

Policy for Water Quality Control for Recycled Water

Table of Contents

Definitions	iii
1. Purpose	1
2. Benefits of recycled water	1
3. Goals and reporting requirements to track recycled water	2
4. State agency roles	6
5. Wastewater change petitions	7
6. Salt and nutrient management plans	8
7. Permitting and antidegradation analysis for non-potable recycled water projects	14
8. Permitting and antidegradation analysis for groundwater recharge projects	18
9. Permitting for reservoir water augmentation	21
10. Constituents of emerging concern	21
11. Maximizing consistency in permitting recycled water projects	23
ATTACHMENT A, Requirements for monitoring constituents of emerging concern for recycled water	A-1

<u>Acronym</u>	<u>Definition</u>
afy	Acre feet per year
AhR	Aryl hydrocarbon receptor
AOP	Advanced oxidation process
Basin plan	Water quality control plan
BEQ	Bioanalytical equivalent concentration
CEC	Constituent of emerging concern
CEQA	California Environmental Quality Act
DOC	Dissolved organic carbon
ELAP	Environmental Laboratory Accreditation Program
ER- α	Estrogen receptor - alpha
MEC	Measured environmental concentration
MTL	Monitoring trigger level
NDMA	N-nitrosodimethylamine
NMOR	N-Nitrosomorpholine
Order WQ 2016-0068-DDW	Order WQ 2016-0068-DDW, Water Reclamation Requirements for Recycled Water Use
Policy	Policy for Water Quality Control for Recycled Water
Regional water board	Regional water quality control board
RO	Reverse osmosis
State Water Board	State Water Resources Control Board
STORMS	Strategy to Optimize Resource Management of Stormwater
TNI	The National Environmental Laboratory Accreditation Conference Institute
Uniform Statewide Recycling Criteria	California Code of Regulations, title 22, division 4, chapter 3
U.S. EPA	U.S. Environmental Protection Agency
UV	Ultraviolet
Water Code	California Water Code

Definitions

The following are definitions of terms used in the Policy.

Bioanalytical equivalent concentration (BEQ): The output from bioanalytical screening tools are referenced to a substance that initiates a physiological response from the receptor (strong agonist) to generate BEQs. A BEQ is generated from a standard curve of a strong agonist for the receptor and is expressed in mass (ng/L) or molar concentration units. A BEQ is typically derived by comparing the 50th percentile effect concentration (EC50) or 10th percentile effect concentration (EC10) responses of the test sample with the same effect concentration (EC) level of the standard curve. The BEQ is compared to the Monitoring Trigger Level in water for the strong agonist for the receptor used to generate the BEQ.

Bioanalytical screening tools: *In vitro* (cell or protein-based) assays that can be used to screen for CECs and measure potential adverse effects of CECs on living cells or tissues.

Constituents of emerging concern (CECs): For purposes of this Policy, CECs are defined to be constituents in personal care products; pharmaceuticals; antimicrobials; industrial, agricultural, and household chemicals; naturally-occurring hormones; food additives; transformation products; inorganic constituents; microplastics; and nanomaterials.

Desalination facility: An industrial facility that processes water to remove salts and other components from the source water to produce water that is less saline than the source water.

Enclosed bays: Enclosed bays are indentations along the coast which enclose an area of oceanic water within distinct headlands or harbor works. Enclosed bays include all bays where the narrowest distance between headlands or outermost harbor works is less than 75 percent of the greatest dimension of the enclosed portion of the bay. This definition includes but is not limited to: Humboldt Bay, Bodega Harbor, Tomales Bay, Drakes Estero, San Francisco Bay, Morro Bay, Los Angeles Harbor, Upper and Lower Newport Bay, Mission Bay, and San Diego Bay.

Estuaries and coastal lagoons: Estuaries and coastal lagoons are waters at the mouths of streams that serve as mixing zones for fresh and ocean waters during a major portion of the year. Mouths of streams that are temporarily separated from the ocean by sandbars shall be considered as estuaries. Estuarine waters will generally be considered to extend from a bay or the open ocean to the upstream limit of tidal action but may be considered to extend seaward if significant mixing of fresh and salt water occurs in the open coastal waters. The waters described by this definition include but are not limited to the Sacramento-San Joaquin Delta as defined by section 12220 of the California Water Code, Suisun Bay, Carquinez Strait downstream to Carquinez Bridge, and appropriate areas of the Smith, Klamath, Mad, Eel, Noyo, and Russian Rivers.

Groundwater recharge: Indirect potable reuse for groundwater recharge is defined in Water Code section 13561(c), as the planned use of recycled water for replenishment of a groundwater basin or an aquifer that has been designated as a source of water supply for a public water system. Groundwater recharge by surface application is the controlled application of water to a spreading area for infiltration resulting in the recharge of a groundwater basin or an aquifer. Subsurface application is the controlled application of water to a groundwater basin or aquifer by a means other than surface application, such as direct injection through a well.

Health-based CECs: CECs that have toxicological relevance to human health. Some health-based CECs may also serve as performance indicator CECs.

Incidental runoff: Unintended small amounts (volume) of runoff from recycled water use areas, such as unintended, minimal over-spray from sprinklers that escapes the recycled water use area. Water leaving a recycled water use area is not considered incidental if it is due to the facility design, excessive application, intentional overflow or application, or negligence.

Measured environmental concentration (MEC): Concentration measured at the monitoring locations specified in Attachment A.

Monitoring trigger level (MTL): CEC concentrations above which response actions may be required. MTLs were established by the Science Advisory Panel for CECs in Recycled Water in their final report "[Monitoring Strategies for Constituents of Emerging Concern \(CECs\) in Recycled Water – Recommendations of a Science Advisory Panel](#), dated April 2018.

Municipal wastewater treatment plant: A wastewater treatment plant that treats or reclaims raw sewage in whole or in part of municipal origin. Some municipal wastewater treatment plants may also be recycled water producers.

Non-potable recycled water: recycled water that is treated for non-potable use pursuant to the uniform statewide recycling criteria in California Code of Regulations, title 22. Non-potable recycled water uses include but are not limited to irrigation, industrial or commercial cooling, supply for recreational impoundment, toilet flushing, and dust control.

Notification level: Health-based advisory levels established by the State Water Board's Division of Drinking Water for chemicals in drinking water that lack maximum contaminant levels. When chemicals are found at concentrations greater than their notification levels, certain requirements and recommendations apply.

Ocean waters: The territorial marine waters of the State as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons.

Performance indicator CECs: CECs that do not to have human health relevance, but can be used to monitor the efficacy of recycled water treatment processes.

Permit: For purposes of this Policy, the term “permit” means an order adopted by a regional water board or the State Water Board prescribing requirements for a recycled water project, including but not limited to water recycling requirements pursuant to Water Code section 13523, master recycling permits pursuant to Water Code section 13523.1, National Pollutant Discharge Elimination System permits pursuant to the Federal Water Pollution Control Act and Water Code section 13377, waste discharge requirements pursuant to Water Code section 13263, and waivers of waste discharge requirements pursuant to Water Code section 13269.

Recycled water: Water which, as a result of treatment of waste, is suitable for a direct beneficial use or a controlled use that would not otherwise occur and is therefore considered a valuable resource (Water Code §13050(n)).

Recycled water producer: An entity that is permitted to produce recycled water, which may then be used on- or off-site.

Recycled water project proponent: An entity seeking permit coverage for a planned recycled water project.

Regional water board: A regional water quality control board. All references to regional water board include the executive officer or his/her designee, who may act for the regional water board in carrying out the provisions of this Policy consistent with Water Code section 13223.

Reservoir water augmentation: The planned placement of recycled water into a raw surface water reservoir used as a source of domestic drinking water supply for a public water system or into a constructed system conveying water to such a reservoir (Wat. Code § 13561; also referred to as surface water augmentation in Wat. Code § 13562).

State Water Board: The State Water Resources Control Board. All references to the State Water Board include the executive director or his/her designee.

Surrogate: A measurable physical or chemical property that can be used to measure the effectiveness of trace organic compound removal by treatment process and/or provide an indication of a treatment process failure.

Water purveyor: An entity that supplies water.

1. Purpose

- 1.1. The purpose of the Policy for Water Quality Control for Recycled Water (Recycled Water Policy, hereafter Policy) is to encourage the safe use of recycled water from municipal wastewater sources that meets the definition in California Water Code (Water Code) section 13050(n), in a manner that implements state and federal water quality laws and protects public health and the environment.
- 1.2. This Policy provides direction to the regional water quality control boards (regional water boards), proponents of recycled water projects, and the public regarding the methodology and appropriate criteria for the State Water Resources Control Board (State Water Board) and the regional water boards to use when issuing permits for recycled water projects.
- 1.3. All elements of this Policy are to be interpreted in a manner that fully implements state and federal water quality laws and regulations to enhance the environment and put the waters of the state to the fullest use of which they are capable.
- 1.4. This Policy describes the circumstances under which permittees may enroll under the statewide water reclamation requirements for recycled water use (e.g., State Water Board [Order WQ 2016-0068-DDW](#)) or choose an alternate permitting mechanism, such as a master recycling permit. For cases where use of statewide water reclamation requirements for recycled water use may not be appropriate, this Policy provides permitting criteria that are intended to aid in the antidegradation analysis of some recycled water projects. The intent of this streamlined process is to expedite the permitting of recycled water projects in a manner that implements state and federal water quality laws while allowing the regional water boards to focus their limited resources on projects that require substantial regulatory review due to unique site-specific conditions.
- 1.5. It is the State Water Board's intent to promote consistency in the permitting of recycled water projects while also preserving sufficient authority and flexibility for the regional water boards to address site-specific conditions.

2. Benefits of recycled water

- 2.1. When used in compliance with this Policy, California Code of Regulations, title 22 and all applicable state and federal water quality laws, the State Water Board finds that recycled water is safe for approved uses, and strongly supports recycled water as a safe alternative to potable water for such approved uses.
- 2.2. Recycled water is presumed to have a beneficial impact when used in accordance with this Policy and all applicable regulations, that is, when supporting the sustainable use of groundwater and surface water with the

intent of substituting for use of potable water. Other public agencies are encouraged to use this presumption in evaluating the impacts of recycled water projects on the environment as required by the California Environmental Quality Act (CEQA).

3. Goals and reporting requirements to track recycled water

3.1. *Goals.* To encourage the increased use of recycled water in California, the State Water Board adopts the following goals:

3.1.1. Increase the use of recycled water from 714,000 acre-feet per year (afy) in 2015 to 1.5 million afy by 2020 and to 2.5 million afy by 2030.

3.1.2. Minimize the direct discharge of treated municipal wastewater to enclosed bays, estuaries and coastal lagoons, and ocean waters, except where necessary to maintain beneficial uses. For the purpose of this goal, treated municipal wastewater does not include brine discharges from recycled water facilities or desalination facilities.

3.2. *Reporting requirements.* The State Water Board will evaluate progress toward these goals and revise the goals or establish mandates as necessary. To support this evaluation, municipal wastewater treatment plants shall electronically report to the State Water Board the volume of influent, treated water produced, and treated water disposed, as specified in 3.2.1, unless otherwise directed by the Executive Director. Recycled water producers shall electronically report to the State Water Board the volume of treated water produced and disposed, as specified in 3.2.2.1 and 3.2.2.2, unless otherwise directed by the Executive Director. Recycled water producers and municipal wastewater treatment plants that are also recycled water producers shall report to the State Water Board the volume of recycled water use, as specified in 3.2.1.4 and 3.2.2.3, unless otherwise directed by the Executive Director. All volumetric data shall be reported as acre-feet per year (afy) to a database identified by the State Water Board. The Executive Director will issue an order to implement the requirements of this section.

3.2.1. *Municipal wastewater treatment plants.* This section includes reporting requirements for municipal wastewater treatment plants and for municipal wastewater treatment plants that are also recycled water producers. Municipal wastewater treatment plants shall report:

3.2.1.1. *Influent.* Volume of untreated wastewater or raw sewage entering a municipal wastewater treatment plant, on a monthly basis.

3.2.1.2. *Production.* Volume of municipal wastewater treated to each of the following standards, on a monthly basis:

- Undisinfected secondary, as defined in California Code of Regulations, title 22, §60301.900
- Disinfected secondary-23, as defined in California Code of Regulations, title 22, §60301.225
- Disinfected secondary-2.2, as defined in California Code of Regulations, title 22, §60301.220
- Disinfected tertiary, as defined in California Code of Regulations, title 22, §60301.230
- Full advanced treatment, as defined in California Code of Regulations, title 22, §60320.201.

3.2.1.3. *Disposal*. Volume of treated municipal wastewater discharged to each of the following, on a monthly basis:

- Inland surface waters, specifying volume required to maintain minimum instream flow
- Enclosed bays, estuaries and coastal lagoons, and ocean waters
- Underground injection wells, such as those classified by U.S. EPA's Underground Injection Control Program
- Land.

3.2.1.4. *Reuse*.

3.2.1.4.1. Volume of treated municipal wastewater distributed to a recycled water producer for further treatment and use, at least on an annual basis.

3.2.1.4.2. Volume of treated municipal wastewater directly distributed for beneficial use in compliance with California Code of Regulations, title 22 in each of the use categories listed below, at least on an annual basis. This category excludes volume reported in 3.2.1.4.1.

- Agricultural irrigation: pasture or crop irrigation

- Landscape irrigation: irrigation of parks, greenbelts, and playgrounds; school yards; athletic fields; golf courses; cemeteries; residential landscaping, common areas; commercial landscaping; industrial landscaping; and freeway, highway, and street landscaping
- Commercial and industrial application: dual-plumbed projects, business use (such as laundries and office buildings), manufacturing facilities, cooling towers, process water, and appurtenant landscaping that is not separately metered
- Geothermal energy production: augmentation of geothermal fields
- Other non-potable uses: including but not limited to dust control, flushing sewers, fire protection, fill stations, snow making, recreational impoundments, etc.
- Groundwater recharge: surface or subsurface application, except for seawater intrusion barrier use
- Seawater intrusion barrier: groundwater recharge via subsurface application intended to reduce seawater intrusion into a coastal aquifer with a seawater interface
- Reservoir water augmentation: the planned placement of recycled water into a raw surface water reservoir used as a source of domestic drinking water supply for a public water system, as defined in Section 116275 of the Health and Safety Code, or into a constructed system conveying water to such a reservoir (Water Code § 13561)
- Raw water augmentation: the planned placement of recycled water into a system of pipelines or aqueducts that deliver raw water to a drinking water treatment plant that provides water to a public water system as defined in Section 116275 of the Health and Safety Code (Water Code § 13561)
- Other potable uses: both indirect and direct potable reuse other than for groundwater recharge; seawater intrusion barrier, reservoir water augmentation, and raw water augmentation

3.2.2. *Recycled water producers*. This section includes reporting requirements for facilities that are solely recycled water producers (i.e., not also municipal wastewater treatment plants). Recycled water producers shall report:

3.2.2.1. *Production.* Volume of municipal wastewater treated to each of the standards described in 3.2.1.2, on a monthly basis.

3.2.2.2. *Disposal.* Volume of treated municipal wastewater not used for any direct beneficial use described in 3.2.2.3 below, including volume of treated municipal wastewater discharged to each of the following, on a monthly basis:

- Inland surface waters, specifying volume required to maintain minimum instream flow
- Enclosed bays, estuaries and coastal lagoons, and ocean waters
- Underground injection wells, such as those classified by U.S. EPA's Underground Injection Control Program
- Land.

3.2.2.3. *Reuse.* Volume of treated municipal wastewater directly distributed for beneficial use in compliance with California Code of Regulations, title 22 in each of the use categories described in 3.2.1.4.2, at least on an annual basis.

3.3. The State Water Board and regional water boards will exercise the authority granted to them by the Legislature to the fullest extent possible to encourage the use of recycled water, consistent with state and federal water quality laws and with state and federal laws to protect public health.

3.3.1. Agencies producing recycled water that is available for reuse and not being put to beneficial use shall make that recycled water available to water purveyors for reuse on reasonable terms and conditions. Such terms and conditions may include payment by the water purveyor of a fair and reasonable share of the cost of the recycled water supply and facilities.

3.3.2. It is a waste and unreasonable use of water for water agencies not to use recycled water when recycled water of adequate quality is available and is not being put to beneficial use, pursuant to the conditions established in Water Code sections 13550 *et seq.* The State Water Board shall exercise its authority pursuant to Water Code section 275, as appropriate, to enforce these requirements.

- 3.4. The State Water Board requests the Public Utilities Commission, Department of Water Resources, State Lands Commission, and Coastal Commission to use their respective authorities to the fullest extent possible to assist the State Water Board and the regional water boards in increasing the use of recycled water in California to make progress toward achieving the recycled water goals set forth in 3.1.

4. State agency roles

The State Water Board recognizes that it shares jurisdiction over regulating the uses of recycled water with the regional water boards. In addition, the State Water Board recognizes several agencies have roles in encouraging the use of recycled water.

- 4.1. The State Water Board establishes general policies governing the permitting of recycled water projects, develops uniform water recycling criteria appropriate to particular uses of water, processes and approves wastewater change petitions filed by wastewater dischargers for recycled water projects that have the potential to decrease the flow in any portion of a watercourse such as a river or stream, adopts statewide orders for the permitting of recycled water projects, reviews and approves Title 22 engineering reports for recycled water use, and allocates and disperses funding for recycled water projects consistent with its roles of protecting water quality, public health, and sustaining water supplies. The State Water Board exercises general oversight over recycled water projects, including review of regional water board permitting practices, and leads the effort to meet the recycled water use goals set forth in 3.1.
- 4.2. The regional water boards issue permits that include requirements needed to protect water quality, human health, and the environment consistent with the State and regional Water Quality Control Plans, Policies, and applicable law. The regional water boards will, pursuant to 3.3, use their authority to the fullest extent possible to encourage the use of recycled water and to streamline permitting of recycled water projects.
- 4.3. The Department of Water Resources is charged with reviewing urban water management plans and, every five years, updating the California Water Plan, including evaluating the quantity of recycled water presently being used, planning for the potential future uses of recycled water, and updating statewide targets for recycled water use, consistent with Water Code section 10608.50(b). Pursuant to Water Code section 13577, the Department of Water Resources is also charged with adopting regulations in the California Plumbing Code to provide design standards to safely plumb buildings with both potable and recycled water systems. The State Water Board and Department of Water Resources work in collaboration to track recycled water volume and use in California. In undertaking these tasks, the Department of Water Resources may rely on annual recycled water production and use data collected by the State Water Board as well as urban water management plans. The Department of Water Resources may share the data from those plans with the

State Water Board and the regional water boards. The Department of Water Resources also shares with the State Water Board the authority to allocate and distribute bond funding, which can provide incentives for the use of recycled water.

- 4.4. The Public Utilities Commission is charged with approving rates and terms of service for the use of recycled water by investor-owned utilities.
- 4.5. The Department of Food and Agriculture is charged with promoting California agriculture and food products and ensuring the safety and quality of such products for the consumer, including products irrigated with recycled water. The State Water Board and Department of Food and Agriculture will work in collaboration to support agricultural diversity and sustainability by working with grower coalitions, third-party technical service providers, public and private agricultural entities, and academia.

5. Wastewater change petitions

In many cases, recycled water project proponents will be required to obtain approvals from several regulatory agencies prior to implementing their project. If the proposed recycled water project will result in reduced stream flows, an approved wastewater change petition may be required pursuant to Water Code section 1211 as described below. For this reason, the State Water Board encourages early coordination by the recycled water project proponent with the State Water Board's Division of Water Rights and Division of Financial Assistance, the regional water boards, Department of Water Resources, and Department of Fish and Wildlife in the process of funding and permitting recycled water projects to ensure compliance with Water Code section 1211.

- 5.1. The use of recycled water may only occur if all requirements prescribed by the State Water Board pursuant to Water Code section 1211 are being met. Prior to changing the point of discharge, place of use, or purpose of use of treated wastewater that could decrease the flow in any portion of a watercourse, or receiving state funding for the treatment or use of recycled water, the recycled water project proponent must receive (1) a determination from the State Water Board's Division of Water Rights that an order approving the change is not required; or (2) State Water Board approval for the proposed change pursuant to Water Code section 1211. The recycled water project proponent shall notify the applicable regional water board and any applicable state funding agency (such as the Division of Financial Assistance of the State Water Board or the Department of Water Resources) of this determination.
- 5.2. To approve a wastewater change petition, the State Water Board must determine that the proposed change will not injure any other legal user of the water involved, will not unreasonably affect instream uses including fish and wildlife, and is in the public interest. In addition, the State Water Board must find that the requirements of CEQA have been met. The State Water Board

also has an independent obligation to consider the effect of the proposed change on public trust resources and to protect those resources where feasible. (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419 [189 Cal. Rptr. 346, 658 P.2d 709].)

- 5.3. The State Water Board may consider potential cumulative impacts to the environment and public trust resources caused by the proposed recycled water project and related projects that may reduce stream flows. Although impacts caused by the incremental decrease in streamflow resulting from the approval of a single wastewater change petition may be insignificant, impacts to the environment may be cumulatively considerable when viewed together with impacts from past, present, and probable future projects with the potential to decrease the streamflow. This is particularly true for streams where discharges from wastewater treatment facilities comprise the majority of streamflow for a portion of the year, such as the dry summer months.
- 5.4. Approval of a wastewater change petition shall not be construed to release any recycled water project proponent from the obligation to comply with any regional water board requirements applicable to the recycled water project.

6. Salt and nutrient management plans

6.1. Introduction

- 6.1.1. Some groundwater basins in the state contain salts and nutrients that exceed or threaten to exceed water quality objectives established in the applicable regional water board Water Quality Control Plans (basin plans). Not all basin plans include adequate implementation procedures for achieving or ensuring compliance with the water quality objectives for salts or nutrients. These conditions can be caused by naturally-occurring sources of salinity, discharges of agricultural, domestic, and municipal wastewater and residual solids (including on-site wastewater treatment systems). In addition, irrigation using imported water, surface water, groundwater, or recycled water, and indirect potable reuse for groundwater recharge (groundwater recharge) can contribute to increased salt and nutrient loading. Regulation of recycled water alone may not fully address these conditions.
- 6.1.2. Salts and nutrients from all sources must be managed on a basin-wide or watershed-wide basis in a manner that ensures attainment of water quality objectives and protection of beneficial uses. The most effective way to address salt and nutrient issues is typically through the development of regional or subregional salt and nutrient management plans rather than through imposing requirements solely on individual recycled water projects or other individual sources of salts and nutrients.

6.1.3. *Basin evaluation.* To sustain the ongoing development of salt and nutrient management plans in basins where plans are needed and to clarify where salt and nutrient management planning is not needed, each regional water board shall evaluate each basin or subbasin in its region within two years of [effective date of the amendment] and identify basins through a resolution or executive officer determination where salts and/or nutrients are a threat to water quality and therefore need salt and nutrient management planning to achieve water quality objectives in the long term. Each regional water board shall update this evaluation at least every 10 years to consider any changes in these factors that have occurred that would change the findings from the initial evaluation. Basin evaluations completed prior to [effective date of the amendment] can be used to satisfy this requirement if the prior evaluation clearly identifies whether the basin requires salt and nutrient management planning to achieve water quality objectives in the long term. Regional water boards may consider the following factors in this determination, as well as any additional region-specific factors:

- Magnitude of and trends in the concentrations of salts and nutrients in groundwater
- Contribution of imported water and recycled water to the basin water supply
- Reliance on groundwater to supply the basin or subbasin
- Population
- Number and density of on-site wastewater treatment systems
- Other sources of salts and nutrients, including irrigated agriculture and confined animal facilities

6.2. *Development and adoption of salt and nutrient management plans*

6.2.1. The State Water Board encourages collaborative work among salt and nutrient management planning groups, the agricultural community, the regional water boards, Integrated Regional Water Management groups, and groundwater sustainability agencies formed under the Sustainable Groundwater Management Act to achieve the goals of groundwater sustainability, recycled water use, and water quality protection. For basins identified pursuant to 6.1.3, the State Water Board encourages local water and wastewater entities, together with local salt and nutrient contributing stakeholders, to continue locally driven and controlled, collaborative processes open to all stakeholders that will result in the development of salt and nutrient management plans for groundwater basins and the

management of salts and nutrients on a basin-wide basis, including participation by the regional water board.

- 6.2.1.1. Every groundwater basin and subbasin identified pursuant to 6.1.3 shall have a salt and nutrient management plan or plan that is functionally equivalent pursuant to 6.2.1.4. Salt and nutrient management plans shall be tailored to address the water quality concerns of the basin and subbasin. Such plans shall include implementation measures, as appropriate, to address all sources of salt and/or nutrients to groundwater basins, including projects using recycled water for irrigation and groundwater recharge. The salt and nutrient management plans may address constituents other than salts and nutrients that adversely affect groundwater quality.
- 6.2.1.2. The State Water Board recognizes that because stormwater is typically lower in nutrients and salts and can augment local water supplies, inclusion of a significant stormwater use and recharge component within salt and nutrient management plans can play a vital role in the long-term sustainable use of water in California. Inclusion of stormwater recharge is consistent with the California Water Plan and the State Water Board Strategy to Optimize Resource Management of Stormwater (STORMS) vision, as adopted in State Water Board [Resolution No. 2016-0003](#), that stormwater be managed as a resource, wherein water quality improvement and water supply enhancement are complementary goals.
- 6.2.1.3. The requirements of 6.2.4 shall not apply to areas that are covered by an existing salt and nutrient management plan that has been accepted by the regional water board pursuant to 6.2.3.2 or any applicable basin plan amendment adopted by the regional water board pursuant to 6.2.3.3.
- 6.2.1.4. The regional water board may determine pursuant to 6.2.3 that a groundwater management plan for a basin, subbasin, or other regional planning area is functionally equivalent to a salt and nutrient management plan. For example, the regional water board may find that groundwater sustainability plans developed pursuant to the Sustainable Groundwater Management Act include water quality components that sufficiently address the components of 6.2.4 and therefore are functionally equivalent to a salt and nutrient management plan.

- 6.2.1.5. The regional water board may use its authority pursuant to Water Code section 13242 to adopt plans and programs of implementation for the protection of beneficial uses in basins whether or not a salt and nutrient management plan has been accepted by the regional water board pursuant to 6.2.3.2.
- 6.2.2. Implementation of salt and nutrient management plans may require a regional water board to amend its basin plan. The regional water board shall consider for adoption a basin plan amendment when implementation of a salt and nutrient management plan involves adoption and/or modification of water quality objectives, beneficial uses, or programs of implementation consistent with Water Code sections 13240, 13241, and 13242. In other cases where a regional water board determines a basin plan amendment is not required, the accepted salt and nutrient management plan serves as a technical document to support future regional water board decisions.
- 6.2.3. *Regional water board review and acceptance of salt and nutrient management plans.* Proposed salt and nutrient management plans shall be submitted to the regional water board for review. The regional water board shall evaluate the salt and nutrient management plan in accordance with the provisions of 6.2.4. Following review, the regional water board shall make one of the following determinations through a resolution. This determination shall be made within six months of receipt of a proposed salt and nutrient management plan, unless compliance with CEQA is required.
- 6.2.3.1. The proposed salt and nutrient management plan does not fully satisfy the requirements of 6.2.4. In this case, the regional water board shall provide specific findings regarding which components in 6.2.4 are not adequately addressed and recommendations for what may need to be included or modified in the proposed salt and nutrient management plan for the regional water board to accept the plan.
- 6.2.3.2. The proposed salt and nutrient management plan fully satisfies the requirements of 6.2.4, a basin plan amendment is not needed to implement the plan, and the regional water board will accept the plan. In this case, the accepted salt and nutrient management plan will serve as a technical document to support future regional water board decisions.

6.2.3.3. The proposed salt and nutrient management plan fully satisfies the requirements of 6.2.4 and a basin plan amendment will be needed to implement the plan. In this case, the regional water board shall initiate a process to amend the basin plan based on the accepted salt and nutrient management plan.

6.2.4. *Required components of salt and nutrient management plans.* The degree of specificity within salt and nutrient management plans and the length of the plans will be dependent on a variety of site-specific factors, including but not limited to, size and complexity of a basin, source water quality, stormwater recharge, hydrogeology, and aquifer water quality. Each salt and nutrient management plan shall include the following components:

6.2.4.1. A basin- or subbasin-wide monitoring plan that includes an appropriate network of monitoring locations to provide a reasonable, cost effective means of determining whether the concentrations of salts, nutrients, and other constituents of concern as identified in the salt and nutrient management plans are consistent with applicable water quality objectives. The number, type, and density of monitoring locations to be sampled and other aspects of the monitoring program shall be dependent upon basin-specific conditions and input from the regional water board. Salts, nutrients, and the constituents identified in 6.2.1.1 shall be monitored. The frequency of monitoring shall be proposed in the salt and nutrient management plan for review by the regional water board pursuant to 6.2.3.

6.2.4.1.1. The monitoring plan must be designed to effectively evaluate water quality in the basin. The plan must focus on water supply wells and areas proximate to large water recycling projects, particularly groundwater recharge projects. Also, monitoring locations shall, where appropriate, target groundwater and surface waters where groundwater has connectivity with adjacent surface waters.

6.2.4.1.2. The monitoring plan may include water quality data from existing wells where the wells are located and screened appropriately to determine water quality throughout the most critical areas of the basin. The State Water Board supports monitoring approaches that leverage the use of groundwater monitoring wells from other regulatory programs, such as the Irrigated Lands Regulatory Program and the Sustainable Groundwater Management Act.

6.2.4.1.3. The monitoring plan shall identify those stakeholders responsible for conducting, compiling, and reporting the monitoring data. The data shall be electronically reported annually to a database in a format identified by the State Water Board (e.g., GeoTracker).

6.2.4.2. Water recycling use goals and objectives.

6.2.4.3. Salt and nutrient source identification, basin or subbasin assimilative capacity and loading estimates, together with fate and transport of salts and nutrients.

6.2.4.4. Implementation measures to manage or reduce the salt and nutrient loading in the basin on a sustainable basis and the intended outcome of each measure.

6.2.4.5. An antidegradation analysis demonstrating that the existing projects, reasonably foreseeable future projects, and other sources of loading to the basin included within the plan will, cumulatively, satisfy the requirements of State Water Board [Resolution No. 68-16](#), Statement of Policy with Respect to Maintaining High Quality of Waters in California (Antidegradation Policy).

6.2.5. Nothing in this Policy shall prevent stakeholders from developing a plan that is more protective of water quality than applicable standards in the basin plan. No regional water board, however, shall seek to modify basin plan objectives without compliance with Water Code section 13241.

6.2.6. *Data assessment.* The regional water boards, in consultation with stakeholders, shall assess and review monitoring data generated from these plans approximately every 5 years but no more than every 10 years, unless an alternate timeline has been established in a basin plan amendment adopted by the regional water board pursuant to 6.2.3.3. This assessment shall include an evaluation of:

- observed trends in water quality data as compared with trends predicted in the salt and nutrient management plan;
- the ability of the monitoring network to adequately characterize groundwater quality in the basin;
- potential new data gaps;

- groundwater quality impacts predicted in the salt and nutrient management plan based on most recent trends and any relied-upon models, including an evaluation of the ability of the model to simulate groundwater quality; and
- available assimilative capacity based on observed trends and most recent water quality data.

6.2.7. The regional water boards, in consultation with stakeholders, shall use the results of these periodic assessments to update basin evaluations of available assimilative capacity, projected trends, and concentrations of salts and nutrients in groundwater, and assess whether potential updates or revisions to the salt and nutrient management plan may be warranted.

7. Permitting and antidegradation analysis for non-potable recycled water projects

The purpose of this section is to describe permitting options and associated antidegradation analysis for non-potable recycled water projects seeking or proposing to revise a permit. Recycled water project proponents must also comply with related statutes and regulations, such as those contained in Water Code sections 13263, 13267, 13377, 13523, 13523.1, and California Code of Regulations, title 17 and title 22.

7.1. Antidegradation analysis for non-potable recycled water projects

7.1.1. Irrigation and other non-potable uses of recycled water in accordance with this Policy is to the benefit of the people of the State of California. Nonetheless, the use of water for irrigation may, regardless of its source, affect groundwater quality.

7.1.2. For non-potable recycled water project proponents within a basin for which the regional water board has adopted a basin plan amendment based on an accepted salt and nutrient management plan pursuant to 6.2.3.3, compliance with the Antidegradation Policy may consist of an analysis demonstrating that the project is consistent with the adopted basin plan amendment. For non-potable recycled water project proponents within a basin with an accepted salt and nutrient management plan without an associated basin plan amendment, the antidegradation analysis may be based, in part, on the technical findings of the accepted salt and nutrient management plan as described in 6.2.2. For non-potable recycled water project proponents within a basin where a salt and nutrient management plan has not been accepted by the regional water board, compliance with the Antidegradation Policy will depend on the permitting mechanism selected by the regional water board as described in 7.2. and 7.3 below. If the proposed project is in a basin identified pursuant to 6.1.3 as needing a

salt and nutrient management plan and if directed by a regional water board pursuant to Water Code section 13267, the recycled water project proponent may be required to develop or participate in developing a salt and nutrient management plan.

7.2. Use of statewide water reclamation requirements

The State Water Board adopted statewide water reclamation requirements (e.g., Order WQ 2016-0068-DDW) to streamline permitting of recycled water projects where recycled water is used for non-potable uses.

7.2.1. To achieve the goals of statewide consistency, streamlined permitting, and efficiency of resource management, all appropriate and eligible projects with the capability of taking on the responsibility of administering water recycling programs shall enroll under statewide water reclamation requirements.

7.2.2. *Antidegradation analysis.* Recycled water project proponents seeking to enroll under statewide water reclamation requirements can demonstrate compliance with the Antidegradation Policy by demonstrating that the project complies with the conditions of the order, which includes compliance with an accepted salt and nutrient management plan or participation in an existing salt and nutrient management planning effort, if directed by the State Water Board or applicable regional water board.

7.3. Site-specific permitting for non-potable recycled water projects

7.3.1. If a project is not appropriate or eligible to enroll under statewide water reclamation requirements, the regional water board shall consider a new site-specific order for adoption or consider the project for enrollment under an existing order (e.g., a master recycling permit), pursuant to 7.3.2 or 7.3.3.

7.3.2. Criteria for streamlined permitting

7.3.2.1. This section provides permitting criteria that, if met, can aid in compliance with the Antidegradation Policy for some recycled water projects. This section applies to non-potable recycled water projects where the proposed use of recycled water or method of recycled water storage would not cause or contribute to pollution or nuisance, or otherwise fail to comply with the applicable basin plan or State Water Board plans or policies. Non-potable recycled water projects that meet all of the following criteria are eligible for streamlined permitting consistent with the requirements of 7.3.2.2:

- 7.3.2.1.1. Compliance with all applicable laws and regulations, including those related to recycled water contained in California Code of Regulations, title 17 and California Code of Regulations, title 22 (including subsequent revisions), and recommendations by the State Water Board for the protection of public health pursuant to Water Code section 13523.
- 7.3.2.1.2. Compliance with an approved Title 22 engineering report that demonstrates or defines compliance with the Uniform Statewide Recycling Criteria (and amendments).
- 7.3.2.1.3. For irrigation projects, application of recycled water at rates that minimize percolation of recycled water below the plants' root zone, i.e., in a manner (1) necessary to satisfy the plants' evapotranspiration requirements, (2) that considers allowances for supplemental water, irrigation distribution uniformity, leaching, and climate, and (3) when the soil is not saturated. The regional water board may require a recycled water project proponent to submit an operations and management plan, which may apply to multiple sites. The operations and management plan shall include the rate(s) of application of recycled water and describe a set of reasonably practicable measures to ensure compliance with this paragraph.
- 7.3.2.1.4. Compliance with any applicable salt and nutrient management plan accepted by the regional water board pursuant to 6.2.3.2 or any applicable basin plan amendment adopted by the regional water board pursuant to 6.2.3.3.
- 7.3.2.1.5. Appropriate use of fertilizers that takes into account the nutrient levels in the recycled water and nutrient demand by plants. Recycled water producers shall monitor and communicate to the users the nutrient levels in their recycled water.
- 7.3.2.1.6. Compliance with Water Code section 1211 for facilities where the changes to the discharge are necessary to accomplish water recycling and will result in changes in flow in a watercourse.
- 7.3.2.1.7. Compliance with all requirements of applicable waste discharge requirements, waivers of waste discharge requirements, including, without limitation, waste discharge requirements or waivers regulating agricultural discharges from irrigated lands.

7.3.2.2. For recycled water projects that meet the streamlined criteria in 7.3.2.1 and where the recycled water project proponent and regional water board select a permitting option other than statewide water reclamation requirements (e.g., master recycling permit):

7.3.2.2.1. The regional water boards shall, absent unusual circumstances (e.g., site-specific conditions such as where recycled water is proposed to be used for irrigation over high transmissivity soils over a shallow (5' or less) high quality groundwater aquifer, or proposed to be stored in unlined ponds where the regional water board determines that it will result in an unacceptable threat to groundwater quality), approve recycled water projects with a site-specific permit.

7.3.2.2.2. The regional water board shall make a finding of unusual circumstances in a site-specific permit pursuant to 7.3.3, resolution or other order based on substantial evidence in the record if the regional water board determines that unusual circumstances apply, after public notice and hearing.

7.3.2.2.3. The regional water board shall not require a project-specific receiving water and groundwater monitoring component if the recycled water project meets the criteria set forth in 7.3.2.1, unless such project-specific monitoring is required under the accepted salt and nutrient management plan or applicable basin plan.

7.3.2.2.4. The regional water board may require submittal of a site-specific Implementation Plan or Operations and Management Plan as a condition of the permit if the recycled water project meets the criteria set forth in 7.3.2.1.

7.3.2.2.5. *Antidegradation analysis.* Non-potable recycled water project proponents can satisfy the requirements of the Antidegradation Policy by submitting an analysis demonstrating that the project is consistent with the criteria specified in 7.3.2.1 to the regional water board with the report of waste discharge, which includes compliance with any applicable salt and nutrient management plan accepted by the regional water board pursuant to 6.2.3.2 or any applicable basin plan amendment adopted by the regional water board pursuant to 6.2.3.3.

7.3.3. *Permitting for non-potable recycled water projects that do not meet the requirements of 7.3.2.1*

7.3.3.1. Projects that are ineligible or inappropriate for enrollment under statewide water reclamation requirements and that do not meet the criteria of 7.3.2.1 must be reviewed and permitted on a site-specific basis.

7.3.3.2. *Antidegradation analysis.* Non-potable recycled water project proponents ineligible or inappropriate for enrollment under statewide water reclamation requirements and that do not meet the criteria specified in 7.3.2.1 must submit an antidegradation analysis to the regional water board with the report of waste discharge to demonstrate compliance with the Antidegradation Policy.

7.4. Incidental runoff of recycled water for irrigation

Recycled water shall not be allowed to escape from the use area as surface flow that would either pond or enter surface waters, unless authorized by waste discharge requirements, waivers of waste discharge requirements, or conditional prohibitions (e.g., agricultural discharges from irrigated lands).

8. Permitting and antidegradation analysis for groundwater recharge projects

8.1. Permitting for groundwater recharge projects

8.1.1. All recycled water groundwater recharge projects must be reviewed and permitted on a site-specific basis.

8.1.2. Approved groundwater recharge projects shall meet the following criteria:

8.1.2.1. Compliance with regulations related to recycled water for groundwater recharge projects (including subsequent revisions) contained in California Code of Regulations, title 17 and California Code of Regulations, title 22, and recommendations by the State Water Board for the protection of public health pursuant to Water Code section 13523.

8.1.2.2. Implementation of a monitoring program for constituents of emerging concern (CECs) that is consistent with Attachment A and any recommendations from the State Water Board.

8.1.3. Nothing in this section shall be construed to limit the authority of a regional water board to protect designated beneficial uses, provided that any proposed limitations for the protection of public health may only be imposed following regular consultation by the regional water board with the State Water Board, consistent with the precedent established in State Water Board [Orders WQ 2005-0007](#) and [WQ 2006-0001](#).

- 8.1.4. Nothing in this Policy shall be construed to prevent a regional water board from imposing additional requirements for a proposed recharge project that has a substantial adverse effect on the fate and transport of a contaminant plume or changes the geochemistry of an aquifer thereby causing the dissolution of constituents, such as arsenic, from the geologic formation into groundwater.
- 8.1.5. Projects that utilize surface spreading to recharge groundwater with recycled water treated by reverse osmosis shall be permitted by a regional water board within one year of receipt of an approved Title 22 engineering report, provided that the project proposes a brine disposal method to the satisfaction of the regional water board. Furthermore, the regional water board shall give a high priority to review and approval of such projects.

8.2. Antidegradation analysis for groundwater recharge projects

- 8.2.1. Groundwater recharge with recycled water for later extraction and use in accordance with this Policy and state and federal water quality law is to the benefit of the people of the state of California. Nonetheless, groundwater recharge projects using recycled water have the potential to degrade water quality within a basin. To ensure a project does not degrade water quality within a basin, the proponent of a groundwater recharge project must submit an antidegradation analysis to the regional water board with the report of waste discharge to demonstrate compliance with the Antidegradation Policy.
- 8.2.2. For groundwater recharge projects within a basin for which the regional water board has adopted a basin plan amendment based on an accepted salt and nutrient management plan pursuant to 6.2.3.3, compliance with the Antidegradation Policy may consist of conducting an analysis demonstrating that the project is consistent with the adopted basin plan amendment.
- 8.2.3. For groundwater recharge projects within a basin with a salt and nutrient management plan accepted by the regional water board pursuant to 6.2.3.2 (i.e., without an associated basin plan amendment), the antidegradation analysis may be based, in part, on the technical findings of the accepted salt and nutrient management plan as described in 6.2.2.
- 8.2.4. If a groundwater recharge project proponent is actively participating in the development of a salt and nutrient management plan for the basin or subbasin to the satisfaction of the applicable regional water board, then compliance with the Antidegradation Policy may be demonstrated as follows:

- 8.2.4.1. If a groundwater recharge project proposes to utilize less than 10 percent of the available assimilative capacity in a basin or subbasin (or multiple projects to utilize less than 20 percent of the available assimilative capacity in a basin or subbasin), the antidegradation analysis need only demonstrate that the project will use less than 10 percent (or multiple projects will use less than 20 percent) of the available assimilative capacity. For those basins or subbasins where the regional water boards have not determined the baseline assimilative capacity, the baseline assimilative capacity shall be calculated by the initial project proponent, with review and approval by the regional water board, until the salt and nutrient management plan is accepted by the regional water board consistent with 6.2. For compliance with this subparagraph, the available assimilative capacity shall be calculated by comparing the mineral water quality objective with the average concentration of the basin or subbasin, either over the most recent five years of data available or using a data set approved by the regional water board. In determining whether the available assimilative capacity will be exceeded by the project or projects, the regional water board shall calculate the impacts of the project or projects over at least a ten-year time frame.
- 8.2.4.2. In the event a project or multiple projects utilize more than the fraction of the assimilative capacity designated in 8.2.4.1, then a more detailed antidegradation analysis shall be performed to comply with the Antidegradation Policy. The project proponent shall provide sufficient information for the regional water board to make this determination. An example of an approved method is the method used in State Water Board [Resolution No. 2004-0060](#) and the regional water board in California Regional Water Quality Control Board, Santa Ana Region Resolution No. R8-2004-0001. An integrated approach (using surface water, groundwater, recycled water, stormwater, pollution prevention, water conservation, etc.) to the implementation of the Antidegradation Policy is encouraged.
- 8.2.5. For groundwater recharge projects within a basin without a salt and nutrient management plan accepted by the regional water board pursuant to 6.2.3.2 or any applicable basin plan amendment adopted by the regional water board pursuant to 6.2.3.3, a more detailed antidegradation analysis shall be performed to comply with the Antidegradation Policy. The project proponent shall provide sufficient information for the regional water board to make this determination. An example of an approved method is the method used in State Water Board Resolution No. 2004-0060 and in California Regional Water Quality Control Board, Santa Ana Region [Resolution No. R8-2004-0001](#). An integrated approach (using surface water, groundwater, recycled water, stormwater, pollution

prevention, water conservation, etc.) to the implementation of the Antidegradation Policy is encouraged.

9. Permitting for reservoir water augmentation

9.1. All recycled water reservoir water augmentation projects must be reviewed and permitted on a site-specific basis.

9.2. Approved reservoir water augmentation projects shall meet the following criteria:

9.2.1. Compliance with regulations adopted by the State Water Board for reservoir water augmentation projects; and

9.2.2. Implementation of a monitoring program for CECs that is consistent with Attachment A and recommendations by the State Water Board for the protection of public health pursuant to Water Code section 13523.

9.3. Nothing in this section shall be construed to limit the authority of a regional water board to protect designated beneficial uses, provided that any proposed limitations for the protection of public health may only be imposed following regular consultation by the regional water board with the State Water Board, consistent with the precedent established in State Water Board Orders WQ 2005-0007 and WQ 2006-0001.

10. Constituents of emerging concern

10.1. Introduction

10.1.1. The presence, variety, and concentration of CECs in water may vary over time. In addition, the state of knowledge regarding CECs is inherently incomplete and will change over time based on scientific developments. Continuing research is needed to support understanding of which CECs present a risk to public health and the environment.

10.1.2. Agencies should employ source control and/or pollution prevention programs to minimize the likelihood of CECs impacting human health and the environment.

10.1.3. Additional research to improve analytical methods and screening tools, increase the availability of toxicological studies, and improve our understanding of prevalence and persistence of CECs in water will assist in the State Water Board in identifying CECs with the greatest potential to be of toxicological relevance to human health and the environment.

10.2. Research program

- 10.2.1. The State Water Board shall convene a Science Advisory Panel every five years to guide future actions relating to CECs.
- 10.2.2. The Panel shall be composed of members representing the following areas of expertise: human health toxicology, environmental toxicology, epidemiology, biochemistry, civil engineering (particularly the design and construction of recycled water treatment facilities), analytical chemistry (particularly the design and operation of advanced laboratory methods for the detection of CECs), and human health pathology (particularly antibiotic resistant bacteria and antibiotic resistance genes). Each panelist shall have extensive experience as a principal investigator in their respective area of expertise.
- 10.2.3. The Panel will review the scientific literature and submit a report to the State Water Board that describes the current state of scientific knowledge regarding the risks of CECs to public health and the environment.
- 10.2.4. Each report shall recommend actions that the State of California should take to improve our understanding of CECs and, as may be appropriate, to protect human health and the environment.
- 10.2.5. Each report shall at a minimum address the following topics:
 - 10.2.5.1. The appropriate constituents to be monitored in recycled water, including analytical methods and reporting limits.
 - 10.2.5.2. The known toxicological information for the above constituents and persistence through treatment systems.
 - 10.2.5.3. Any change to the above constituents based on level of treatment and uses specified in Title 22 and for reservoir water augmentation.
 - 10.2.5.4. The indicators or surrogates that can be used to represent a suite of CECs.
 - 10.2.5.5. The concentrations of CECs that should trigger enhanced monitoring.
 - 10.2.5.6. Recommendations regarding antibiotic resistant bacteria and antibiotic resistance genes.

10.2.6. Within six months from receipt of a report, the State Water Board shall hold a hearing to consider recommendations from staff and shall endorse the recommendations, as appropriate, after making any necessary modifications.

11. Maximizing consistency in permitting recycled water projects

11.1. CEC permit provisions

Permits for recycled water projects shall be consistent with any applicable monitoring requirements prescribed in Attachment A.

11.2. Regional water board general orders

To ensure consistent regulation of recycled water statewide, coverage under existing regional water board general orders for non-potable uses of recycled water will terminate on [one year from the effective date of this Policy] and, except for enforcement purposes, these orders will have no further force and effect. Regional water boards shall, where appropriate, transition enrollees from these orders to Order WQ 2016-0068-DDW or its successor before [one year from the effective date of this Policy].

11.3. Permit review

By [three years from the effective date of this Policy],

11.3.1. The State Water Board shall review Title 22 engineering reports for recycled water permits issued prior to 2000 for consistency with all applicable regulations, including those related to recycled water contained in California Code of Regulations, title 17 and California Code of Regulations, title 22. If the Title 22 engineering report was never prepared or is inconsistent with applicable regulations, the State Water Board may require a new or updated Title 22 engineering report to be submitted for review and approval.

11.3.2. Regional water boards shall review all recycled water permits and shall identify any recycled water permits that are (1) inconsistent with this Policy, (2) inconsistent with an approved Title 22 engineering report pursuant to 11.3.1 or (3) inconsistent with the applicable regional water board basin plan.

11.3.3. Regional water boards shall update any permits and/or monitoring and reporting programs as identified in 11.3.2 and, if appropriate, enroll permittees in Order WQ 2016-0068-DDW or its successor.

- 11.3.4. The regional water boards shall prioritize updating orders, permits and/or monitoring and reporting programs that were issued prior to January 1, 2000 or are located in basins identified pursuant to 6.1.3.
- 11.3.5. Timelines consistent with a prioritized approach identified in a basin plan amendment based on an accepted salt and nutrient management plan pursuant to 6.2.3.3 will supersede the three-year timeline identified above.

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ATTACHMENT A
REQUIREMENTS FOR MONITORING
CONSTITUENTS OF EMERGING CONCERN
FOR RECYCLED WATER

The purpose of this attachment to the Policy is to provide direction to the regional water boards on monitoring requirements for constituents of emerging concern (CECs) in recycled water. The monitoring requirements and criteria for evaluating monitoring results are based on recommendations from a Science Advisory Panel¹.

The monitoring requirements in this attachment pertain only to the production and use of recycled water for groundwater recharge and reservoir water augmentation. Recycled water producers using recycled water for groundwater recharge or for reservoir water augmentation shall follow the monitoring requirements in this attachment.

The regional water boards shall not issue requirements for monitoring of additional CECs in recycled water beyond the requirements provided in this Policy except when recommended by the State Water Board or requested by the recycled water project proponent or recycled water producer.

CEC monitoring requirements for groundwater recharge projects implementing treatment processes that provide control of CECs by processes other than soil aquifer treatment or reverse osmosis/advanced oxidation processes (RO/AOPs) shall be established on a case-by-case basis by the State Water Board. CEC monitoring requirements for reservoir water augmentation projects implementing treatment processes that provide control of CECs by processes other than RO/AOPs shall be established on a case-by-case basis by the State Water Board.

Monitoring results required by this Policy shall be electronically reported to a database identified by the State Water Board.

1 QUALITY ASSURANCE AND QUALITY CONTROL

This section is to ensure laboratories conducting CEC monitoring generate data of known, consistent, and documented quality and to verify that the laboratory can meet the required reporting limits. Quality assurance and quality control measures shall be used for both collection of samples and laboratory analysis work. The recycled water

¹ The Science Advisory Panel was convened in accordance with provision 10.2 of the Policy. The Panel's recommendations were presented in the report [Monitoring Strategies for Constituents of Emerging Concern \(CECs\) in Recycled Water – Recommendations of a Science Advisory Panel](#), dated April 2018.

project proponent or recycled water producer shall develop a quality assurance project plan that is consistent with this Policy. The quality assurance project plan shall be submitted to and approved by the regional water board prior to beginning any sampling and analysis.

1.1 Quality Management Systems

The recycled water project proponent or recycled water producer shall confirm and be able to produce documentation that a laboratory used to perform analysis of CECs required under this Policy has a laboratory quality management system in place that meets the requirements described in 1.1.1 or 1.1.2 below. The requirements in 1.1.1 and 1.1.2 describe equivalent quality management systems. The recycled water project proponent or recycled water producer shall make such documentation available if requested by the State Water Board or regional water board. A laboratory must comply with the requirements of either 1.1.1 or 1.1.2:

1.1.1 Comply with the management and technical requirements applicable to their operations in accordance with The National Environmental Laboratory Accreditation Conference Institute (TNI) 2016 Standard Volume 1, Module 2 – 7, with the following exceptions:

1.1.1.1 Volume 1, Module 2, Section 4.1.7.2(f) – Technical Manager Qualifications; and

1.1.1.2 Volume 1, Module 2, Section 5.2.6 – Additional Personnel Requirements.

1.1.2 Develop and implement a quality assurance program to ensure the reliability and validity of the analytical or bioanalytical data produced by the laboratory. As evidence of such a program, the laboratory shall develop and maintain a quality manual.

1.1.2.1 The quality manual shall address all quality assurance and quality control practices to be employed by the laboratory and shall, at least, include the quality assurance and quality control requirements specified for the CECs and bioanalytical test methods. The quality manual shall include the following elements: laboratory organization and personnel responsibilities; quality assurance objectives for measurement data; sampling procedures (when the laboratory performs the sampling); custody, handling, and disposal of samples; calibration procedures and frequency; analytical procedures; acquisition and reduction, validation and reporting of data; internal quality control checks; performance and system audits; preventive maintenance; assessment of precision and accuracy; corrective action; and quality assurance reports.

- 1.1.2.2 The laboratory's technical manager shall review, and amend if necessary, the quality assurance program and quality manual at least annually. The technical manager shall also review and amend the quality assurance program and manual whenever there are changes in methods or laboratory equipment employed, in the laboratory structure or physical arrangements, or changes in the laboratory organization.
- 1.1.2.3 A laboratory shall maintain records of the implementation of its quality assurance program, and provide those records upon request of the State Water Board or the regional water board. Records shall be maintained for a minimum of five years.

1.2 Chemistry Analyses

1.2.1 *Selection of Analytical Chemistry Methods*

Analytical chemistry methods for laboratory analysis of CECs shall be selected to achieve the reporting limits presented in Table 1. The State Water Board views the use of drinking water methods as most appropriate, since they are generally more sensitive than wastewater methods. However, this may not always be possible, since there may be characteristics of recycled water (e.g., high total dissolved solids) that may make the use of drinking water methods impractical. A laboratory providing analysis of CECs shall be accredited by the Environmental Laboratory Accreditation Program (ELAP) for whichever method is selected based on (1)-(4) below, if such accreditation is available at the time that monitoring is required to begin. Any modifications to the methods shall be submitted to the State Water Board for review and subsequently submitted to the regional water board in an updated quality assurance project plan.

Analytical chemistry methods shall be selected in the following hierarchical order:

- (1) Use U.S. EPA-approved methods, if available. If more than a single U.S. EPA-approved method is available, consult with the State Water Board to determine the appropriate U.S. EPA-approved method. If these methods are unavailable;
- (2) Use Standard Methods, if available. If more than a single Standard Method is available, consult with the State Water Board to determine the appropriate Standard Method. If these methods are unavailable;
- (3) Use methods required by the State Water Board for state-only drinking water standards or for identifying chemicals having notification levels. If these methods are unavailable;

- (4) Use a method from the scientific literature (e.g., peer-reviewed journals). If more than one method is available, consult with State Water Board to determine an appropriate method.

1.2.2 Analytical chemistry data submission

Method detection limit studies and reporting limit verification data shall be submitted to the State Water Board for review and approval prior to beginning any sampling and analysis to ensure that the data meets the required reporting limits in Table 1. Percent recoveries and acceptable recovery ranges for each analyte shall be reported to the regional water board with each data set.

1.3 Bioanalytical Screening Tools

1.3.1 Selection of Bioanalytical Screening Tool Methods

Bioanalytical screening tool methods shall be selected to achieve the reporting limits presented in Table 3. A laboratory providing analysis for bioanalytical screening tools shall be accredited by ELAP for whichever method is selected based on (1) or (2) below, if such accreditation is available at the time that monitoring is required to begin. Any modifications to the methods shall be submitted to the State Water Board for review and subsequently submitted to the regional water board in an updated quality assurance project plan.

Bioanalytical screening tool methods shall be selected in the following hierarchical order:

- (1) Use U.S. EPA methods, if available. If more than a single U.S. EPA-approved method is available, consult with the State Water Board to determine the appropriate U.S. EPA-approved method. If these methods are unavailable;
- (2) Consult with the State Water Board to determine an appropriate method.

1.3.2 Bioanalytical screening tool data submission

Method detection limit studies and reporting limit verification data shall be submitted to the State Water Board for review and approval prior to beginning any sampling and analysis to ensure that the data meets the required reporting limits in Table 3.

2 CEC MONITORING REQUIREMENTS

2.1 Health-based CECs and Performance Indicator CECs

Table 1 provides the monitoring requirements and reporting limits for the health-based CECs and performance indicator CECs for groundwater recharge and reservoir water augmentation.

- 2.1.1** All CECs listed for a recycled water application shall be monitored during an initial assessment monitoring phase, as described in 4.1 of Attachment A. Based on monitoring results and findings, the regional water board may refine the required list of performance indicator CECs for subsequent monitoring phases.
- 2.1.2** The health-based CECs listed in Table 1 shall be monitored during the entirety of the initial assessment and baseline monitoring phases (4.1 and 4.2 of Attachment A). Based on the results of the baseline monitoring phase and/or subsequent monitoring, the regional water board may refine the required list of health-based CECs. The method for evaluating monitoring results for health-based CECs is provided in 5.2 of Attachment A.

Table 1: Health-based and performance indicator CECs

Constituent	Constituent Group	Relevance/Indicator Type	Reporting Limit (µg/L)
GROUNDWATER RECHARGE - SURFACE APPLICATION			
1,4-Dioxane	Industrial chemical	Health	0.1
N-Nitrosodimethylamine (NDMA)	Disinfection byproduct	Health	0.002
N-Nitrosomorpholine (NMOR)	Industrial chemical	Health	0.002
Gemfibrozil	Pharmaceutical	Performance	0.01
Iohexol	Pharmaceutical	Performance	0.05
Sucralose	Food additive	Performance	0.1
Sulfamethoxazole	Antibiotic	Performance	0.01
RESERVOIR WATER AUGMENTATION AND GROUNDWATER RECHARGE - SUBSURFACE APPLICATION			
1,4-Dioxane	Industrial chemical	Health	0.1
NDMA	Disinfection byproduct	Health & Performance	0.002
NMOR	Industrial chemical	Health	0.002
Sucralose	Food additive	Performance	0.1
Sulfamethoxazole	Antibiotic	Performance	0.01

µg/L – Micrograms per liter

2.2 Surrogates for CECs

Table 2 presents a list of surrogates that shall be considered for monitoring treatment of recycled water used for groundwater recharge and reservoir water augmentation. Other surrogates not listed in Table 2 may also be considered.

The recycled water project proponent or recycled water producer shall develop surrogates to monitor on a case-by-case basis appropriate for the treatment process or processes, in consultation with the regional water board. The regional water board shall review and approve the selected surrogates in consultation with the State Water Board.

Where applicable, surrogates may be measured using on-line or hand-held instruments provided that instrument calibration procedures are implemented in accordance with the manufacturer's specifications and that calibration is documented.

Table 2: Surrogates for CECs

GROUNDWATER RECHARGE - SURFACE APPLICATION
Ammonia
Dissolved Organic Carbon (DOC)
Nitrate
Total fluorescence
Ultraviolet (UV) Light Absorbance
RESERVOIR WATER AUGMENTATION AND GROUNDWATER RECHARGE - SUBSURFACE APPLICATION
Electrical Conductivity
DOC
UV Light Absorbance

2.3 Bioanalytical Screening Tools for CECs

Table 3 provides the required bioanalytical screening tools and reporting limits for groundwater recharge and reservoir water augmentation. All bioanalytical screening tools listed in Table 3 shall be used in monitoring during an initial assessment monitoring phase, as described in 4.1 of Attachment A. The bioanalytical screening tools listed in Table 3 shall be used in monitoring during the entirety of the initial assessment and baseline monitoring phases (4.1 and 4.2 of Attachment A). Based on the results of the baseline monitoring phase and/or subsequent monitoring, the regional water board may revise the frequency of monitoring with bioanalytical screening tools. The method for evaluating bioanalytical screening tool monitoring results is provided in 5.3 of Attachment A.

Table 3: Bioanalytical screening tools for CECs

Endpoint Activity	Relevant CECs	Adverse effect	Reporting Limit (ng/L)
RESERVOIR WATER AUGMENTATION AND GROUNDWATER RECHARGE – SURFACE AND SUBSURFACE APPLICATION			
Estrogen receptor- α (ER- α)	Estradiol, bisphenol A, nonylphenol	Feminization, impaired reproduction, cancer	0.5
Aryl hydrocarbon receptor (AhR)	Dioxin-like chemicals, polycyclic aromatic hydrocarbons, pesticides	Cancer, impaired reproduction	0.5

3 MONITORING LOCATIONS

Monitoring locations for the CEC Monitoring Requirements in Section 2 are described in this section and are presented in Table 4, Table 5, and Table 6.

3.1 Groundwater Recharge - Surface Application

For groundwater recharge projects implementing surface application of recycled water, health-based CECs, performance indicator CECs, surrogates and bioanalytical screening tools shall be monitored at these locations:

- (1) Following tertiary treatment² prior to application to the surface spreading area; and
- (2) At monitoring well locations designated in consultation with the State Water Board within the distance groundwater travels downgradient from the application site in 30 days.

3.2 Groundwater Recharge - Subsurface Application

3.2.1 Monitoring Locations for Health-Based CECs and Bioanalytical Screening Tools

² Standards for disinfected tertiary recycled water presented in California Code of Regulations, title 22, section 60301.230 and 60301.320.

For groundwater recharge projects implementing subsurface application of recycled water, health-based CECs and bioanalytical screening tools shall be monitored at a location following treatment prior to release into the aquifer.

3.2.2 *Monitoring Locations for Performance Indicator CECs and Surrogates*

For groundwater recharge projects using subsurface application of recycled water, performance indicator CECs shall be monitored in recycled water at these locations:

- (1) Prior to treatment by RO; and
- (2) Following treatment prior to release into the aquifer.

If the recycled water project proponent or recycled water producer can demonstrate that the RO unit will not substantially remove a CEC, the regional water board may allow monitoring for that CEC prior to the AOPs, instead of prior to the RO unit.

For groundwater recharge projects using subsurface application of recycled water, surrogates shall be monitored at locations proposed by the recycled water project proponent or recycled water producer and approved by the regional water board in consultation with the State Water Board.

3.3 Reservoir Water Augmentation

3.3.1 *Monitoring Locations for Health-Based CECs and Bioanalytical Screening Tools*

For reservoir water augmentation projects, health-based CECs and bioanalytical screening tools shall be monitored at a location following treatment prior to release into the surface water reservoir.

3.3.2 *Monitoring Locations for Performance Indicator CECs and Surrogates*

For reservoir water augmentation projects, performance indicator CECs shall be monitored in recycled water at these locations:

- (1) Prior to treatment by RO; and
- (2) Following treatment prior to release into the surface water reservoir.

If the recycled water project proponent or producer can demonstrate that the RO unit will not substantially remove a CEC, the regional water board may allow monitoring for that CEC prior to the AOPs, instead of prior to the RO unit. For reservoir water augmentation projects, surrogates shall be monitored at locations proposed by the recycled water project proponent or producer and approved by the regional water board in consultation with the State Water Board.

4 PHASED MONITORING REQUIREMENTS

The regional water board shall phase the monitoring requirements for CECs, surrogates, and bioanalytical screening tools for groundwater recharge and reservoir water augmentation projects. The purpose of phased monitoring is to allow monitoring requirements for health-based CECs, performance indicator CECs, surrogates, and bioanalytical screening tools to be refined based on the monitoring results and findings of the previous phase. An initial assessment monitoring phase, followed by a baseline monitoring phase, shall be conducted to determine the project-specific monitoring requirements for standard operations. The initial assessment and baseline monitoring phases shall be conducted after State Water Board approval of the groundwater recharge or reservoir water augmentation project's Title 22 Engineering Report.

4.1 Initial Assessment Monitoring Phase

The purposes of the initial assessment phase are to: (1) identify the occurrence of health-based CECs, performance indicator CECs, and surrogates in recycled water and groundwater;³ (2) determine treatment effectiveness; (3) define the project-specific performance indicator CECs and surrogates to monitor during the baseline phase; (4) specify the expected removal percentages for performance indicator CECs and surrogates; and (5) determine whether bioactivity for ER- α and AhR bioassays are below their respective monitoring trigger levels. The monitoring requirements for the initial assessment monitoring phase shall apply to the start-up of new facilities, piloting of new unit processes at existing facilities, and existing facilities where CECs, surrogates, and bioanalytical screening tools have not been assessed equivalent to the requirements of this attachment. Data from prior assessment need not replicate the exact frequency and duration of the initial assessment phase requirements specified in Table 4, if the overall robustness and size of the data are sufficient to adequately characterize the CECs, surrogates, bioactivity, and treatment performance. The initial assessment monitoring phase shall be conducted for a period of one year.

During the initial assessment monitoring phase for the applicable recycled water application method, each of the health-based CECs and performance indicator CECs listed in Table 1 and appropriate surrogates (see 2.2 of Attachment A) shall be monitored, as well as the bioanalytical screening tools. Surrogates shall be selected to monitor individual unit processes or combinations of unit processes that remove CECs. Performance indicator CEC and surrogate monitoring results that demonstrate measurable removal for a given unit process shall be candidates for use in the

³ The identification of the occurrence of health-based CECs, performance indicator CECs, and surrogates in groundwater only applies to groundwater recharge by surface application.

monitoring programs for the baseline and standard operation phases. Monitoring requirements for the initial assessment phase are summarized in Table 4.

For groundwater recharge projects in operation prior to 2013, historic monitoring data may be used to assess the occurrence and removal of CECs and surrogates. Existing projects demonstrating prior assessment of CECs and surrogates equivalent to the initial assessment phase requirements of this Policy may skip the initial monitoring phase and initiate the baseline monitoring phase requirements in 4.1 and 4.2 of Attachment A. Existing projects shall conduct bioanalytical monitoring according to the frequency specified in Table 4.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a concentration of a health-based CEC above the thresholds described in Table 7, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operations. If additional monitoring is required, the regional water board shall consult with the State Water Board and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 5 of Attachment A.

Following completion of the initial assessment monitoring phase, monitoring requirements shall be re-evaluated and subsequent requirements for the baseline monitoring phase shall be determined on a project-specific basis.

4.2 Baseline Monitoring Phase

Based on the findings of the initial assessment monitoring phase, project-specific performance indicator CECs and surrogates shall be selected for monitoring during the baseline monitoring phase. The purpose of the baseline monitoring phase is to assess and refine which health-based CECs, performance indicator CECs, surrogates, and bioanalytical screening tools are appropriate to monitor the removal of CECs and treatment system performance for the standard operation of a facility. Performance indicator CECs and surrogates that exhibited reduction by unit processes and/or provided an indication of operational performance shall be selected for monitoring

Table 4: Initial Assessment Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge - Surface Application	Health-Based CECs and Performance Indicator CECs: All listed in Table 1.	Quarterly ¹	- Following tertiary treatment prior to application to surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
	Surrogates: To be selected on a project-specific basis (see 2.2), considering those listed in Table 2.	1 st 3 months: To be determined on a project-specific basis. ³	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
		3-12 months: To be determined on a project- specific basis. ³	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
	Bioanalytical Screening Tools: All listed in Table 3.	Quarterly ¹	- Following tertiary treatment prior to application to surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
Reservoir Water Augmentation and Groundwater Recharge - Subsurface Application	Health-Based CECs: All listed in Table 1.	Quarterly ¹	Following treatment prior to release to the aquifer or surface water reservoir.
	Performance Indicator CECs: All listed in Table 1.	Quarterly ¹	- Prior to RO treatment. ⁴ - Following treatment prior to release to the aquifer or surface water reservoir.
	Surrogates: To be selected on a project-specific basis (see 2.2), considering those listed in Table 2.	To be determined on a project-specific basis.	At locations approved by the regional water board. ⁵
	Bioanalytical Screening Tools: All listed in Table 3.	Quarterly ¹	Following treatment prior to release to the aquifer or surface water reservoir.

¹ This is the initial monitoring frequency for the monitoring and reporting program. The regional water board may require additional monitoring to respond to a concern as stated in 4.1 of Attachment A.

² Groundwater within the distance groundwater travels downgradient from the application site in 30-days.

³ The monitoring frequency shall be determined by the regional water board in consultation with the State Water Board. The intent is to have an increased monitoring frequency during the first three months and a decreased monitoring frequency after three months.

⁴ If the recycled water project proponent or producer can demonstrate that the RO unit will not substantially remove a CEC, the regional water board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.

⁵ See 3.2.2 of Attachment A for information on surrogate monitoring locations for subsurface application and 3.3.2 of Attachment A for reservoir water augmentation.

during the baseline monitoring phase. Surrogates not reduced through a unit process are not good indicators of the unit's intended performance. For example, soil aquifer treatment may not effectively lower electrical conductivity. Therefore, electrical conductivity may not be a good surrogate for soil aquifer treatment. The baseline monitoring phase shall be conducted for a period of three years following the initial assessment monitoring phase. Monitoring requirements for the baseline phase are summarized in Table 5. If a performance indicator CEC listed in Table 1 is found not to be a good indicator, the recycled water producer shall propose an alternative performance indicator CEC representative of the constituent group to monitor. This performance indicator CEC shall be subject to approval by the regional water board in consultation with the State Water Board.

For groundwater recharge projects in operation prior to 2013, historic monitoring data may be used to assess removal of health-based CECs, performance indicator CECs and surrogates. Projects in operation prior to 2013 that can demonstrate prior assessment of CECs and surrogates equivalent to the initial assessment phase and baseline phase requirements of this Policy may be eligible for the standard operation monitoring requirements.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a concentration of a health-based CEC above the thresholds described in Table 7, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operation. If additional monitoring is required, the regional water board shall consult with the State Water Board and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 5 of Attachment A.

Following the baseline operation monitoring phase, monitoring requirements shall be re-evaluated and subsequent requirements for the standard operation of a project shall be determined on a project-specific basis consistent with 4.3 of Attachment A.

4.3 Standard Operation Monitoring Phase

Based on the findings of the baseline monitoring phase, monitoring requirements for health-based CECs, performance indicator CECs, surrogates, and bioanalytical screening tools may be refined to establish project-specific requirements for monitoring the standard operating conditions of a groundwater recharge or reservoir water augmentation project. Monitoring requirements for the standard operation phase are

summarized in Table 6. The list of health-based CECs may be revised to remove a health-based CEC from the list if monitoring results meet the conditions of the minimum threshold level presented in Table 8.

Performance indicator CECs and surrogates that exhibited reduction by a unit process and/or provided an indication of operational performance shall be selected for monitoring of standard operations. If a performance indicator CEC is found to be a poor indicator, the recycled water producer shall propose an alternative performance indicator CEC representative of the constituent group to monitor. This performance indicator CEC shall be subject to approval by the regional water board in consultation with the State Water Board. The list of bioanalytical screening tools may be revised to remove a bioanalytical screening tool from the list if monitoring results meet the conditions of the minimum threshold level presented in Table 10.

Monitoring locations for the standard operation phase shall be the same as the locations used for the baseline monitoring phase.

Monitoring for health-based CECs, performance indicator CECs, and with bioanalytical screening tools shall be conducted on a semi-annual basis, unless the project demonstrates consistency in treatment effectiveness in removal of CECs, treatment operational performance, and appropriate recycled water quality. These projects may be monitored for CECs and with bioanalytical screening tools on an annual basis. Monitoring frequencies for CECs and surrogates for standard operation monitoring are presented in Table 6.

Monitoring results shall be evaluated following each sampling event to allow timely implementation of any response actions. If evaluation of monitoring results indicates a concern, such as finding a health-based CEC above the thresholds described in Table 7 or a decline in removal of a performance indicator CEC from the performance levels established during the initial and baseline monitoring phases, more frequent monitoring may be required to further evaluate the effectiveness of the treatment process. Additional actions may also be warranted, which may include, but not be limited to, resampling to confirm a result, additional monitoring, implementation of a source identification program, toxicological studies, engineering removal studies, and/or modification of facility operation. If additional monitoring is required, the regional water board shall consult with the State Water Board and revise the Monitoring and Reporting Program as appropriate. Evaluation of monitoring results and determination of appropriate response actions based on the monitoring results are presented in Section 5 of Attachment A.

Table 5: Baseline Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge – Surface Application	Health-Based CECs: All listed in Table 1.	Semi-Annually ¹	- Following tertiary treatment prior to application to the surface spreading area.
	Performance Indicator CECs: Selected based on the findings of the initial assessment phase.		- At monitoring well locations designated in consultation with the State Water Board. ²
	Surrogates: Selected based on the findings of the initial assessment phase.	Based on findings of the initial assessment phase.	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
	Bioanalytical Screening Tools: All listed in Table 3.	Semi-Annually ¹	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
Reservoir Water Augmentation and Groundwater Recharge – Subsurface Application	Health-Based CECs: All listed in Table 1.	Semi-Annually ¹	Following treatment prior to release to the aquifer or surface water reservoir.
	Performance Indicator CECs: Selected based on the findings of the initial assessment phase.	Semi-Annually ¹	- Prior to RO treatment. ³ - Following treatment prior to release to the aquifer or surface water reservoir.
	Surrogates: Selected based on the findings of the initial assessment phase.	Based on findings of the initial assessment phase.	- At locations approved by the regional water board. ⁴
	Bioanalytical Screening Tools: All listed in Table 3.	Semi-Annually ¹	Following treatment prior to release to the aquifer or surface water reservoir.

¹ More frequent monitoring may be required to respond to a concern as stated in 4.2 of Attachment A.

² Groundwater within the distance groundwater travels downgradient from the application site in 30-days.

³ If the recycled water producer can demonstrate that the RO unit will not substantially remove a CEC, the regional water board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.

⁴ See 3.2.2 of Attachment A for information on surrogate monitoring locations for subsurface application and 3.3.2 of Attachment A for reservoir water augmentation.

Table 6: Standard Operation Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge - Surface Application	Health-Based CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually ¹	- Following tertiary treatment prior to application to the surface spreading area.
	Performance Indicator CECs: Selected based on the findings of the baseline phase.		- At monitoring well locations designated in consultation with the State Water Board. ²
	Surrogates: Selected based on the findings of the baseline phase.	Based on findings of the baseline phase.	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
	Bioanalytical Screening Tools: Selected based on the findings of the baseline phase.	Semi-Annually ¹	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with the State Water Board. ²
Reservoir Water Augmentation and Groundwater Recharge - Subsurface Application	Health-Based CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually ¹	-Following RO/AOPs treatment prior to release to the aquifer or surface water reservoir.
	Performance Indicator CECs: Selected based on the findings of the baseline phase.	Semi-Annually or Annually ¹	- Prior to RO treatment. ³ - Following treatment prior to release to the aquifer or surface water reservoir.
	Surrogates: Selected based on the findings of the baseline phase.	Based on findings of the baseline phase.	At locations approved by the regional water board. ⁴
	Bioanalytical Screening Tools: Selected based on the findings of the baseline phase.	Semi-Annually ¹	Following treatment prior to release to the aquifer or surface water reservoir.

¹ More frequent monitoring may be required to respond to a concern as stated in 4.3 of Attachment A.

² Groundwater within the distance groundwater travels downgradient from the application site in 30-days.

³ If the recycled water producer can demonstrate that the RO unit will not substantially remove a CEC, the regional water board may allow monitoring for that CEC prior to the AOP, instead of prior to the RO unit.

⁴ See 3.2.2 of Attachment A for information on surrogate monitoring locations for subsurface application and 3.3.2 of Attachment A for reservoir water augmentation.

5 EVALUATION OF CEC, SURROGATE, AND BIOANALYTICAL SCREENING TOOL MONITORING RESULTS

This section presents the approaches for evaluating treatment process performance and health-based CEC and bioanalytical screening tool monitoring results. Monitoring results for performance indicator CECs and surrogates shall be used to evaluate the operational performance of a treatment process and the effectiveness of a treatment process in removing CECs. For evaluation of health-based CEC and bioanalytical screening tool monitoring results, a multi-tiered approach of thresholds and corresponding response actions is presented in 5.2 and 5.3 of Attachment A, respectively. The evaluation of monitoring results shall be included in monitoring reports submitted to the regional water board.

5.1 Evaluation of Performance Indicator CEC and Surrogate Results

The effectiveness of a treatment process to remove CECs shall be evaluated by determining the removal percentages for performance indicator CECs and surrogates. The removal percentage is the difference in the concentration of a compound in recycled water prior to and after a treatment process (e.g., soil aquifer treatment or RO followed by AOPs), divided by the concentration prior to the treatment process and multiplied by 100.

$$\text{Removal Percentage} = ([X_{in} - X_{out}]/X_{in}) (100)$$

X_{in} - Concentration in recycled water prior to a treatment process

X_{out} - Concentration in recycled water after a treatment process

During the initial assessment, the recycled water project proponent or recycled water producer shall monitor performance to determine removal percentages for performance indicator CECs and surrogates. The removal percentages shall be confirmed during the baseline monitoring phase. One example of removal percentages for each application scenario and their associated processes (i.e., soil aquifer treatment or RO/AOPs) is presented in Table 7. The established removal percentages for each project shall be used to evaluate treatment effectiveness and operational performance.

5.1.1 Groundwater Recharge – Surface Application

For groundwater recharge by surface application, the removal percentage shall be determined by comparing the quality of the recycled water applied to a surface spreading area to the quality of groundwater at monitoring wells. The distance between the application site and the monitoring wells shall be no more than the distance the groundwater travels in 30 days downgradient from the application site. The location of the monitoring wells shall be designated by the regional water board in consultation with the State Water Board. The removal percentage shall be adjusted to account for

differences in concentrations due to dilution from potable water applied to the application site, stormwater applied to the application site, and native groundwater. The removal percentage shall also be adjusted to account for CECs in these waters. The recycled water project proponent or recycled water producer shall submit a proposal to the regional water board and the State Water Board as part of its operation plan on how it will perform this accounting.

5.1.2 Groundwater Recharge – Subsurface Application

For groundwater recharge using subsurface application, the removal percentage shall be determined by comparing recycled water quality before treatment by RO/AOPs and after treatment prior to release into the aquifer.

5.1.3 Reservoir Water Augmentation

For reservoir water augmentation, the removal percentage shall be determined by comparing recycled water quality before treatment by RO/AOPs and after treatment prior to release into the surface water reservoir.

5.2 Evaluation of Health-Based CEC Results

The recycled water project proponent or recycled water producer shall evaluate health-based CEC monitoring results. To determine the appropriate response actions, the recycled water project proponent or recycled water producer shall compare measured environmental concentrations (MECs) to their respective monitoring trigger levels⁴ (MTLs) listed in Table 7 to determine MEC/MTL ratios. The recycled water project proponent or recycled water producer shall compare the calculated MEC/MTL ratios to the thresholds presented in Table 8 and shall implement the response actions corresponding to the threshold.

For surface application, the results shall be evaluated for groundwater collected from the monitoring wells. For subsurface application and reservoir water augmentation projects, results shall be evaluated for the recycled water following treatment prior to release into the aquifer or surface water reservoir.

⁴ Recommended MTLs were established in [Monitoring Strategies for Constituents of Emerging Concern \(CECs\) in Recycled Water – Recommendations of a Science Advisory Panel](#), dated April 2018.

Table 7: Monitoring Trigger Levels and Example Removal Percentages

Constituent/ Parameter	Relevance/Indicator Type/Surrogate	Monitoring Trigger Level (micrograms/liter) ¹	Example Removal Percentages (%) ²
GROUNDWATER RECHARGE - SURFACE APPLICATION³			
1,4-Dioxane	Health	1	-- ⁴
NDMA	Health	0.010	--
NMOR	Health	0.012	--
Gemfibrozil	Performance	--	>90
Iohexol	Performance	--	>90
Sucralose	Performance	--	<25 ⁵
Sulfamethoxazole	Performance	--	>30
Ammonia	Surrogate	--	>90
DOC	Surrogate	--	>30
Nitrate	Surrogate	--	>30
Total fluorescence	Surrogate	--	>30
UV Absorbance	Surrogate	--	>30
RESERVOIR WATER AUGMENTATION AND GROUNDWATER RECHARGE - SUBSURFACE APPLICATION⁶			
1,4-Dioxane	Health	1	--
NDMA	Health & Performance	0.010	25-50, >80 ⁷
NMOR	Health	0.012	--
Sucralose	Performance	--	>90
Sulfamethoxazole	Performance	--	>90
Electrical Conductivity	Surrogate	--	>90
DOC	Surrogate	--	>90
UV Absorbance	Surrogate	--	>50

¹ Recommended monitoring trigger levels for groundwater recharge and reservoir water augmentation applications were established in [Monitoring Strategies for Constituents of Emerging Concern \(CECs\) in Recycled Water – Recommendations of a Science Advisory Panel](#), dated April 2018.

² The removal percentages are from Drewes et al. (2008) and provide an example of performance for that specific research. Project specific removal percentages will be developed for each project during the initial and baseline monitoring phases.

³ Treatment process: Soil aquifer treatment. The stated removal percentages are examples and need to be finalized during the initial and baseline monitoring phases for a given site.

⁴ Not applicable

⁵ Sucralose degrades poorly during soil aquifer treatment. It is included here mainly as a tracer.

⁶ Treatment process: RO/AOP.

⁷ For treatment using RO, removal percentage is between 25 and 50 percent. For treatment using RO/AOP, removal percentage is greater than 80 percent.

Table 8: MEC/MTL Thresholds and Response Actions

MEC/MTL Threshold	Response Action
If greater than 75 percent of the MEC/MTL ratio results for a CEC are less than or equal to 0.1 during the baseline monitoring phase and/or subsequent monitoring	A) After completion of the baseline monitoring phase, consider requesting removal of the CEC from the monitoring program.
If MEC/MTL ratio is greater than 0.1 and less than or equal to 1	B) Continue to monitor.
If MEC/MTL ratio is greater than 1 and less than or equal to 10	C) Check the data. Continue to monitor.
If MEC/MTL ratio is greater than 10 and less than or equal to 100	D) Check the data, resample immediately and analyze to confirm CEC result. Continue to monitor.
If MEC/MTL ratio is greater than 100	E) Check the data, resample immediately and analyze to confirm CEC result. Continue to monitor. Contact the regional water board and the State Water Board to discuss additional actions. (Additional actions may include, but are not limited to, additional monitoring, toxicological studies, engineering removal studies, modification of facility operation, implementation of a source identification program, and monitoring at additional locations.)

5.3 Evaluation of Bioanalytical Screening Tool Results

The recycled water project proponent or recycled water producer shall evaluate bioanalytical assay monitoring results. To determine the appropriate response actions, the recycled water project proponent or recycled water producer shall compare bioanalytical equivalent concentrations (BEQs) to their respective MTLs listed in Table 9 to determine BEQ/MTL ratios. The recycled water project proponent or recycled water producer shall compare the calculated BEQ/MTL ratios to the thresholds presented in Table 10 and shall implement the response actions corresponding to the threshold.

For groundwater recharge - surface application, the results shall be evaluated for groundwater collected from the monitoring wells. For groundwater recharge - subsurface application and reservoir water augmentation projects, results shall be evaluated for the recycled water following treatment prior to release to the aquifer or surface water reservoir.

Table 9: Required Equivalency Agonists and Monitoring Trigger Levels for Bioanalytical Screening Tools

Constituent/ Parameter	Equivalency Agonist	Monitoring Trigger Level (nanograms/liter)
Estrogen receptor- α (ER- α)	17-beta-estradiol	3.5
Aryl hydrocarbon receptor (AhR)	2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)	0.5

Table 10: BEQ/MTL Thresholds and Response Actions

BEQ/MTL Threshold	Response Action
If BEQ/MTL ratio is consistently less than 0.1	A) Consider decreasing monitoring frequency or eliminating requirement for inclusion of endpoint
If BEQ/MTL ratio is greater than 0.1 and less than or equal to 10	B) Continue to monitor.
If BEQ/MTL ratio is greater than 10 and less than or equal to 1000	<p>C) Check the data, resample immediately and analyze to confirm bioassay result.</p> <p>Continue to monitor.</p> <p>Contact the regional water board and State the Water Board to discuss additional actions.</p> <p>(Additional actions may include, but are not limited to, targeted analytical chemistry monitoring, increased frequency of bioassay monitoring, and implementation of a source identification program.)</p>
If BEQ/MTL ratio is greater than 1000	<p>D) Check the data, resample immediately and analyze to confirm bioassay result.</p> <p>Continue to monitor.</p> <p>Contact the regional water board and the State Water Board to discuss additional actions.</p> <p>(Additional actions may include, but are not limited to, targeted and/or non-targeted analytical chemistry monitoring, increased frequency of bioassay monitoring, toxicological studies, engineering removal studies, modification of facility operation, implementation of a source identification program, and monitoring at additional locations.)</p>