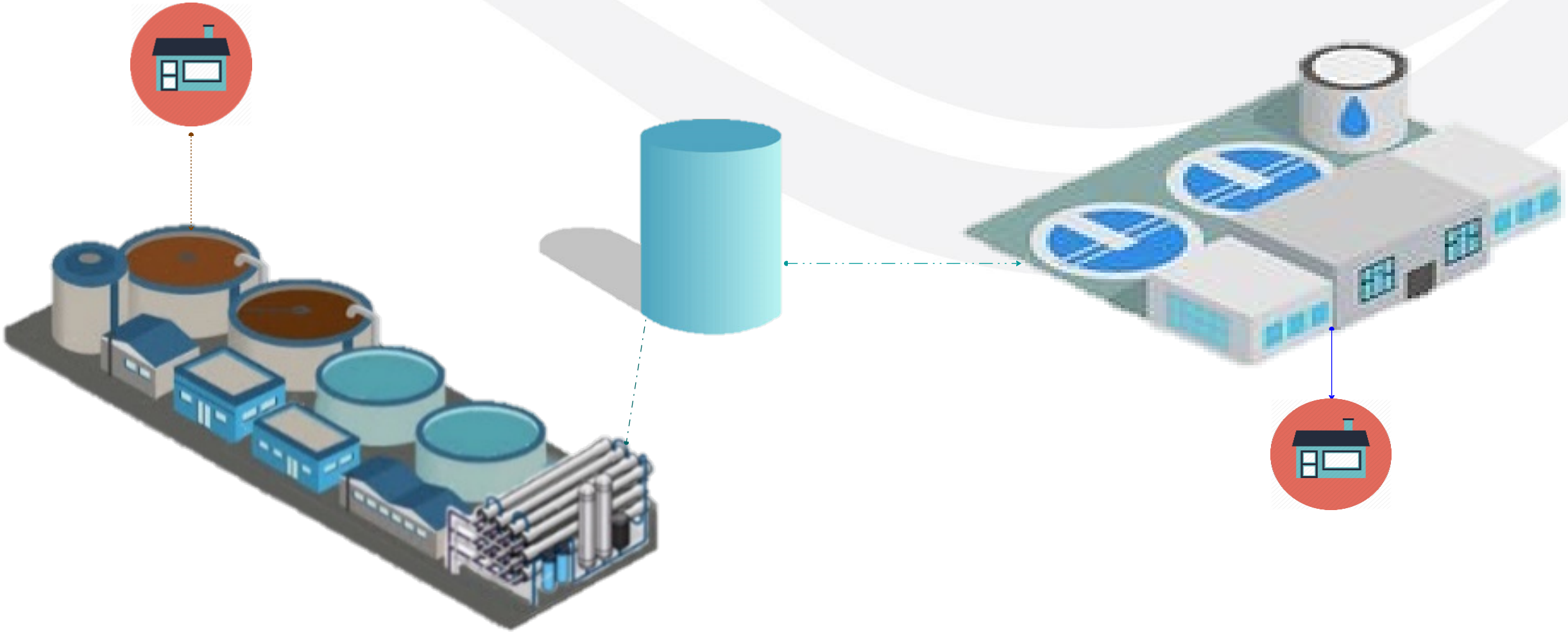



LOTT
Infiltration Basin
Wastewater
Reclaimed
Water
Groundwater

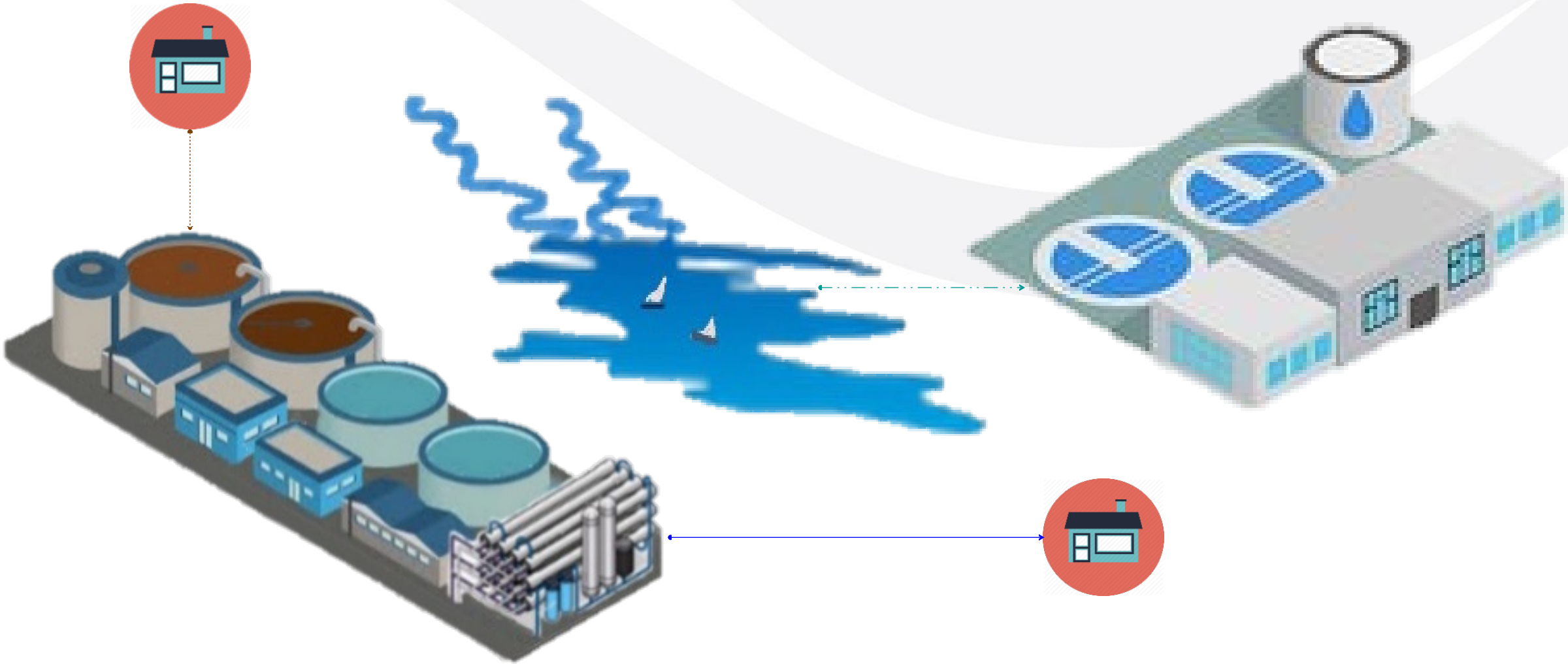
# DPR - Raw Water Augmentation



# DPR - Raw Water Augmentation



# DPR - Treated Water Augmentation



# DPR Regulation Development

# Background


DPR Feasibility
• Dec 2016
Framework for DPR
• Jun 2018
Framew 2nd Ed
• Aug 201
A Proposed Framework of Regulating Direct Potable Reuse in California Addendum
DPR Framework 2nd edition Addendum – Early Draft of Anticipated Criteria for Direct Potable Reuse
DPR Criteria Expert Panel
• Aug 2021
DPR Regulations
• Dec 2023
DPR Research

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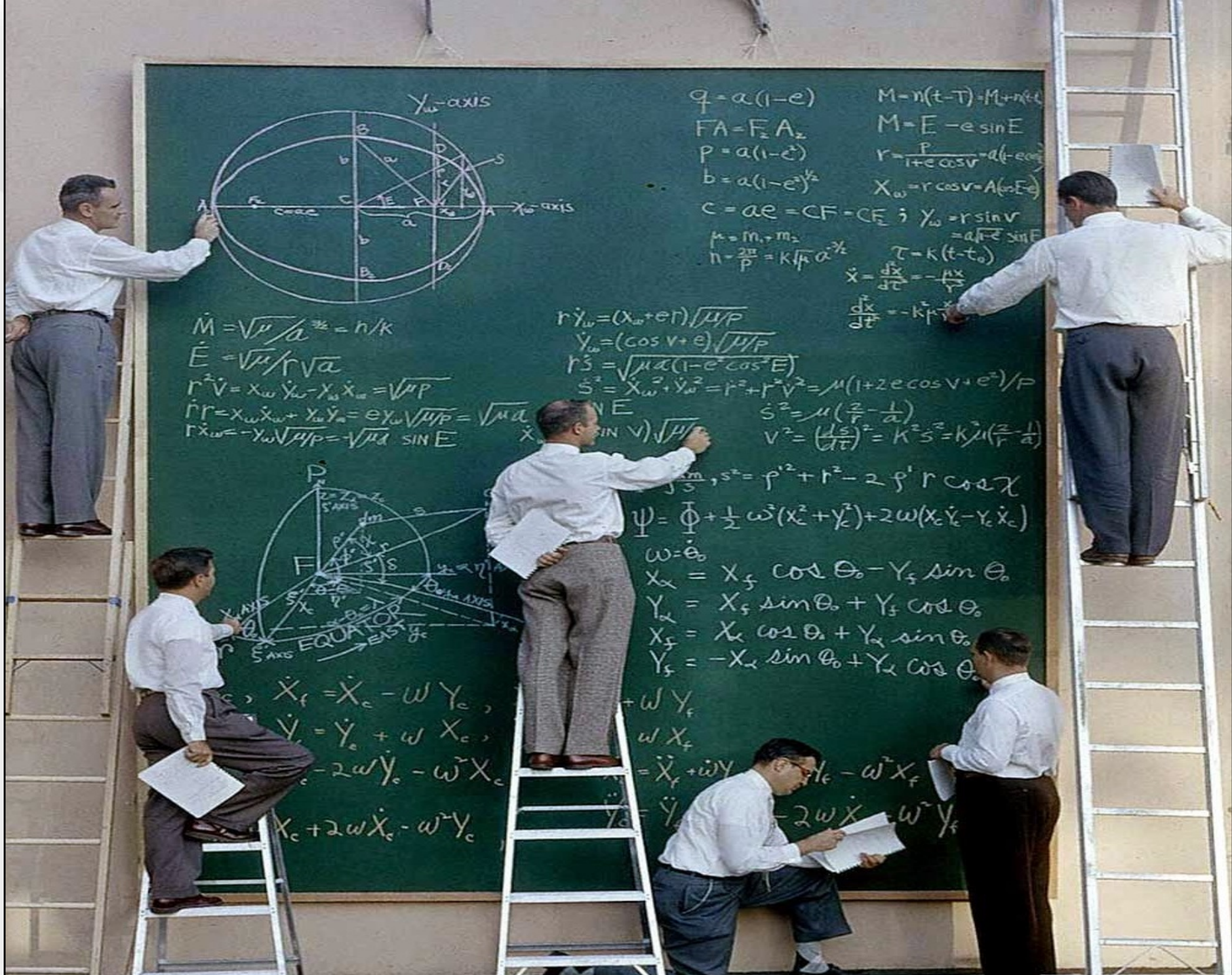
- Source control
- QMRA
- Wastewater monitoring
- Outbreak data
- Averaging
- Unknown methods



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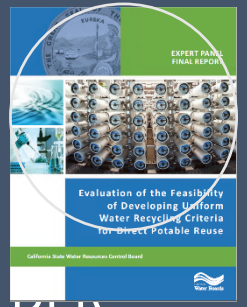
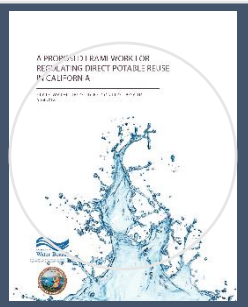


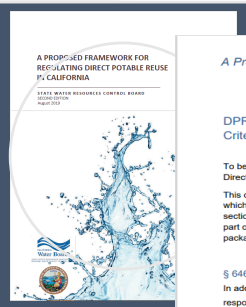

DPR Feasibility

- Dec 2016



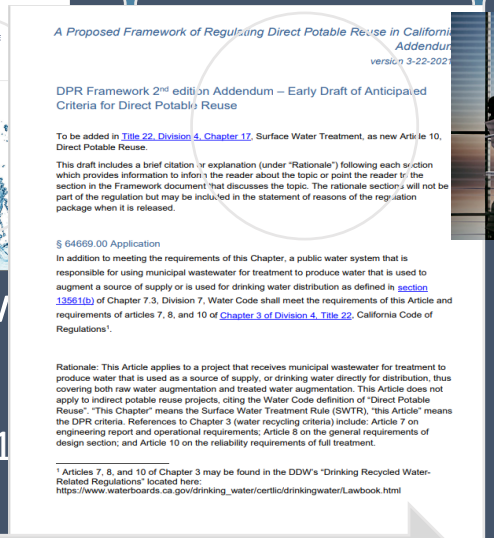

Framework for DPR

- Jun 2018




Framew 2nd Ed

- Aug 201


A Proposed Framework of Regulating Direct Potable Reuse in California – Addendum

version 3-22-2021

DPR Framework 2nd edition Addendum – Early Draft of Anticipated Criteria for Direct Potable Reuse

To be added in Title 22, Division 4, Chapter 17, Surface Water Treatment, as new Article 10, Direct Potable Reuse.

This draft includes a brief citation or explanation (under "Rationale") following each section which provides information to inform the reader about the topic or point the reader to the section in the Framework document that discusses the topic. The rationale sections will not be part of the regulation but may be included in the statement of reasons of the regulation package when it is released.

§ 64669.00 Application

In addition to meeting the requirements of this Chapter, a public water system that is responsible for using municipal wastewater for treatment to produce water that is used to augment a source of supply or is used for drinking water distribution as defined in section 13561(b) of Chapter 7.3, Division 7, Water Code shall meet the requirements of this Article and requirements of articles 7, 8, and 10 of Chapter 3 of Division 4, Title 22, California Code of Regulations[1].

Rationale: This Article applies to a project that receives municipal wastewater for treatment to produce water that is used as a source of supply, or drinking water directly for distribution, thus covering both raw water augmentation and treated water augmentation. This Article does not apply to indirect potable reuse projects, citing the Water Code definition of "Direct Potable Reuse". "This Chapter" means the Surface Water Treatment Rule (SWTR), "this Article" means the DPR criteria. References to Chapter 3 (water recycling criteria) include: Article 7 on engineering report and operational requirements; Article 8 on the general requirements of design section; and Article 10 on the reliability requirements of full treatment.

[1] Articles 7, 8, and 10 of Chapter 3 may be found in the DDW's "Drinking Recycled Water-Related Regulations" located here: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Lawbook.html

DPR Criteria Expert Panel

- Aug 2021

DPR Regulations

- Dec 2023

DPR Research

# Background


EXPERT PANEL FINAL REPORT
Evaluation of the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse
California State Water Resources Control Board
A PROPOSED FRAMEWORK FOR REGULATING DIRECT POTABLE REUSE IN CALIFORNIA
A PROPOSED FRAMEWORK FOR REGULATING DIRECT POTABLE REUSE IN CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD
A Proposed Framework of Regulating Direct Potable Reuse in California
Addendum
version 3-22-2021
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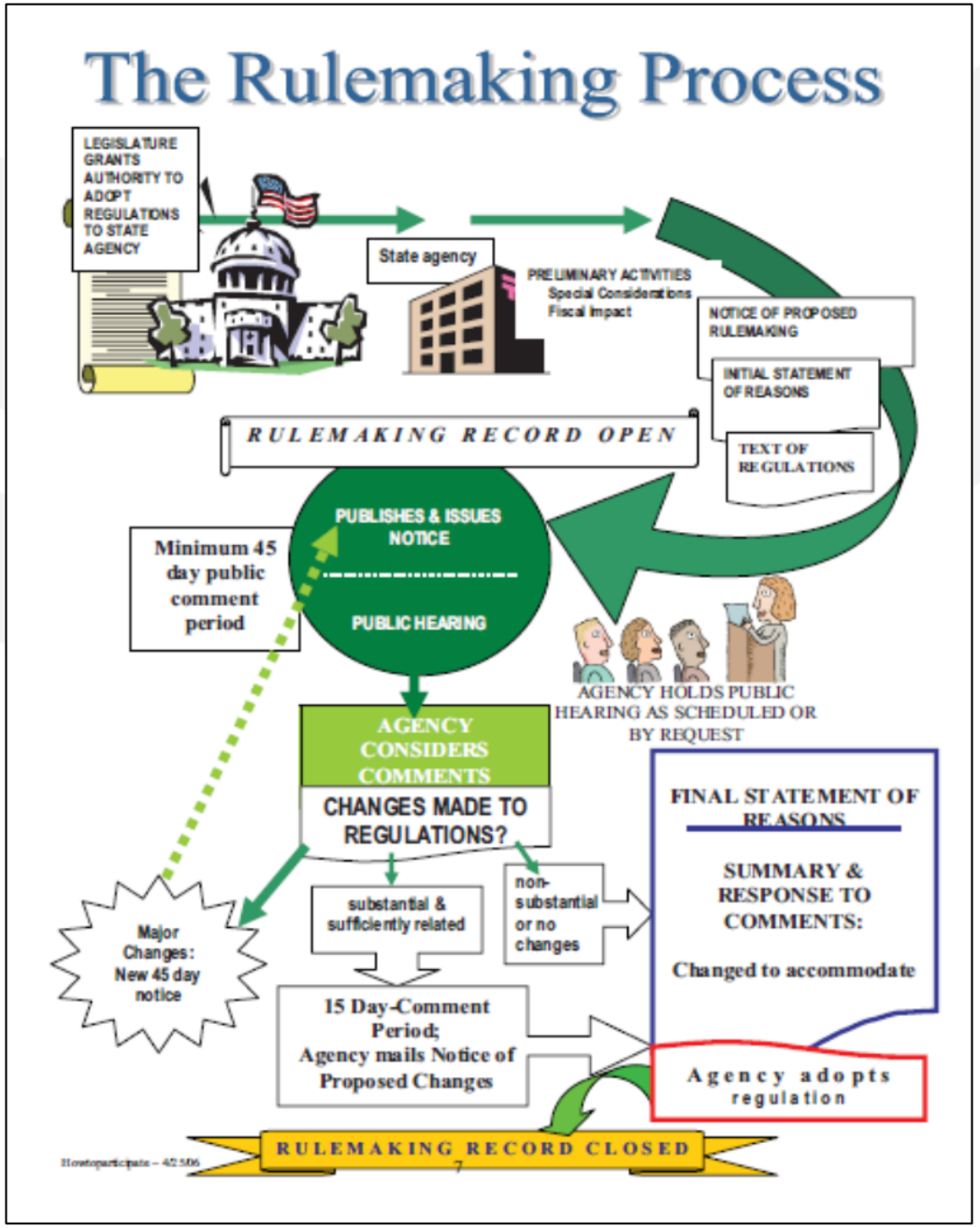
# Regulation Adoption Process

# Reg Adoption Steps

- Inspiration, cause, or need for a regulation
- Regulatory package development
- Formal regulation adoption process
- Implementation



# Regulatory Package Development

- Transmittal memos
- Informative Digest
- Statement of Reasons
- Statement of Determinations
- Regulation Text
- Fiscal Impact Statement

# Peer Review Process

- Health and Safety Code Section 57004, requires all Cal/EPA organizations to submit for external scientific review:
  - The scientific basis and scientific portion of all proposed policies, plans and regulations.
  - Peer reviewers determine whether the scientific findings, conclusions, and assumptions are based upon sound scientific knowledge, methods, and practices
- More information of peer review process: www.swrcb.ca.gov/water_issues/programs/peer_review/

# Expert Panel Timeline

- National Water Research Institute
- Expert Panel meetings – August 2021 to April 2022
- Expert Panel consensus memo – April 2022

# Formal Adoption Process

- Reviewed by Office of Regs and Office of Legal Services
- Review by Budget Office and Office of Finance
- Review by Health and Human Services Agency
- Public notice via OAL
- 45-day public review
- 15-day public review if changes made
- Approval by Director’s Office
- 30-day OAL review
- Signature by Secretary of State (reg is effective 30 days later)

# Timeline

Complete DPR Research

HSC 57004 Peer Review

Convene Expert Panel

Obtain Expert Panel findings

Regular Rulemaking Process under APA

**Adopt regulations by December 31, 2023**

| | |
|---|---|
| Determine if 18-month deadline extension needed | June 30, 2023 |
| If deadline beyond 18 months is needed, consult with expert review panel and post findings per CWC 13561.2(a)(5) process | June 30, 2024 |

# Drinking Water Regulations

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Assistant Deputy Director
Field Operations Branch Chief,
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CALIFORNIA
Water Boards

Division of Drinking Water

# Safe Drinking Water

- California's legal authority to carry out the federal Safe Drinking Water Act is defined in the California Health and Safety Code (HSC), Chapter 4, "California Safe Drinking Water Act," §116270 - §116751.
- The regulations to carry out the SDWA are defined in the California Code of Regulations, Title 17 and Title 22.
- HSC §116555 requires each public water system (PWS) to ***"Provide a reliable and adequate supply of pure, wholesome, healthful, and potable water."***

# CA Safe Drinking Water Act

- "It is the intent of the Legislature to improve laws governing drinking water quality, to **improve upon the minimum requirements of the federal Safe Drinking Water Act** Amendments of 1996, to establish primary drinking water standards that are at least as stringent as those established under the federal Safe Drinking Water Act, and to **establish a program under this chapter that is more protective of public health than the minimum federal requirements**."
- "It is the policy of the state to reduce to the lowest level feasible all concentrations of toxic chemicals that, when present in drinking water, may cause cancer, birth defects, and other chronic diseases." HSC §116270

# Public Water System

- HSC §116275 (h) “Public water system” means a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year. A public water system includes the following:
- (1) Any collection, treatment, storage, and distribution facilities under control of the operator of the system that are used primarily in connection with the system.
- (2) Any collection or pretreatment storage facilities not under the control of the operator that are used primarily in connection with the system.
- (3) Any water system that treats water on behalf of one or more public water systems for the purpose of rendering it safe for human consumption.

# Sources of Drinking Water

- Groundwater
- Groundwater Under the Direct Influence of Surface Water
- Surface Water
- Extremely Impaired Source, such as:
  - Extremely contaminated ground water
  - Sewage effluent dominated surface water
  - Oilfield produced water
  - Water that is predominantly recycled water, urban storm drainage, **treated or untreated wastewater**, or agricultural return water
  - Products of toxic site cleanup programs

# PWS Oversight

- Permits & Inspections
- Routine monitoring and compliance reporting
- Violations and enforcement
- Emergency response (vulnerability assessment, emergency response plan, emergency notification plan, emergency disinfection plan)
  - Boil water orders, “do not drink” orders, “do not use” orders

# Drinking Water Standards

- Maximum Contaminant Levels (MCL)
  - Primary MCL: Federal SDWA + 13 CA-specific chemicals; CA MCLs are more stringent than federal MCLs for 25 chemicals
  - Secondary MCL: 16 constituents
- Treatment Techniques (TT) may be established in lieu of an MCL
  - Surface water treatment regulations
  - Other regulations include TT's along with MCLs, such as the total coliform rule and disinfection byproducts rule
- Action Levels
  - Lead and copper

# Drinking Water Standards (cont'd)

- Revised Total Coliform Rule
- Groundwater Rule
- Surface Water Treatment Rules
- Lead and Copper Rule
- Disinfection Byproducts Rule

# Notification Levels

- DDW have set health-based advisory levels, called “notification levels” (NLs), as needed, since the early 1980s.
- Generally, NLs are established in response to actual contamination of drinking water supplies or in anticipation of possible contamination.
- Chemicals for which NLs are established may eventually be regulated by MCLs (through a formal regulatory process), depending on the extent of contamination, the levels observed, and the risk to human health.
- To date, NLs have been established for 96 chemicals, 40 of which have since been regulated (MCLs established), 32 of which still have NLs, and 24 of which have been archived.

# Source Monitoring & Assessment

- Watershed Sanitary Survey
- Source Water Assessment
- Possible Contaminating Activities and Vulnerability Assessment
- Monitoring Schedules
- Sources that do not meet drinking water quality standards must provide treatment. Any treatment proposed must be submitted with an engineering report for review and permit approval

# Other Requirements

- Operator Certification
- Cross-Connection Control
  - Title 17, Cross-connection control policy handbook
- California Waterworks Standards
  - Materials, design, capacity requirements
- Public Notification Rule
- Consumer Confidence Rule
- Permit provisions

# DPR Proposed Criteria Overview

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CALIFORNIA
Water Boards

Division of Drinking Water

# Proposed DPR Criteria Sections

§ 64669.00 Application
§ 64669.05 Definitions
§ 64669.10 General Requirements
§ 64669.15 Permit
§ 64669.20 Public Meeting
§ 64669.25 Joint Plan
§ 64669.30 Technical, Managerial, Financial Capacity
§ 64669.35 Operator Certification
§ 64669.40 Wastewater Source Control
§ 64669.45 Pathogen Control
§ 64669.50 Chemical Control
§ 64669.55 Water Safety Plan
§ 64669.60 Regulated Contaminants & Physical Characteristic Control
§ 64669.65 Additional Monitoring
§ 64669.70 Laboratory Analysis
§ 64669.75 Engineering Report
§ 64669.80 Operations Plan
§ 64669.85 Pathogen and Chemical Control Point Monitoring and Response Plan
§ 64669.90 Monitoring Plan
§ 64669.95 Compliance Reporting
§ 64669.100 Annual Report
§ 64669.105 Cross-Connection Control
§ 64669.110 Corrosion Control and Stabilization
§ 64669.115 Alternatives
§ 64669.120 Independent Advisory Panel
§ 64669.125 Public Notification
§ 64669.130 Consumer Confidence Reporting

# Principles

- Low tolerable risk
  - Daily risk objective not to exceed $2.7x10^{-7}$ ($10^{-4}$ annual risk of infection divided by 365)
  - Meet drinking water standards
  - Address chemical peaks
  - Reduce unknown chemicals to levels that are below public health concern

# Principles

- Multiple barriers for chemical control
- Multi-barrier log reduction requirements for pathogens
- Robust - different mechanisms
- Source control
- Extensive process monitoring – accurate real-time information
  - Continuous monitoring, alarms, automatic diversion
- Critical control point approach

# Principles

Response:  Fail ➔ Safe

- A failure:
  - Treatment efficacy falls below some specified level
  - A loss of monitoring capability

- The response to a failure:
  - Transition to a safe condition – halt drinking water production
  - Identify and correct the fault
  - Restart per a start-up procedure

# Organization & Joint Plan
## § 64669.15 (a)

- A DiPRRA is the agency responsible for complying with the criteria
  - Only one DiPRRA shall be designated for a DPR project
  - Must be a public water system and must obtain a water supply permit
  - Must submit a Joint Plan that describes partner agency(ies) involved in the DPR project, the roles and responsibilities of all involved in the project, legal authority of each agency to fulfill its role, and the overall organizational structure involved in implementing the Joint Plan.

# Joint Plan
## § 64669.25

- Plan for the DiPRRA, utilizing agreements with partner agencies to facilitate, to:
  - Ensure that the DiPRRA has current knowledge of the status of treatment of the entire DPR project;
  - Take corrective actions if water delivered from a treatment facility fails to meet the treatment or water quality requirements of this Article;
  - Implement source control requirements pursuant to section 64669.40, including provisions to conduct source control investigations;
  - Optimize corrosion control to reduce lead and copper levels in the distribution system;

# Joint Plan (cont'd)
# § 64669.25

- Provide notification of partner agency(ies) and the State Board of operational changes that may adversely affect the quality of water delivered by the treatment facility
- Provide customer notification pursuant to sections 64669.20, 64669.60, and 64669.125, and receive customer complaints pursuant to section 64669.95;
- Provide an alternative source of domestic water supply or drinking water if the DPR project is unable to supply water.

- Joint Plan must be up-to-date

# Technical, Managerial, Financial Capacity § 64669.30

- Prior to operation of a DPR project, all participating agencies in the Joint Plan involved in wastewater collection, treatment, monitoring, or control of the DPR project prior to finished water distribution shall demonstrate to the State Board that the agencies possess adequate technical, managerial, and financial capability to assure compliance with this Article.

# Demonstration of TMF Capacity § 64669.30

- The Engineering Report must:
  - Describe in detail the facilities, staffing, and support services necessary to comply with regulations, and continuously produce safe drinking water;
  - Specify elements that have costs associated (operation and maintenance costs, 20-year life-cycle costs of equipment, capital replacement costs, energy costs, personnel costs, etc.);
  - Reliable and continuing funding sources must be identified for the necessary costs associated with annual operations and maintenance, capital replacement, and an annual capital budget.

# Regulated Chemical Monitoring § 64669.60

| Sampling Location | (a) (1) – wastewater that feeds the DPR project | (a)(2) advanced treated water at a location immediately after advanced oxidation | (a)(3) finished water prior to entry point to the distribution system |
|---|---|---|---|
| Exceeds MCL or AL | C | C | C |
| Confirmed Exceed MCL or AL | C T S | M NSB T S | M NSB D PN |
| Confirmed Exceed 10X MCL or AL | NSB | | |

C Collect confirmation sample

M Increase to weekly sampling

T Evaluate treatment system

S Initiate source investigation

PN Notify public

NSB Notify State Board

D Divert flow

# Unregulated Chemical Monitoring
## § 64669.65 (b)

- Monitor at same locations as regulated chemical monitoring, for the following chemicals not monitored pursuant to §64669.60, including:
  - Priority Toxic Pollutants specified by the State Board, based on the State Board's review of the DPR project Engineering Report;
  - Contaminants with Notification Levels;
  - Chemicals specified by the State Board, based on its review of the DPR project Engineering Report and findings from source control investigations/assessments performed;
  - The following solvents: acetone, N,N-dimethylacetamide, methanol, and methyl ethyl ketone; and
  - Treatment byproducts and their precursors

# Unregulated Chemical Monitoring
## § 64669.65 (g) and (h)

- Monitor at same locations as regulated chemical monitoring, for the following chemicals within the wastewater collection area(s) of the DPR project that are not otherwise required to be monitored that are:
  - From industrial sources identified in section 64669.40;
  - From business and household sources of hazardous substances, the most prescribed pharmaceuticals, and personal care products, based on analyses of wastewater and environmental waters sampled locally;
  - Known to the State pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986 to cause cancer or reproductive toxicity, as listed in California Code of Regulations, Title 27, Division 4, Chapter 1, Article 9, sections 27001(b) or 27001(c); or
  - Likely to be present in wastewater used in the DPR project, based on reviews of possible contaminating activities identified in drinking water source assessments performed by or for the DiPRRA or the partner water agency(ies) in the Joint Plan; reviews of chemicals of emerging concern (CECs) in wastewater, including endocrine disrupting chemicals, in reports from State Water Board advisory bodies and the scientific literature; and lists of the most prescribed pharmaceuticals.

# Unregulated Chemical Monitoring § 64669.65

- Detection of chemicals with Notification Levels:
  - Collect confirmation sample, increase monitoring frequency to weekly, conduct an evaluation of the treatment system, initiate a source control investigation per the approved Joint Plan, and submit the results in the monthly compliance report. The DiPRRA may apply to the State Board to resume monthly sampling after submitting a report summarizing the treatment evaluation and source investigation to the State Board.
  - Report results of detected chemicals at the (a)(3) sampling location (entry point to the distribution system) in Consumer Confidence Report.

# Unregulated Chemical Monitoring § 64669.65

- Exceedance of Notification Levels:
  - Follow the same procedures as NL detects, plus notify the State Board, local governing bodies, partner agencies, and PWS receiving DPR water
- Exceedance of Response Levels:
  - Notify the State Boards and follow the applicable requirements in Health and Safety Code sections 116455 and 116378.
- Monitoring reduction to quarterly for chemicals in subsection (b),and reduction/waiver from monitoring chemicals in subsection (g) and (h) after 2 years of non-detected results

# Alternatives
# § 64669.115

- Proposals for alternatives to a treatment requirement will be considered
- Must provide an equivalent level of public health protection
- Effectiveness must be documented
- Review by independent advisory panel
- Hold public meeting if required by State Board
- Process validation steps have been added

# Water Safety Plan
## § 64669.55

- The DiPRRA shall develop a Water Safety Plan for the DPR project and update every 5 years.
  - Submit the plan for review by an independent advisory panel (IAP), and consider panel recommendations
  - The IAP will provide recommendations on whether all hazards have been considered by the DiPRRA.
- The plan is a comprehensive hazard analysis that considers all steps in a drinking water supply chain from wastewater source to consumer.
  - Describes the risk management control(s) that are necessary beyond the source control, pathogen control, and chemical control requirements.

# RWA – TWA Distinction

- No property of RWA that is uniquely RWA for all scenarios, no property of RWA that can only be applied to RWA and not TWA, except for the existence of a water treatment plant.
- The presence of a water treatment plant is the only distinction. However, the treatment plant may be simply a chlorination station or a GAC filter – the statutory definition does not specify it to be a surface water treatment plant.

# RWA – TWA Distinction (cont'd)

Blending

- Framework document 1st edition provided a proposed distinction between RWA and TWA (the water treatment plant is a surface water treatment plant, and there is a meaningful blend with other water). A meaningful blend is a 9:1 blend of an approved source of water with municipal wastewater.
- Revisions made on addressing the chemical peak
  - Ozone/BAC equivalent for a blend
  - 0.5 TOC limit allowance for a blend

# RWA – TWA Distinction (cont'd)

Mixing

- Requirement for addressing chemical peaks
  - Longitudinal mixing §64669.50 (k)
  - Mixing capacity available beyond subsection (k) → alternatives

# RWA – TWA Distinction (cont'd)

Response Time §64669.85 (j)

- Between the DPR project intake and the entry point to the distribution system, sufficient time must elapse to allow for:
  - The identification of any treatment failure
  - Diversion of flow to protect the public from exposure to inadequately treated water

# RWA – TWA Distinction (cont'd)

- Role of Water Treatment Plant for Pathogen Reduction Treatment
  - A treatment process must be validated. Draft language has been added to clarify that validation can be done at the pilot scale, and that previously-validated membrane filters do not need to be revalidated.
  - A disinfection process at a surface water treatment plant that was previously validated may be credited using the existing surface water treatment rule frameworks without additional revalidation.
  - A satellite treatment plant that provides pathogen credit – the plant control system communications feed must be shared with DiPRRA (§64669.80 (k)), since the DiPRRA must have current knowledge of the status of treatment for the entire DPR project (§64669.25).