CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LAHONTAN REGION

MEETING OF OCTOBER 9-10, 2013
BARSTOW

ITEM: **4**

SUBJECT: **DISCUSSION OF THE WATER BOARD'S ROLE AND AUTHORITY IN MANAGING THE DISCHARGE OF SALTS TO GROUNDWATER OF THE LAHONTAN REGION**

CHRONOLOGY: NA

ISSUE: Any time someone requests to discharge wastes that may degrade existing water quality, Water Board staff must evaluate requests using the State Water Board Resolution 68-16, "Policy with Respect to Maintaining High Quality Waters," also referred to as the State's Anti-degradation Policy (hereafter referred to as "Policy," a copy of which is enclosed). The Policy specifies some criteria and guidance but allows the Water Board great latitude and discretion on the magnitude and extent of water quality degradation allowed, up to water quality objectives set forth in the Basin Plan. The challenge for Water Board staff when considering a report of waste discharge is determining how much degradation should be allowed, and for groundwater specifically, how far that degradation should be allowed to expand within the aquifer and at what magnitude. Staff intends to share its current approaches towards meeting anti-degradation requirements in determining how much salt to allow discharged to groundwater, and seeks guidance from the Water Board members on key factors for consideration.

DISCUSSION: **Analysis of Requirements set for in the Policy**

The Policy requires that discharges of waste to waters of the State (both groundwater and surface water) achieve the highest water quality consistent with maximum benefit to the people of the State. A discharge of waste to waters of the State inherently implies that a change in water quality will likely occur from the discharge. The intent of the Policy is to limit degradation and maintain high quality water to the maximum extent possible. The State Board will be reviewing the Policy in 2014 and will schedule initial listening sessions with stakeholders this Fall.

When applying the Policy, Water Board staff have to consider a number of issues, including:

1) Whether there are reasonable additional treatment or controls available to reduce the impacts of the discharge on water quality.
2) Whether the discharge has the potential to adversely affect beneficial uses or violate a water quality objective?
3) Whether the proposed discharge and change in water quality will be consistent with maximum benefit to the people of the State.

To answer these questions staff typically requests a discharger to provide an antidegradation analysis in their report of waste discharge. As part of the analysis, the discharger must determine the magnitude and extent of degradation, and evaluate alternatives to reduce the effects of discharge on water quality.

The discharger must use the best practicable treatment or control to maintain the highest water quality consistent with the maximum benefit to the people of the State. This requires an evaluation of the available treatment or control measures available to prevent or limit degradation, and the feasibility of their implementation, which includes their costs. The cost-benefit analysis is, therefore, usually incorporated into the analyses. At no point is the discharge allowed to exceed water quality objectives set out in the Basin Plan.

In cases where a change in water quality involves a constituent with a single numerical water quality objective, the analyses are relatively straightforward. For example, discharges from waste water treatment plants are compared to water quality objectives in the Basin Plan for those constituents. For a constituent such as nitrate as nitrogen, the water quality objective is the maximum contaminant level (MCL) of 10 mg/L. A future proposed discharge or change in an existing permitted discharge would not be allowed to cause the receiving water quality (groundwater or surface water) to exceed this MCL, but the Water Board has the authority to set a more stringent effluent limit to reserve capacity for increased or additional discharges in the future.

Water Quality Objective for Total Dissolved Solids

Unlike most constituents in drinking water that have a single numerical water quality objective, TDS is subject to a three-part, secondary standard MCL of 500, 1000, and 1500 mg/L. Secondary MCLs are based on protecting taste and odor, and are not based on health concerns. The challenge for staff is which of the three TDS standards should be applied (or whether some other limit be established) to a proposed discharge, and what level of treatment or controls should be required of the discharger to maintain the existing high quality waters?

The closed hydrologic systems of the Lahontan Region allow the accumulation of salts and minerals in groundwaters. A myriad of important and necessary activities contribute salts to groundwater in the region such as wastewater treatment plants, dairies, and agriculture. Increased demand on groundwater resources for consumptive uses and competition for assimilative capacity of the resource to accept additional salts and nutrient loads over time has resulted in heightened sensitivity by water resource managers to control the level of salts in the supply. To that end, the State's Recycled Water Policy (State Board Resolution No. 2009-0011) recognizes the need to develop salt and nutrient management plans to address potential water quality impacts to groundwater basins from recycled water projects.

KEY FACTORS: Excerpts of case studies are provided in Enclosures 1 and 2 to illustrate the decision making process Water Board staff have recently used to evaluate whether a proposed discharge meets the requirements of the Policy. Some key factors to consider are listed below.

1. Consider other demands for assimilative capacity of the groundwater.
2. Consider the economic impact of requiring best treatment controls to improve water quality.

3. Consider the sensitivity of a particular groundwater basin to multiple demands on the assimilative capacity at present and anticipated for the future.
4. Should the Water Board hold dischargers to the 500 mg/L TDS standard in areas where background water quality is below 500 mg/L. This means that dischargers will incur additional costs and responsibilities to implement best controls and technology to protect beneficial uses.
5. Should the Water Board hold dischargers to the standard of 1000 mg/L in other areas of the Region where background water quality is between 500 and 1000 mg/?. In these cases dischargers would be required to implement best control methods to ensure receiving water quality is maintained below these limits.

ENCLOSURES	ITEM	BATE NUMBER
1	Hesperia Excerpt	**4-7**
2	Apple Valley Excerpt	**4-15**
3	State Board Resolution No. 68-16	**4-23**
4	State Board Resolution No. 2009-0011	**4-27**

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ENCLOSURE 1

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ENCLOSURE 1

Excerpt - Findings for Non-Degradation and Effluent Limitation Basis

VVWRA – CITY OF HESPERIA
HESPERIA SUB-REGIONAL RP
San Bernardino County

BOARD ORDER NO.
R6V-2013-0005
WDID NO. 6B360907005

17. Maintenance of High Quality Waters in California, State Board Resolution 68-16, Degradation Analysis

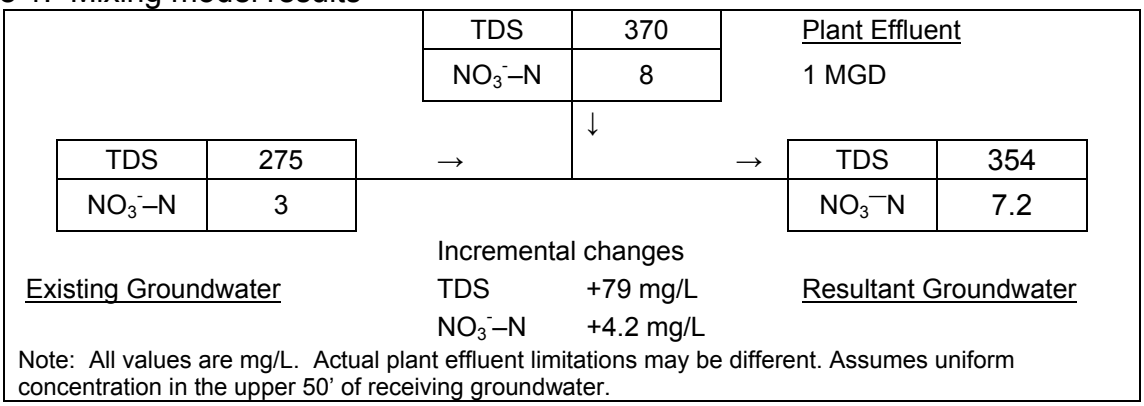
The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16 for both surface and groundwater. That policy requires that whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies. If degradation is proposed, the proposed discharge that results in degradation must be treated using best practical control technology, pollution or nuisance will not occur, and that the highest water quality consistent with maximum benefit to the people of the State will be maintained. The Water Board's Basin Plan implements, and incorporates by reference, the State antidegradation policy.

The two constituents that may cause significant degradation of the existing groundwater quality are TDS and nitrate–nitrogen. Elevated TDS concentration degrades the taste of the water. High nitrate–nitrogen in water has cause incidents of methemoglobinemia in infants. The water quality objective defined in the Basin Plan for nitrate–nitrogen is 10 mg/L (also drinking water standard or maximum contaminant level, or MCL).

The Producer/Discharger's Cumulative Impact Assessment analyzed potential groundwater degradation predicted by the operation of the sub-regional plant. The Producer/Discharger's Title 22 Engineering Report, Revised, supplemented the Cumulative Impact Assessment report with existing groundwater data and the results of a groundwater mixing model. The model involves a complete mixing column, an estimated hydraulic conductivity of 50 ft/day, and the local groundwater gradient. The mixing column includes the upper part of the aquifer, particularly a thickness extending to 50 feet below the water table, or saturated zone, and a ½ mile radius from the land discharge site. The results of the mixing model are shown in Figure 1. The mixing model results show that TDS and nitrate-nitrogen will increase by 79 mg/L and 4.2 mg/L, respectively, from the discharge to the percolation ponds at the land discharge site. Even with the degradation, the groundwater quality will still meet Basin Plan

water quality objectives. In addition, the intent of this Order is to authorize production and delivery of recycled water to users. Specific uses of recycled water will be separately regulated. Recycled water use will reduce and possibly eliminate the discharge to the land discharge site as new users are identified. Therefore, this amount of degradation is acceptable and there is no need for more restrictive requirements.

Figure 1. Mixing model results



The Producer/Discharger evaluated the additional capital and operation cost of an alternative process that would remove additional TDS and nitrate-nitrogen by reverse osmosis (RO) technology. Application of this additional technology would produce effluent that is equal or superior to existing underlying groundwater quality. The Producer/Discharger found that the incremental increase in the monthly user cost is $10.89. The Producer/Discharger charges a based fee of $12.03; therefore, the user base fee would double to $22.92 per month (which does not include additional fees added by the member agency).

To determine whether the application of additional RO technology would result in the best practicable treatment or control of the discharge necessary to assure that the highest water quality consistent with maximum benefit to the people of the State will be maintained, the Producer/Discharger performed a maximum benefit analysis. The analysis compared the water quality benefit relative to the social economic benefit when RO technology is added to the treatment process. RO will not result in groundwater degradation, and may even cause a modest improvement in groundwater quality. The Producer/Discharger estimated the social-economic impacts of the increased user fees using the house-hold income distribution for the Victor Valley area. The Producer/Discharger found that the increases in user fees for the alternative process would result in a loss of 60 jobs in the Victor Valley area. Therefore, the alternative treatment process, which would keep the existing groundwater quality, does not result in the highest water quality consistent with the maximum benefit to the people of the State. Further, the degradation still results in groundwater quality meeting Basin Plan water quality objectives.

In summary, groundwater degradation resulting from effluent discharged to percolation ponds is acceptable and justified according to State Water Board Resolution No. 68-16.

20.Basis for Effluent Limitations

a. Secondary treatment of sewage

According to Basin Plan Section 4.4, municipal treatment facilities must provide effective solids removal and some soluble organics removal for percolation pond operations. The U.S. Environmental Protection Agency (EPA) has established secondary treatment standards that represent removal of soluble and solid matter in sewage. Although these standards apply only to surface water discharges, the Water Board is using these standards to ensure that the discharge meets the Basin Plan requirement.

Because the sub-regional plant produces disinfected tertiary recycled water, the plant is capable of producing a lower concentration of BOD and suspended solids than the secondary treatment standards. However, the Basin Plan does not specify tertiary treatment as the standard for discharge to percolation ponds. Therefore, the selected effluent limitations are the U.S. EPA secondary standards, which will be easily met by the Producer's/Discharger's proposed tertiary treatment.

b. Total dissolved solids (TDS)

TDS control is needed to protect groundwater from excessive degradation on account of salts. Ideally, the TDS effluent limitation is set to the Basin Plan numeric TDS objective for the receiving groundwater basin. However, the Basin Plan does not have a numeric TDS objective for the receiving groundwater basin.

The Basin Plan states, in areas where insufficient data preclude the establishment of a TDS objective, and as an interim measure until such data are available, effluent limitations may specify a reasonable incremental increase for constituents above the level contained in the underlying groundwater. However, this method is not suitable for the proposed discharge because the delivered supply quality to the location served by the sub-regional plant will likely differ from the existing underlying groundwater. Specifying an effluent limitation based on current effluent quality is not possible because, as a new discharge, TDS effluent data do not exist.

The Basin Plan does have an objective for all groundwater basins, which states that the groundwater must not contain concentrations of TDS, as a chemical constituent, in excess of the secondary maximum contaminant level (MCL) based upon drinking water standards specified in Title 22, CCR, Table 64449-A of Section 64449, Secondary Maximum Contaminant Levels-Consumer Acceptance Limits. Water Board implements this objective in WDRs as a receiving water

limitation. For TDS, the drinking water standard, MCL and thus water quality objective, is a three part standard; 500 mg/L long-term, 1,000 mg/L recommended, 1,500 mg/L short term.

Based on the above considerations, Water Board is not specifying a TDS effluent limitation in this Order. Control of TDS is implemented as a receiving water limitation.

c. Total nitrogen

Total nitrogen is important because the oxidized component, nitrate–nitrogen, has a primary MCL value of 10 mg/L, which is necessary to protect public health. Wastewater effluent will typically contain some non-oxidized nitrogen components, which are organic nitrogen, ammonia, and nitrite. For the purposes of groundwater protection, the effluent limitation is set for total nitrogen with the assumption that all nitrogen is in the oxidized state by the time the effluent reaches groundwater.

The Producer/Discharger reports in Table 3.4-4 of the draft EIR that the treatment process is designed to meet 8 mg/L total nitrogen limit initially, with the flexibility to meet a future anticipated goal of 4 mg/L. The Producer/Discharger does not describe how the treatment process will be changed to go from total nitrogen limit of 8 mg/L to 4 mg/L. In the development of the NPDES permit for the regional treatment plant, which the Water Board adopted in February 2008, the Water Board examined the ability of MBR technology to achieve nitrogen removal. The Water Board found that an MBR facility can meet a long-term average of 6.0 mg/L total nitrogen. Therefore, Water Board selected 6.0 mg/L as the long-term average of total nitrogen in the effluent.

To evaluate compliance for each monthly monitoring period, Water Board converts the long-term average to an average monthly effluent limitation, and if appropriate, a maximum daily effluent limitation through use of multiplier values. The generalized equations are the following:

$$\begin{Bmatrix}\text{Average}\\ \text{monthly}\\ \text{effluent}\\ \text{limitation}\end{Bmatrix} = \begin{Bmatrix}\text{Long-}\\ \text{term}\\ \text{average}\end{Bmatrix} \times \begin{Bmatrix}\text{average}\\ \text{monthly}\\ \text{multiplier}\end{Bmatrix}$$

and

$$\begin{Bmatrix}\text{Maximum}\\ \text{daily}\\ \text{effluent}\\ \text{limitation}\end{Bmatrix} = \begin{Bmatrix}\text{Long-}\\ \text{term}\\ \text{average}\end{Bmatrix} \times \begin{Bmatrix}\text{maximum}\\ \text{daily}\\ \text{multiplier}\end{Bmatrix}$$

The multiplier values are determined using statistical methods founded in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP)[1]. The multiplier values are essentially a function of two variables: (1) the variability of the data and (2) the number of samples collected in a month. Data variability is quantified using the coefficient of variation parameter, which is the sample standard deviation divided by the sample mean. The SIP has a lookup table that display multipliers as a function of the two variables. The SIP provides detailed instructions for the coefficient of variation calculation, and includes the statistical equations that are the basis for the multiplier values in the table.

In the absence of sample data, the Water Board cannot derive a coefficient of variability. In those cases where no sample data exist, the SIP instructs the user to select a default coefficient of variation of 0.6. Using that default coefficient of variation, the resulting average monthly multiplier and maximum daily multiplier values are 1.55 and 2.01. Therefore, the proposed nitrogen limits are the following:

Average monthly effluent limitation	=	6 mg/L	×	1.55	=	**9.3 mg/L**

and

Maximum daily effluent limitation	=	6 mg/L	×	2.01	=	**12.1 mg/L**

[1] The SIP implements criteria for priority toxic pollutants contained in the California Toxics rule promulgated by the US EPA, as well as other toxic pollutant criteria and objectives, and does not apply specifically to discharges to groundwater. Nonetheless, the standardized approach set forth in the SIP for developing water quality-based effluent limitations is being used to develop effluent limitations in groundwater for total nitrogen and TDS because it provides useful guidance that is not theoretically limited to application to surface waters.

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ENCLOSURE 2

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ENCLOSURE 2

Excerpt - Findings for Non-Degradation and Effluent Limitation Basis

VVWRA - TOWN OF APPLE VALLEY
APPLE VALLEY SUB-REGIONAL RP
San Bernardino County

BOARD ORDER NO.
R6V-2013-0004
WDID NO. 6B360907006

17. Maintenance of High Quality Waters in California, State Board Resolution 68-16, Degradation Analysis

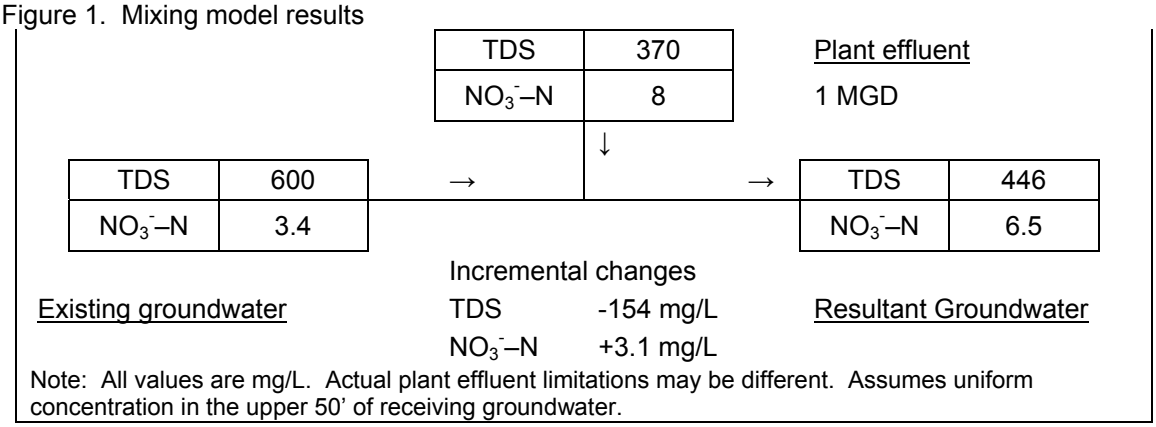
The State Water Board established California's antidegradation policy in State Water Board Resolution No. 68-16 for both surface and groundwater. That policy requires that whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies. If degradation is proposed, the proposed discharge that results in degradation must be treated using best practical control technology, pollution or nuisance will not occur, and that the highest water quality consistent with maximum benefit to the people of the State will be maintained. The Water Board's Basin Plan implements, and incorporates by reference, the State antidegradation policy.

The two constituents that may cause significant degradation of the existing groundwater quality are TDS and nitrate–nitrogen. Elevated TDS concentration degrades the taste of the water. High nitrate–nitrogen in water has cause incidents of methemoglobinemia in infants. The water quality objective defined in the Basin Plan for nitrate–nitrogen is 10 mg/L (also drinking water standard or maximum contaminant level, or MCL).

The Producer/Discharger's Cumulative Impact Assessment analyzed potential groundwater degradation predicted by the operation of the sub-regional plant. The Producer/Discharger's Title 22 Engineering Report, Revised, supplemented the Cumulative Impact Assessment report with existing groundwater data and the results of a groundwater mixing model. The model involves a complete mixing column, an estimated hydraulic conductivity of 50 ft/day, and the local groundwater gradient. The mixing column includes the upper part of the aquifer, particularly a thickness extending to 50 feet below the water table, or saturated zone, and a ½ mile radius from the land discharge site. The results of the mixing model are shown in Figure 1. The mixing model results show nitrate-nitrogen will increase by 3.1 mg/L from the discharge to the percolation ponds at the land discharge site. On the other hand, the concentration of

TDS in groundwater is expected to improve by 154 mg/L because the existing groundwater has a higher TDS concentration than the discharge. Even with the degradation, the groundwater quality will still meet Basin Plan water quality objectives. In addition, the intent of this Order is to authorize production and delivery of recycled water to users. Specific uses of recycled water will be separately regulated. Recycled water use will reduce and possibly eliminate the discharge to the land discharge site as new users are identified. Therefore, this amount of degradation is acceptable and there is no need for more restrictive requirements.

Figure 1. Mixing model results



Note: All values are mg/L. Actual plant effluent limitations may be different. Assumes uniform concentration in the upper 50' of receiving groundwater.

The Producer/Discharger evaluated the additional capital and operation cost of an alternative process that would remove additional TDS and nitrate-nitrogen by reverse osmosis (RO) technology. Application of this additional technology would produce effluent that is equal or superior to existing underlying groundwater quality. The Producer/Discharger found that the incremental increase in the monthly user cost is $10.89. The Producer/Discharger charges a based fee of $12.03; therefore, the user base fee would double to $22.92 per month (which does not include additional fees added by the member agency).

To determine whether the application of additional RO technology would result in the best practicable treatment or control of the discharge necessary to assure that the highest water quality consistent with maximum benefit to the people of the State will be maintained, the Producer/Discharger performed a maximum benefit analysis. The analysis compared the water quality benefit relative to the social economic benefit when RO technology is added to the treatment process. RO will not result in groundwater degradation, and may even cause a modest improvement in groundwater quality. The Producer/Discharger estimated the social-economic impacts of the increased user fees using the house-hold income distribution for the Victor Valley area. The Producer/Discharger found that the increases in user fees for the alternative process would result in a loss of 60 jobs in the Victor Valley area. Therefore, the alternative treatment process, which would keep the existing groundwater quality, does not result in the highest water quality consistent with the maximum benefit to the people of the State.

In summary, groundwater degradation resulting from effluent discharged to percolation ponds is acceptable and justified according to State Water Board Resolution No. 68-16.

The Producer/Discharger's degradation analysis is based on a theoretical land discharge site location because the mixing model was conducted prior to final land discharge site selection. Based on contour drawings in the Cumulative Impacts Assessment, the estimated existing groundwater quality for TDS and nitrate-nitrogen is 400 mg/L and 1 mg/L, respectively. With these values, TDS would still improve. However incremental degradation of nitrate would be higher than 3.1 mg/L although

the resulting groundwater would be less than 6.5 mg/L shown in Figure 1. Nevertheless, the conclusions of the maximum benefit principle are the same because the Discharger would need to install reverse osmosis to keep the discharge from increasing existing groundwater quality.

20. Basis for Effluent Limitations

a. Secondary treatment of sewage

According to Basin Plan Section 4.4, municipal treatment facilities must provide effective solids removal and some soluble organics removal for percolation pond operations. The U.S. Environmental Protection Agency (EPA) has established secondary treatment standards that represent removal of soluble and solid matter in sewage. Although these standards apply only to surface water discharges, the Water Board is using these standards to ensure that the discharger meets the Basin Plan requirement.

Because the sub-regional plant produces disinfected tertiary recycled water, the plant is capable of producing a lower concentration of BOD and suspended solids than the secondary treatment standards. However, the Basin Plan does not specify tertiary treatment as the standard for discharge to percolation ponds. Therefore, the selected effluent limitations are the U.S. EPA secondary standards, which will be easily met by the Producer's/Discharger's proposed tertiary treatment.

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b. Total dissolved solids (TDS)

TDS control is needed to protect from excessive groundwater degradation on account of salts. Ideally, the TDS effluent limitation is set to the Basin Plan numeric TDS objective for the receiving groundwater basin. However, the Basin Plan does not have a numeric TDS objective for the receiving groundwater basin.

The Basin Plan states, in areas where insufficient data preclude the establishment of a TDS objective, and as an interim measure until such data are available, effluent limitations may specify a reasonable incremental increase for constituents above the level contained in the underlying groundwater. However, this method is not suitable for the proposed discharge because the delivered supply quality to the location served by the sub-regional plant will likely differ from the existing underlying groundwater. Specifying an effluent limitation based on current effluent quality is not possible because, as a new discharge, TDS effluent data do not exist.

The Basin Plan does have an objective for all groundwater basins, which states that the groundwater must not contain concentrations of TDS, as a chemical constituent, in excess of the secondary maximum contaminant level (MCL) based upon drinking water standards specified in Title 22, CCR, Table 64449-A of Section 64449, Secondary Maximum Contaminant Levels-Consumer Acceptance

Limits. Water Board implements this objective in WDRs as a receiving water limitation. For TDS, the drinking water standard, MCL and thus water quality objective, is a three part standard; 500 mg/L long-term, 1,000 mg/L recommended, 1,500 mg/L short term.

Based on the above considerations, Water Board is not specifying a TDS effluent limitation in this Order. Control of TDS is implemented as a receiving water limitation.

c. Total nitrogen

Total nitrogen is important because the oxidized component, nitrate–nitrogen, has a primary MCL value of 10 mg/L, which is necessary to protect of public health. Wastewater effluent will typically contain some non-oxidized nitrogen components, which are organic nitrogen, ammonia, and nitrite. For the purposes of groundwater protection, the effluent limitation is set for total nitrogen with the assumption that all nitrogen is in the oxidized state by the time the effluent reaches groundwater.

The Producer/Discharger reports in Table 3.4-4 of the draft EIR that the treatment process is designed to meet 8 mg/L total nitrogen limit initially, with the flexibility to meet a future anticipated goal of 4 mg/L. The Producer/Discharger does not describe how the treatment process will be changed to go from total nitrogen limit of 8 mg/L to 4 mg/L. In the development of the NPDES permit for the regional treatment plant, which the Water Board adopted in February 2008, the Water Board examined the ability of MBR technology to achieve nitrogen removal. The Water Board found that an MBR facility can meet a long-term average of 6.0 mg/L total nitrogen. Therefore, Water Board selected 6.0 mg/L as the long-term average of total nitrogen in the effluent.

To evaluate compliance for each monthly monitoring period, Water Board converts the long-term average to an average monthly effluent limitation, and if appropriate, a maximum daily effluent limitation through use of multiplier values. The generalized equations are the following:

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The multiplier values are determined using statistical methods found in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP)[1]. The multiplier values are essentially a function of two variables: (1) the variability of the data and (2) the number of samples collected in a month. Data variability is quantified using the coefficient of variation parameter, which is the sample standard deviation divided by the sample mean. The SIP has a lookup table that display multipliers as a function of the two variables. The SIP provides detailed instructions for the coefficient of variation calculation, and includes the statistical equations that are the basis for the multiplier values in the table.

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Average monthly effluent limitation	=	6 mg/L	×	1.55	=	**9.3 mg/L**

and

Maximum daily effluent limitation	=	6 mg/L	×	2.01	=	**12.1 mg/L**

[1] The SIP implements criteria for priority toxic pollutants contained in the California Toxics rule promulgated by the US EPA, as well as other toxic pollutant criteria and objectives, and does not apply specifically to discharges to groundwater. Nonetheless, the standardized approach set forth in the SIP for developing water quality-based effluent limitations is being used to develop effluent limitations in groundwater for total nitrogen and TDS because it provides useful guidance that is not theoretically limited to application to surface waters.

ENCLOSURE 3

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STATE WATER RESOURCES CONTROL BOARD

RESOLUTION NO. 68-16

STATEMENT OF POLICY WITH RESPECT TO
MAINTAINING HIGH QUALITY OF WATERS IN CALIFORNIA

WHEREAS the California Legislature has declared that it is the policy of the State that the granting of permits and licenses for unappropriated water and the disposal of wastes into the waters of the State shall be so regulated as to achieve highest water quality consistent with maximum benefit to the people of the State and shall be controlled so as to promote the peace, health, safety and welfare of the people of the State; and

WHEREAS water quality control policies have been and are being adopted for waters of the State; and

WHEREAS the quality of some waters of the State is higher than that established by the adopted policies and it is the intent and purpose of this Board that such higher quality shall be maintained to the maximum extent possible consistent with the declaration of the Legislature;

NOW, THEREFORE, BE IT RESOLVED:

1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.

2. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

3. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act.

BE IT FURTHER RESOLVED that a copy of this resolution be forwarded to the Secretary of the Interior as part of California's water quality control policy submission.

CERTIFICATION

The undersigned, Executive Officer of the State Water Resources Control Board, does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on October 24, 1968.

Dated: October 28, 1968

Kerry W. Mulligan
Executive Officer
State Water Resources
Control Board

ENCLOSURE 4

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STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 2013-0003

ADOPTION OF AN AMENDMENT TO THE POLICY FOR WATER QUALITY CONTROL FOR RECYCLED WATER CONCERNING MONITORING REQUIREMENTS FOR CONSTITUTENTS OF EMERGING CONCERN

WHEREAS:

1. Provisions of the Policy for Water Quality Control for Recycled Water (Recycled Water Policy), adopted under Resolution No. 2009-0011, directed the State Water Resources Control Board (State Water Board) to convene a "blue-ribbon" advisory panel (Panel) to provide guidance on future actions related to monitoring constituents of emerging concern (CECs) in recycled water.

2. In June 2010, the Panel submitted a report titled "Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel" (Report), which presented recommendations for monitoring CECs in municipal recycled water used for groundwater recharge.

3. In December 2010, the State Water Board held a public hearing regarding the Panel's Report and received public comments.

4. In May 2012, staff circulated a draft amendment to the Recycled Water Policy that: (1) proposed, in accordance with the Panel's recommendations, monitoring requirements for CECs and surrogates in recycled water used for groundwater recharge; and (2) proposed a reduction of priority pollutant monitoring of recycled water used for landscape irrigation.

5. In July 2012, a scientific peer review of the draft amendment and the Panel's Report was conducted.

6. Staff reviewed comments received on the draft amendment from the public and peer reviewers and issued a revised draft amendment on September 14, 2012. Written comments were received on this draft prior to an October 9, 2012, due date.

7. The State Water Board held a public hearing on October 16, 2012, to consider adoption of the draft amendment. At the hearing, the adoption was postponed to refine the responses to comments and allow additional time for public review.

8. The Natural Resources Agency has approved the State Water Board's and the Regional Water Quality Control Boards' water quality control planning process as a "certified regulatory program" that adequately satisfies the California Environmental Quality Act requirements for preparing environmental documents. The amendment concerns monitoring requirements for priority pollutants and constituents of emerging concern. It is not a "project" as defined by title 14, California Code of Regulations chapter 3, Guidelines for Implementation of the California Environmental Quality Act. Hence, approval of an environmental document is not required to adopt the amendment.

THEREFORE BE IT RESOLVED THAT:

The State Water Board

1. Adopts the amendment to the Recycled Water Policy.

2. Directs State Water Board Staff to submit the amended Recycled Water Policy to the Office of Administrative Law (OAL) for final approval.

3. Directs the Executive Director or designee to make minor, non-substantive modifications to the language of the amendment, if OAL determines during its approval process that such changes are needed; and directs the Executive Director to inform the State Water Board of any such changes.

CERTIFICATION

The undersigned Clerk to the Board does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the State Water Resources Control Board held on January 22, 2013.

AYE:	Vice Chair Frances Spivy-Weber Board Member Tam M. Doduc Board Member Steven Moore
NAY:	None
ABSENT:	Chairman Charles R. Hoppin Board Member Felicia Marcus
ABSTAIN:	None

Jeanine Townsend

Jeanine Townsend
Clerk to the Board

Recycled Water Policy

1. *Preamble*

California is facing an unprecedented water crisis.

The collapse of the Bay-Delta ecosystem, climate change, and continuing population growth have combined with a severe drought on the Colorado River and failing levees in the Delta to create a new reality that challenges California's ability to provide the clean water needed for a healthy environment, a healthy population and a healthy economy, both now and in the future.

These challenges also present an unparalleled opportunity for California to move aggressively towards a sustainable water future. The State Water Resources Control Board (State Water Board) declares that we will achieve our mission to "preserve, enhance and restore the quality of California's water resources to the benefit of present and future generations." To achieve that mission, we support and encourage every region in California to develop a salt/nutrient management plan by 2014 that is sustainable on a long-term basis and that provides California with clean, abundant water. These plans shall be consistent with the Department of Water Resources' Bulletin 160, as appropriate, and shall be locally developed, locally controlled and recognize the variability of California's water supplies and the diversity of its waterways. We strongly encourage local and regional water agencies to move toward clean, abundant, local water for California by emphasizing appropriate water recycling, water conservation, and maintenance of supply infrastructure and the use of stormwater (including dry-weather urban runoff) in these plans; these sources of supply are drought-proof, reliable, and minimize our carbon footprint and can be sustained over the long-term.

We declare our independence from relying on the vagaries of annual precipitation and move towards sustainable management of surface waters and groundwater, together with enhanced water conservation, water reuse and the use of stormwater. To this end, we adopt the following goals for California:

- Increase the use of recycled water over 2002 levels by at least one million acre-feet per year (afy) by 2020 and by at least two million afy by 2030.
- Increase the use of stormwater over use in 2007 by at least 500,000 afy by 2020 and by at least one million afy by 2030.
- Increase the amount of water conserved in urban and industrial uses by comparison to 2007 by at least 20 percent by 2020.
- Included in these goals is the substitution of as much recycled water for potable water as possible by 2030.

As modified by
State Water Board Resolution 2013-0003
(January 22, 2013)

The purpose of this Policy is to increase the use of recycled water from municipal wastewater sources that meets the definition in Water Code section 13050(n), in a manner that implements state and federal water quality laws. The State Water Board expects to develop additional policies to encourage the use of stormwater, encourage water conservation, encourage the conjunctive use of surface and groundwater, and improve the use of local water supplies.

When used in compliance with this Policy, 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. *Purpose of the Policy*

   a. The purpose of this Policy is to provide direction to the Regional Water Quality Control Boards (Regional Water Boards), proponents of recycled water projects, and the public regarding the appropriate criteria to be used by the State Water Board and the Regional Water Boards in issuing permits for recycled water projects.

   b. It is the intent of the State Water Board that all elements of this Policy are to be interpreted in a manner that fully implements state and federal water quality laws and regulations in order to enhance the environment and put the waters of the state to the fullest use of which they are capable.

   c. This Policy describes permitting criteria that are intended to streamline the permitting of the vast majority of recycled water projects. The intent of this streamlined permit process is to expedite the implementation 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.

   d. By prescribing permitting criteria that apply to the vast majority of recycled water projects, it is the State Water Board's intent to maximize consistency in the permitting of recycled water projects in California while also reserving to the Regional Water Boards sufficient authority and flexibility to address site-specific conditions.

   e. The State Water Board will establish additional policies that are intended to assist the State of California in meeting the goals established in the preamble to this Policy for water conservation and the use of stormwater.

f. 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, master reclamation permits, and waste discharge requirements.

3. *Benefits of Recycled Water*

The State Water Board finds that the use of recycled water in accordance with this Policy, that is, which supports the sustainable use of groundwater and/or surface water, which is sufficiently treated so as not to adversely impact public health or the environment and which ideally substitutes for use of potable water, is presumed to have a beneficial impact. 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).

4. *Mandate for the Use of Recycled Water*

a. 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.

(1) The State Water Board hereby establishes a mandate to increase the use of recycled water in California by 200,000 afy by 2020 and by an additional 300,000 afy by 2030. These mandates shall be achieved through the cooperation and collaboration of the State Water Board, the Regional Water Boards, the environmental community, water purveyors and the operators of publicly owned treatment works. The State Water Board will evaluate progress toward these mandates biennially and review and revise as necessary the implementation provisions of this Policy in 2012 and 2016.

(2) 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) The State Water Board hereby declares that, pursuant to Water Code sections 13550 *et seq.*, 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, subject to the conditions established in sections 13550 *et seq.* The State Water Board shall exercise its authority pursuant to Water Code section 275 to the fullest extent possible to enforce the mandates of this subparagraph.

b. These mandates are contingent on the availability of sufficient capital funding for the construction of recycled water projects from private, local, state, and federal sources and assume that the Regional Water Boards will effectively implement regulatory streamlining in accordance with this Policy.

c. The water industry and the environmental community have agreed jointly to advocate for $1 billion in state and federal funds over the next five years to fund projects needed to meet the goals and mandates for the use of recycled water established in this Policy.

d. The State Water Board requests the California Department of Public Health (CDPH), the California Public Utilities Commission (CPUC), and the California Department of Water Resources (CDWR) to use their respective authorities to the fullest extent practicable to assist the State Water Board and the Regional Water Boards in increasing the use of recycled water in California.

5. *Roles of the State Water Board, Regional Water Boards, CDPH and CDWR*

The State Water Board recognizes that it shares jurisdiction over the use of recycled water with the Regional Water Boards and with CDPH. In addition, the State Water Board recognizes that CDWR and the CPUC have important roles to play in encouraging the use of recycled water. The State Water Board believes that it is important to clarify the respective roles of each of these agencies in connection with recycled water projects, as follows:

a. The State Water Board establishes general policies governing the permitting of recycled water projects consistent with its role of protecting water quality and sustaining water supplies. The State Water Board exercises general oversight over recycled water projects, including review of Regional Water Board permitting practices, and shall lead the effort to meet the recycled water use goals set forth in the Preamble to this Policy. The State Water Board is also charged by statute with developing a general permit for irrigation uses of recycled water.

b. The CDPH is charged with protection of public health and drinking water supplies and with the development of uniform water recycling criteria appropriate to particular uses of water. Regional Water Boards shall appropriately rely on the expertise of CDPH for the establishment of permit conditions needed to protect human health.

c. The Regional Water Boards are charged with protection of surface and groundwater resources and with the issuance of permits that implement CDPH recommendations, this Policy, and applicable law and will, pursuant to paragraph 4 of this Policy, use their authority to the fullest extent possible to encourage the use of recycled water.

d. CDWR is charged with reviewing and, every five years, updating the California Water Plan, including evaluating the quantity of recycled water presently being used and planning for the potential for future uses of recycled water. In undertaking these tasks, CDWR may appropriately rely on urban water management plans and may share the data from those plans with the State Water Board and the Regional Water Boards. CDWR 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.

e. The CPUC is charged with approving rates and terms of service for the use of recycled water by investor-owned utilities.

6. *Salt/Nutrient Management Plans*

a. Introduction.

(1) Some groundwater basins in the state contain salts and nutrients that exceed or threaten to exceed water quality objectives established in the applicable Water Quality Control Plans (Basin Plans), and not all Basin Plans include adequate implementation procedures for achieving or ensuring compliance with the water quality objectives for salt or nutrients. These conditions can be caused by natural soils/conditions, discharges of waste, irrigation using surface water, groundwater or recycled water and water supply augmentation using surface or recycled water. Regulation of recycled water alone will not address these conditions.

(2) It is the intent of this Policy that salts and nutrients from all sources 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 State Water Board finds that the appropriate way to address salt and nutrient issues is through the development of regional or subregional salt and nutrient management plans

rather than through imposing requirements solely on individual recycled water projects.

b. Adoption of Salt/ Nutrient Management Plans.

(1) The State Water Board recognizes that, pursuant to the letter dated December 19, 2008 and attached to the Resolution adopting this Policy, the local water and wastewater entities, together with local salt/nutrient contributing stakeholders, will fund locally driven and controlled, collaborative processes open to all stakeholders that will prepare salt and nutrient management plans for each basin/sub-basin in California, including compliance with CEQA and participation by Regional Water Board staff.

(a) It is the intent of this Policy for every groundwater basin/sub-basin in California to have a consistent salt/nutrient management plan. The degree of specificity within these plans and the length of these 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. It is also the intent of the State Water Board 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 the salt/nutrient management plans is critical to the long-term sustainable use of water in California. Inclusion of stormwater recharge is consistent with State Water Board Resolution No. 2005-0006, which establishes sustainability as a core value for State Water Board programs and also assists in implementing Resolution No. 2008-0030, which requires sustainable water resources management and is consistent with Objective 3.2 of the State Water Board Strategic Plan Update dated September 2, 2008.

(b) Salt and nutrient plans shall be tailored to address the water quality concerns in each basin/sub-basin and may include constituents other than salt and nutrients that impact water quality in the basin/sub-basin. Such plans shall address and implement provisions, as appropriate, for all sources of salt and/or nutrients to groundwater basins, including recycled water irrigation projects and groundwater recharge reuse projects.

(c) Such plans may be developed or funded pursuant to the provisions of Water Code sections 10750 *et seq.* or other appropriate authority.

(d) Salt and nutrient plans shall be completed and proposed to the Regional Water Board within five years from the date of this Policy unless a Regional Water Board finds that the stakeholders are making substantial progress towards completion of a plan. In no case shall the period for the completion of a plan exceed seven years.

(e) The requirements of this paragraph shall not apply to areas that have already completed a Regional Water Board approved salt and nutrient plan for a basin, sub-basin, or other regional planning area that is functionally equivalent to paragraph 6(b)3.

(f) The plans may, depending upon the local situation, address constituents other than salt and nutrients that adversely affect groundwater quality.

(2) Within one year of the receipt of a proposed salt and nutrient management plan, the Regional Water Boards shall consider for adoption revised implementation plans, consistent with Water Code section 13242, for those groundwater basins within their regions where water quality objectives for salts or nutrients are being, or are threatening to be, exceeded. The implementation plans shall be based on the salt and nutrient plans required by this Policy.

(3) Each salt and nutrient management plan shall include the following components:

(a) A basin/sub-basin wide monitoring plan that includes an appropriate network of monitoring locations. The scale of the basin/sub-basin monitoring plan is dependent upon the site-specific conditions and shall be adequate to provide a reasonable, cost-effective means of determining whether the concentrations of salt, nutrients, and other constituents of concern as identified in the salt and nutrient plans are consistent with applicable water quality objectives. Salts, nutrients, and the constituents identified in paragraph 6(b)(1)(f) shall be monitored. The frequency of monitoring shall be determined in the salt/nutrient management plan and approved by the Regional Water Board pursuant to paragraph 6(b)(2).

(i) The monitoring plan must be designed to determine water quality in the basin. The plan must focus on basin water quality near 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.

(ii) The preferred approach to monitoring plan development is to collect samples from existing wells if feasible as long as the existing wells are located appropriately to determine water quality throughout the most critical areas of the basin.

(iii) The monitoring plan shall identify those stakeholders responsible for conducting, compiling, and reporting the monitoring data. The data shall be reported to the Regional Water Board at least every three years.

(b) A provision for annual monitoring of Constituents of Emerging Concern (e.g., endocrine disrupters, personal care products or pharmaceuticals) (CECs) consistent with recommendations by CDPH and consistent with any actions by the State Water Board taken pursuant to paragraph 10(b) of this Policy.

(c) Water recycling and stormwater recharge/use goals and objectives.

(d) Salt and nutrient source identification, basin/sub-basin assimilative capacity and loading estimates, together with fate and transport of salts and nutrients.

(e) Implementation measures to manage salt and nutrient loading in the basin on a sustainable basis.

(f) An antidegradation analysis demonstrating that the projects included within the plan will, collectively, satisfy the requirements of Resolution No. 68-16.

(4) 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 full compliance with the process for such modification as established by existing law.

7. *Landscape Irrigation Projects*[1]

a. *Control of incidental runoff.* Incidental runoff is defined as 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 part of the facility design, if it is due to excessive application, if it is due to intentional overflow or application, or if it is due to negligence. Incidental runoff may be regulated by waste discharge requirements or, where necessary, waste discharge requirements that serve as a National Pollutant Discharge Elimination System (NPDES) permit, including municipal separate storm water system permits, but regardless of the regulatory instrument, the project shall include, but is not limited to, the following practices:

(1) Implementation of an operations and management plan that may apply to multiple sites and provides for detection of leaks, (for example, from broken sprinkler heads), and correction either within 72 hours of learning of the runoff, or prior to the release of 1,000 gallons, whichever occurs first,

(2) Proper design and aim of sprinkler heads,

(3) Refraining from application during precipitation events, and

(4) Management of any ponds containing recycled water such that no discharge occurs unless the discharge is a result of a 25-year, 24-hour storm event or greater, and there is notification of the appropriate Regional Water Board Executive Officer of the discharge.

b. *Streamlined Permitting.*

(1) The Regional Water Boards shall, absent unusual circumstances (i.e., unique, site-specific conditions such as where recycled water is proposed to be used for irrigation over high transmissivity soils

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[1] Specified uses of recycled water considered "landscape irrigation" projects include any of the following:
i. Parks, greenbelts, and playgrounds;
ii. School yards;
iii. Athletic fields;
iv. Golf courses;
v. Cemeteries;
vi. Residential landscaping, common areas;
vii. Commercial landscaping, except eating areas;
viii. Industrial landscaping, except eating areas; and
ix. Freeway, highway, and street landscaping.

over a shallow (5' or less) high quality groundwater aquifer), permit recycled water projects that meet the criteria set forth in this Policy, consistent with the provisions of this paragraph.

(2) If the Regional Water Board determines that unusual circumstances apply, the Regional Water Board shall make a finding of unusual circumstances based on substantial evidence in the record, after public notice and hearing.

(3) Projects meeting the criteria set forth below and eligible for enrollment under requirements established in a general order shall be enrolled by the State or Regional Water Board within 60 days from the date on which an application is deemed complete by the State or Regional Water Board. For projects that are not enrolled in a general order, the Regional Water Board shall consider permit adoption within 120 days from the date on which the application is deemed complete by the Regional Water Board.

(4) Landscape irrigation projects that qualify for streamlined permitting shall not be required to include a project specific receiving water and groundwater monitoring component unless such project specific monitoring is required under the adopted salt/nutrient management plan. During the interim while the salt management plan is under development, a landscape irrigation project proponent can either perform project specific monitoring, or actively participate in the development and implementation of a salt/nutrient management plan, including basin/sub-basin monitoring. Permits or requirements for landscape irrigation projects shall include, in addition to any other appropriate recycled water monitoring requirements, monitoring for priority pollutants in the recycled water at the recycled water production facility once per year, except when the recycled water production facility has a design production flow for the entire water reuse system of one million gallons per day or less. For these smaller facilities, the recycled water shall be monitored for priority pollutants once every five years.

(5) It is the intent of the State Water Board that the general permit for landscape irrigation projects be consistent with the terms of this Policy.

c. *Criteria for streamlined permitting.* Irrigation projects using recycled water that meet the following criteria are eligible for streamlined permitting, and, if otherwise in compliance with applicable laws, shall be approved absent unusual circumstances:

(1) Compliance with the requirements for recycled water established in Title 22 of the California Code of Regulations, including the requirements for treatment and use area restrictions, together with any other recommendations by CDPH pursuant to Water Code section 13523.

(2) Application in amounts and at rates as needed for the landscape (i.e., at agronomic rates and not when the soil is saturated). Each irrigation project shall be subject to an operations and management plan, that may apply to multiple sites, provided to the Regional Water Board that specifies the agronomic rate(s) and describes a set of reasonably practicable measures to ensure compliance with this requirement, which may include the development of water budgets for use areas, site supervisor training, periodic inspections, tiered rate structures, the use of smart controllers, or other appropriate measures.

(3) Compliance with any applicable salt and nutrient management plan.

(4) Appropriate use of fertilizers that takes into account the nutrient levels in the recycled water. Recycled water producers shall monitor and communicate to the users the nutrient levels in their recycled water.

8. *Recycled Water Groundwater Recharge Projects*

   a. The State Water Board acknowledges that all recycled water groundwater recharge projects must be reviewed and permitted on a site-specific basis, and so such projects will require project-by-project review.

   b. Approved groundwater recharge projects will meet the following criteria:

      (1) Compliance with regulations adopted by CDPH for groundwater recharge projects or, in the interim until such regulations are approved, CDPH's recommendations pursuant to Water Code section 13523 for the project (e.g., level of treatment, retention time, setback distance, source control, monitoring program, etc.).

      (2) Implementation of a monitoring program for CECs that is consistent with Attachment A and any recommendations from CDPH. Groundwater recharge projects shall include monitoring of recycled water for priority pollutants twice per year.

   c. Nothing in this paragraph 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 CDPH, consistent with State Water Board Orders WQ 2005-0007 and 2006-0001.

   d. 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.

   e. 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 recommendations from CDPH. Furthermore, the Regional Water Board shall give a high priority to review and approval of such projects.

9. *Antidegradation*

   a. The State Water Board adopted Resolution No. 68-16 as a policy statement to implement the Legislature's intent that waters of the state shall be regulated to achieve the highest water quality consistent with the maximum benefit to the people of the state.

b. Activities involving the disposal of waste that could impact high quality waters are required to implement best practicable treatment or control of the discharge necessary to ensure that pollution or nuisance will not occur, and the highest water quality consistent with the maximum benefit to the people of the state will be maintained.

c. 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, the State Water Board finds that groundwater recharge projects using recycled water have the potential to lower water quality within a basin. The proponent of a groundwater recharge project must demonstrate compliance with Resolution No. 68-16. Until such time as a salt/nutrient management plan is in effect, such compliance may be demonstrated as follows:

(1) A project that utilizes less than 10 percent of the available assimilative capacity in a basin/sub-basin (or multiple projects utilizing less than 20 percent of the available assimilative capacity in a basin/sub-basin) need only conduct an antidegradation analysis verifying the use of the assimilative capacity. For those basins/sub-basins 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 such time as the salt/nutrient plan is approved by the Regional Water Board and is in effect. 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/sub-basin, either over the most recent five years of data available or using a data set approved by the Regional Water Board Executive Officer. 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.

(2) In the event a project or multiple projects utilize more than the fraction of the assimilative capacity designated in subparagraph (1), then a Regional Water Board-deemed acceptable antidegradation analysis shall be performed to comply with Resolution No. 68-16. 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 by the State Water Board in connection with Resolution No. 2004-0060 and the Regional Water Board in connection with Resolution No. R8-2004-0001. An

integrated approach (using surface water, groundwater, recycled water, stormwater, pollution prevention, water conservation, etc.) to the implementation of Resolution No. 68-16 is encouraged.

d. Landscape irrigation with recycled water in accordance with this Policy is to the benefit of the people of the State of California. Nonetheless, the State Water Board finds that the use of water for irrigation may, regardless of its source, collectively affect groundwater quality over time. The State Water Board intends to address these impacts in part through the development of salt/nutrient management plans described in paragraph 6.

(1) A project that meets the criteria for a streamlined irrigation permit and is within a basin where a salt/nutrient management plan satisfying the provisions of paragraph 6(b) is in place may be approved without further antidegradation analysis, provided that the project is consistent with that plan.

(2) A project that meets the criteria for a streamlined irrigation permit and is within a basin where a salt/nutrient management plan satisfying the provisions of paragraph 6(b) is being prepared may be approved by the Regional Water Board by demonstrating through a salt/nutrient mass balance or similar analysis that the project uses less than 10 percent of the available assimilative capacity as estimated by the project proponent in a basin/sub-basin (or multiple projects using less than 20 percent of the available assimilative capacity as estimated by the project proponent in a basin/sub-basin).

10. *Constituents of Emerging Concern*

a. General Provisions

(1) Regulatory requirements for recycled water shall be based on the best available peer-reviewed science. In addition, all uses of recycled water must meet conditions set by CDPH.

(2) Knowledge of risks will change over time and recycled water projects must meet legally applicable criteria. However, when standards change, projects should be allowed time to comply through a compliance schedule.

(3) The state of knowledge regarding CECs is incomplete. There needs to be additional research and development of analytical methods and surrogates to determine potential environmental and public health impacts. Agencies should minimize the likelihood of

CECs impacting human health and the environment by means of source control and/or pollution prevention programs.

(4) Regulating most CECs will require significant work to develop test methods and more specific determinations as to how and at what level CECs impact public health or our environment.

b. Research Program

(1) The State Water Board, in consultation with CDPH, convened a "blue-ribbon" advisory panel to guide future actions relating to CECs.

(a) The panel was actively managed by the State Water Board and was composed of the following: one human health toxicologist, one environmental toxicologist, one epidemiologist, one biochemist, one civil engineer familiar with the design and construction of recycled water treatment facilities, and one chemist familiar with the design and operation of advanced laboratory methods for the detection of emerging constituents. Each of these panelists had extensive experience as a principal investigator in their respective areas of expertise.

(b) The panel reviewed the scientific literature and submitted a report to the State Water Board and CDPH that described the current state of scientific knowledge regarding the risks of CECs to public health and the environment. In December 2010, the State Water Board, in coordination with CDPH, held a public hearing to hear a presentation on the report and to receive comments from stakeholders.

(c) The State Water Board considered the panel report and the comments received and adopted an amendment to the Policy establishing monitoring requirements for CECs in recycled water. These monitoring requirements are prescribed in Attachment A.

(2) The panel or a similarly constituted panel shall update the report every five years. The next update is due in June 2015.

(a) Each updated report shall recommend actions that the State of California should take to improve our understanding of CECs and, as may be appropriate, to protect public health and the environment.

(b) The updated reports shall answer the following questions: What are the appropriate constituents to be monitored in recycled water, including analytical methods and method detection limits? What is the known toxicological information for the above constituents? Would the above lists change based on level of treatment and use? If so, how? What are possible indicators that represent a suite of CECs? What levels of CEC's should trigger enhanced monitoring of CEC's in recycled water, groundwater and/or surface waters?

(c) Within six months from receipt of an updated 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.

c. Permit Provisions

Permits for recycled water projects shall be consistent with any CDPH recommendations to protect public health and the monitoring requirements prescribed in Attachment A.

11. *Incentives for the Use of Recycled Water*

a. Funding

The State Water Board will request CDWR to provide priority funding for projects that have major recycling components; particularly those that decrease demand on potable water supplies. The State Water Board will also request priority funding for stormwater recharge projects that augment local water supplies. The State Water Board shall promote the use of the State Revolving Fund (SRF) for water purveyor, stormwater agencies, and water recyclers to use for water reuse and stormwater use and recharge projects.

b. Stormwater

The State Water Board strongly encourages all water purveyors to provide financial incentives for water recycling and stormwater recharge and reuse projects. The State Water Board also encourages the Regional Water Boards to require less stringent monitoring and regulatory requirements for stormwater treatment and use projects than for projects involving untreated stormwater discharges.

c. TMDLs

Water recycling reduces mass loadings from municipal wastewater sources to impaired waters. As such, waste load allocations shall be assigned as appropriate by the Regional Water Boards in a manner that provides an incentive for greater water recycling.

ATTACHMENT A

REQUIREMENTS FOR MONITORING CONSTITUENTS OF EMERGING CONCERN FOR RECYCLED WATER

The purpose of this attachment to the Recycled Water Policy (Policy) is to provide direction to the Regional Water Quality Control Boards (Regional Water Boards) on monitoring requirements for constituents of emerging concern[1] (CECs) in recycled municipal wastewater, herein referred to as "recycled water." The monitoring requirements and criteria for evaluating monitoring results in the Policy are based on recommendations from a Science Advisory Panel[2]. The monitoring requirements pertain to the production and use of recycled water for groundwater recharge reuse[3] by surface and subsurface application methods. The monitoring requirements apply to recycled water producers, including entities that further treat or enhance the quality of recycled water supplied by municipal wastewater treatment facilities, and groundwater recharge reuse facilities.

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. 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.

The California Department of Public Health (CDPH) shall be consulted for any additional monitoring requirements for recycled water use found necessary by CDPH to protect human health.

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[1] For this Policy, CECs are defined to be chemicals in personal care products, pharmaceuticals including antibiotics, antimicrobials; industrial, agricultural, and household chemicals; hormones; food additives; transformation products, inorganic constituents; and nanomaterials.

[2] The Science Advisory Panel was convened in accordance with provision 10.b. of the Policy. The panel's recommendations were presented in the report; *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

[3] As used in this attachment, use of recycled water for groundwater recharge reuse has the same meaning as indirect potable reuse for groundwater recharge as defined in Water Code section 13561(c), where it is defined 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.

1. CECS AND SURROGATES

Within this Policy, CECs of toxicological relevance to human health are referred to as "health-based CECs."[4] CECs determined not to have human health relevance, but useful for monitoring treatment process effectiveness, are referred to as "performance indicator CECs." A performance indicator CEC is an individual CEC used for evaluating a family of CECs with similar physicochemical or biodegradable characteristics. The removal of a performance indicator CEC through a treatment process provides an indication of removal of CECs with similar properties. A health-based CEC may also serve as a performance indicator CEC.

A surrogate is a measurable physical or chemical property, such as chlorine residual or electrical conductivity, 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. A reverse osmosis (RO) treatment process, for example, is expected to substantially reduce the electrical conductivity of the recycled water being treated. This reduction in the level of the surrogate also provides an indication that inorganic and organic compounds, including CECs, are being removed.

Recycled water monitoring programs used for groundwater recharge reuse shall include monitoring for: (1) human health-based CECs; (2) performance indicator CECs; and (3) surrogates. The purpose of monitoring performance indicator CECs and surrogates is to assess the effectiveness of unit processes to remove CECs. For this policy for groundwater recharge reuse, unit processes that remove CECs include RO, advanced oxidation processes (AOPs), and soil aquifer treatment.[5] AOPs are treatment processes involving the use of oxidizing agents, such as hydrogen peroxide and ozone, combined with ultraviolet light irradiation. Soil aquifer treatment is a natural treatment process that removes CECs as water passes through soil, the vadose zone, and within an aquifer.

This Policy provides CEC monitoring requirements for recycled water which undergoes additional treatment by soil aquifer treatment or by RO followed by AOPs. CEC monitoring requirements for groundwater recharge reuse projects implementing treatment processes that provide control of CECs by processes other than soil aquifer treatment or RO/AOPs shall be established on a case-by-case basis by the State Water Board in consultation with CDPH.

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[4] Heath-based CECs were determined through a screening process that was developed and conducted by the CEC Science Advisory Panel; *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

[5] For evaluating removal of CECs, the treatment zone for soil aquifer treatment is from the surface of the application area through the unsaturated zone to groundwater, including groundwater within a 30-day travel time distance through the aquifer downgradient of the surface application area.

Monitoring of health-based CECs or performance indicator CECs is not required for recycled water used for landscape irrigation due to the low risk for ingestion of the water.[6]

1.1. CECs for Monitoring Programs

This Policy provides requirements for monitoring CECs in recycled water used for groundwater recharge reuse. 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 CDPH or requested by the project proponent.

Table 1 provides the health-based CECs and performance indicator CECs to be monitored along with their respective reporting limits. All CECs listed for a recycled water application shall be monitored during an initial assessment monitoring phase, as described in Section 3.1. Based on monitoring results and findings, the list of performance indicator CECs required for monitoring may be refined for subsequent monitoring phases. The health-based CECs listed in Table 1 shall be monitored during the entirety of the initial assessment and baseline monitoring phases (Sections 3.1 and 3.2). Based on the results of the baseline monitoring phase and/or subsequent monitoring, the list of health-based CECs required for monitoring may be revised. The method for evaluation of monitoring results for health-based CECs is provided in Section 4.2.

Quality assurance and quality control measures shall be used for both collection of samples and laboratory analysis work. The project proponent shall develop a quality assurance project plan that includes the appropriate number of field blanks, laboratory blanks, replicate samples, and matrix spikes.

[6] "For monitoring programs to assess CEC threats for urban irrigation reuse, none of the chemicals for which measurement methods and exposure data are available exceeded the threshold for monitoring priority. This is largely attributable to higher Monitoring Trigger Levels (MTLs), because of reduced water ingestion in a landscape irrigation setting compared to drinking water." MTLs are health-based screening level values for CECs for a particular water reuse scenario. MTLs were established in, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.

Table 1 – CECs to be Monitored

Constituent	Constituent Group	Relevance/Indicator Type	Reporting Limit (µg/L)
GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
N-Nitrosodimethylamine (NDMA)	Disinfection byproduct	Health	0.002
Triclosan	Antimicrobial	Health	0.05
Gemfibrozil	Pharmaceutical	Performance	0.01
Iopromide	Pharmaceutical	Performance	0.05
N,N-Diethyl-meta-toluamide (DEET)	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION			
17β-estradiol	Steroid hormones	Health	0.001
Caffeine	Stimulant	Health & Performance	0.05
NDMA	Disinfection byproduct	Health & Performance	0.002
Triclosan	Antimicrobial	Health	0.05
DEET	Personal care product	Performance	0.05
Sucralose	Food additive	Performance	0.1

µg/L – Micrograms per liter

Analytical methods for laboratory analysis of CECs shall be selected to achieve the reporting limits presented in Table 1. The analytical methods shall be based on methods published by the United States Environmental Protection Agency, methods certified by CDPH, or peer reviewed and published methods that have been reviewed by CDPH, including those published by voluntary consensus standards bodies such as the Standards Methods Committee and the American Society for Testing and Materials International. Any modifications to the published or certified methods shall be reviewed by CDPH and subsequently submitted to the Regional Water Board in an updated quality assurance project plan.

1.2. Surrogates for Monitoring Programs

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

Table 2: Surrogates

GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION
Ammonia
Total Organic Carbon (TOC)
Nitrate
Ultraviolet (UV) Light Absorption
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION
Electrical Conductivity
TOC

The project proponent shall propose surrogates to monitor on a case-by-case basis appropriate for the treatment process or processes. The Regional Water Board shall review and approve the selected surrogates in consultation with CDPH.

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.

2. MONITORING LOCATIONS

Monitoring locations for CECs and surrogates are described in this section.

2.1. Health-Based CEC Monitoring Locations

2.1.1. Groundwater Recharge Reuse - Surface Application

For groundwater recharge reuse projects implementing surface application of recycled water, health-based CECs shall be monitored at these locations:

(1) Following tertiary treatment[7] prior to application to the surface spreading area; and

(2) At monitoring well locations designated in consultation with CDPH within the distance groundwater travels downgradient from the application site in 30 days.

[7] Standards for disinfected tertiary recycled water presented in California Code of Regulations, Title 22, section 60301.230 and 60301.320.

Monitoring locations for health-based CECs for the phases of monitoring are presented in Tables 3 through 5.

2.1.2. Groundwater Recharge Reuse - Subsurface Application

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

2.2. Performance Indicator CEC and Surrogate Monitoring Locations

To allow evaluation of individual unit processes or a combination of unit processes that provide removal of CECs, performance indicator CECs and surrogates shall be monitored at the locations described below and presented in Tables 3 through 5.

2.2.1. Groundwater Recharge Reuse - Surface Application

For groundwater recharge reuse projects using surface application of recycled water, performance indicator CECs and surrogates shall be monitored at these locations:

(1) Following tertiary treatment prior to application to the surface spreading area; and

(2) At monitoring well locations designated in consultation with CDPH within the distance groundwater travels downgradient from the application site in 30 days.

Monitoring locations for performance indicator CECs and surrogates for the phases of monitoring are presented in Tables 3 through 5.

2.2.2. Groundwater Recharge Reuse - Subsurface Application

For groundwater recharge reuse 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 to the aquifer.

If the project proponent 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 reuse projects using subsurface application of recycled water, surrogates shall be monitored at locations proposed by the project proponent and approved by the Regional Water Board in consultation with CDPH.

3. PHASED MONITORING REQUIREMENTS

The Regional Water Board shall phase the monitoring requirements for CECs and surrogates for groundwater recharge reuse projects. The purpose of phased monitoring is to allow monitoring requirements for health-based CECs, performance indicator CECs and surrogates 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 CDPH approval for groundwater recharge reuse project operation.

3.1. 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;[8] (2) determine treatment effectiveness; (3) define the project-specific performance indicator CECs and surrogates to monitor during the baseline phase; and (4) specify the expected removal percentages for performance indicator CECs and surrogates. 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 and surrogates have not been assessed equivalent to the requirements of this Policy. Data from prior assessment need not replicate the exact frequency and duration of the initial assessment phase requirements specified in Table 3, if the overall robustness and size of the data are sufficient to adequately characterize the CECs, surrogates, 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 Section 1.2) shall be monitored. 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 monitoring programs for the baseline and standard operation phases. Monitoring requirements for the initial assessment phase are summarized in Table 3.

For existing groundwater recharge reuse projects, 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

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

assessment phase requirements of this Policy may skip the initial monitoring phase and initiate the baseline monitoring phase requirements in Section 3.2.
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 CDPH 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 4.

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.

3.2. 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 and surrogates 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 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 4. If a performance indicator CEC listed in Table 1 is found not to be a good indicator, the project proponent 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 CDPH.

For existing groundwater recharge reuse projects, historic monitoring data may be used to assess removal of health-based CECs, performance indicator CECs and surrogates. Existing projects 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 CDPH 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 4.

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.

Table 3: Initial Assessment Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse- 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 CDPH.[2]
	Surrogates: To be selected on a project-specific basis.[5]	1st 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 CDPH.[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 CDPH.[2]
Groundwater Recharge Reuse -Subsurface Application	Health-Based CECs: All listed in Table 1.	Quarterly[1]	Following treatment prior to release to the aquifer.
	Performance Indicator CECs: All listed in Table 1.	Quarterly[1]	- Prior to RO treatment.[4] - Following treatment prior to release to the aquifer.
	Surrogates: To be selected on a project-specific basis.[5]	To be determined on a project-specific basis.	- At locations approved by the Regional Water Board.[6]

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 Section 3.1.
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 CDPH. 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 project proponent 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 Section 1.2 for guidance on selection of surrogates.
6 – See Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

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Table 4: Baseline Phase Monitoring Requirements

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse – Surface Application	Health-Based CECs: All listed in Table 1. Performance Indicator CECs: Selected based on the findings of the initial assessment phase.	Semi-Annually[1]	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[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 CDPH.[2]
Groundwater Recharge Reuse – Subsurface Application	Health-Based CECs: All listed in Table 1.	Semi-Annually[1]	Following treatment prior to release to the aquifer.
	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.
	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]

1 – More frequent monitoring may be required to respond to a concern as stated in Section 3.2.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – If the project proponent 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 Section 2.2.2 for information on surrogate monitoring locations for subsurface application.

3.3. Standard Operation Monitoring

Based on the findings of the baseline monitoring phase, monitoring requirements for health-based CECs, performance indicator CECs and surrogates may be refined to establish project-specific requirements for monitoring the standard operating conditions of a groundwater recharge reuse project. Monitoring requirements for the standard operation phase are summarized in Table 5. 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 7. 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 project proponent 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 CDPH.

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 and performance indicator CECs 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 on an annual basis. Monitoring frequencies for CECs and surrogates for standard operation monitoring are presented in Table 5.

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 CDPH 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 4.

Table 5: Standard Operation Monitoring Requirement

Recycled Water Use	Constituent	Frequency	Monitoring Point
Groundwater Recharge Reuse - 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. - At monitoring well locations designated in consultation with CDPH.[2]
	Performance Indicator CECs: Selected based on the findings of the baseline phase.		
	Surrogates: Selected based on the findings of the baseline phase.	Based on findings of the baseline assessment phase.	- Following tertiary treatment prior to application to the surface spreading area. - At monitoring well locations designated in consultation with CDPH.[2]
Groundwater Recharge Reuse - 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.
	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.
	Surrogates: Selected based on the findings of the baseline phase,	Based on findings of the baseline assessment phase.	At locations approved by the Regional Water Board.[4]

1 – More frequent monitoring may be required to respond to a concern as stated in Section 3.3.
2 – Groundwater within the distance groundwater travels downgradient from the application site in 30-days.
3 – If the project proponent 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 Section 2.2.2 for information on surrogate monitoring locations for subsurface application

4. EVALUATION OF CEC AND SURROGATE MONITORING RESULTS

This section presents the approaches for evaluating treatment process performance and health-based CEC 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 monitoring results, a multi-tiered approach of thresholds and corresponding response actions is presented in Section 4.2. The evaluation of monitoring results shall be included in monitoring reports submitted to the Regional Water Board and CDPH.

4.1 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 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 from Drews et. al. (2008) for each application scenario and their associated processes (i.e. soil aquifer treatment or RO/AOPs) is presented in Table 6. The established removal percentages for each project shall be used to evaluate treatment effectiveness and operational performance.

4.1.1. Groundwater Recharge Reuse – Surface Application

For groundwater recharge reuse 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 in consultation with CDPH. The removal percentage shall be adjusted to account for dilution from potable water applied to the application site, storm water applied to the application site, and native groundwater. The removal percentage shall also be adjusted to account for CECs in these waters. The project proponent shall submit a proposal to the Regional Water Board and CDPH as part of its operation plan on how it will perform this accounting.

4.1.2. Groundwater Recharge Reuse – Subsurface Application

For groundwater recharge reuse 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 to the aquifer.

Table 6: Monitoring Trigger Levels and Removal Percentages

Constituent/ Parameter	Relevance/Indicator Type/Surrogate	Monitoring Trigger Level (micrograms/liter)[1]	Removal Percentages (%)[2]
GROUNDWATER RECHARGE REUSE - SURFACE APPLICATION[3]			
17β-estradiol	Health	0.0009	--[4]
Caffeine	Health & Performance	0.35	>90
NDMA	Health	0.01	--
Triclosan	Health	0.35	--
Gemfibrozil	Performance	--	>90
Iopromide	Performance	--	>90
DEET	Performance	--	>90
Sucralose	Performance	--	<25[5]
Ammonia	Surrogate	--	>90
TOC	Surrogate	--	>30
Nitrate	Surrogate	--	>30
UV Absorption	Surrogate	--	>30
GROUNDWATER RECHARGE REUSE - SUBSURFACE APPLICATION[6]			
17β-estradiol	Health	0.0009	--
Caffeine	Health & Performance	0.35	>90
NDMA	Health & Performance	0.01	25-50, >80[7]
Triclosan	Health	0.35	--
DEET	Performance	--	>90
Sucralose	Performance	--	>90
Electrical Conductivity	Surrogate	--	>90
TOC	Surrogate	--	>90

1 – Monitoring trigger levels for groundwater recharge reuse and landscape irrigation applications were established in *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.
2 –The removal percentages presented in this table are from work by Drewes et.al. (2008) and provide an example of performance for that specific research. Project specific removal percentages will be developed for each groundwater recharge reuse 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: Reverse osmosis and advanced oxidation process.
7 – For treatment using reverse osmosis, removal percentage is between 25 and 50 percent. For treatment using reverse osmosis and advanced oxidation processes, removal percentage is greater than 80 percent.

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4.2. Evaluation of Health-Based CEC Results

The project proponent shall evaluate health-based CEC monitoring results. To determine the appropriate response actions, the project proponent shall compare measured environmental concentrations (MECs) to their respective monitoring trigger levels[9] (MTLs) listed in Table 6 to determine MEC/MTL ratios. The project proponent shall compare the calculated MEC/MTL ratios to the thresholds presented in Table 7 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 projects, results shall be evaluated for the recycled water released to the aquifer.

Table 7: MEC/MTL Thresholds and Response Actions

MC/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/MLT ratio is greater than 10 and less than or equal to 100 -	D) Resample immediately and analyze to confirm CEC result. Continue to monitor.
If MEC/MLT ratio is greater than 100 -	E) Resample immediately and analyze to confirm result. Continue to monitor. Contact the Regional Water Board and CDPH 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.)

[9] Monitoring Trigger Level (MTL): Health-based screening level value for a CEC for a particular water reuse scenario. MTLs were established in, *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in Recycled Water – Recommendations of a Science Advisory Panel*, dated June 25, 2010.