INITIAL STATEMENT OF REASONS
Direct Potable Reuse Regulations
Title 22, California Code of Regulations

SUMMARY OF PROPOSAL/PURPOSE

The State Water Resources Control Board (State Board) proposes to adopt regulations governing the planned use of municipal wastewater to produce water that is used to augment a source of supply for a public water system's drinking water treatment plant or placed into a public water system's drinking water distribution system, a process known as direct potable reuse (DPR). The State Board is required by Water Code section 13561.2 to adopt uniform water recycling criteria for DPR through raw water augmentation by December 31, 2023, subject to the condition that a statutorily mandated expert review panel has made a finding that such criteria would adequately protect public health. The regulations are proposed for the purpose of meeting the statutory mandate.

PROBLEM STATEMENT

The objective of the California Safe Drinking Water Act (SDWA) is to ensure that a public water system reliably delivers water for human consumption that is, at all times, pure, wholesome, and potable. A number of water resource challenges make it difficult to meet that objective. Those challenges include the limited availability of new sources of drinking water from surface waters, overuse of groundwater sources and consequent reduction in water available for use as drinking water, and the projected effects of climate change, including the potential for more frequent severe droughts, against the backdrop of population growth. To address these challenges in meeting the central mandate of the SDWA, the California Water Plan and the California Water Resilience Portfolio outline a variety of actions the State will take to better manage water resources, including increased use of treated wastewater. Direct potable reuse – where municipal wastewater, after appropriate treatment, is used by a public water system as a drinking water or a supply for a drinking water treatment plant – is a means to help address the challenges.

BENEFITS

The anticipated benefits from the proposed regulatory action include the following:

- Providing safe drinking water and a safe drinking water supply for Californians.
- Providing a relatively reliable, drought-proof, and sustainable option for drinking water or a drinking water supply.

- Providing an additional means for increased beneficial use of recycled water in California.

- Although the absence of DPR regulations would not preclude the permitting of DPR projects, adoption of uniform criteria in the form of the proposed DPR regulations is expected to streamline the permitting process.

- Compliance with a statutory requirement (Health and Safety Code, § 13561.2, subdivision (a)).

BACKGROUND / AUTHORITY

Drinking Water (Safe Drinking Water Act, Health and Safety Code, § 116270 et seq.)
All public water systems are subject to regulations adopted by the U.S. EPA under the U.S. Safe Drinking Water Act (SDWA) of 1974, as amended (42 U.S.C. § 300f et seq.), as well as by the State Board under the California SDWA (Health and Safety Code, div. 104, pt. 12, ch. 4, § 116270 et seq.). Pursuant to section 116270 of the Health and Safety Code, it is the objective of the California SDWA for a public water system to deliver drinking water to consumers that is, at all times, pure, wholesome, and potable. The ability to meet this objective is a reflection of the water quality and quantity of a public water system's source of supply, the public water system's ability to treat the source of supply (if necessary), and its ability to deliver drinking water, all in a manner that ensures compliance with all applicable drinking water standards. Section 116375 of the Health and Safety Code authorizes the State Department of Public Health to administer the California SDWA and all provisions related to the regulation of drinking water to protect public health. Health and Safety Code section 116271 transferred this function of the State Department of Public Health Drinking Water Program to the State Board Division of Drinking Water.

Recycled Water and Potable Reuse (Water Code, § 13520 et seq.)
Pursuant to sections 13521 and 13561.2 of the Water Code, and sections 116271 and 116375 of the Health and Safety Code, the State Board has authority to adopt the subject regulations. Water Code section 13521 authorizes the State Department of Public Health to establish uniform statewide recycling criteria for each varying type of use of recycled water where the use involves the protection of public health. Health and Safety Code section 116271 transferred this function and authority of the State Department of Public Health Drinking Water Program to the State Board Division of Drinking Water. Water Code section 13561.2 requires the State Board to adopt uniform water recycling criteria for direct potable reuse, which is the planned introduction of recycled water either directly into a public water system or into a raw water supply immediately upstream of a water treatment plant.

Regulation of Direct Potable Reuse (Water Code, § 13561.2)

In September 2010, Senate Bill 918 (SB 918) was signed by the Governor and filed with the Secretary of State, establishing Chapter 7.3 ("Direct and Indirect Potable Reuse"), under Division 7 of the Water Code. Specific to the proposed DPR regulations and among other things, SB 918 provided a definition of direct potable reuse and mandated that the Department of Public Health (since transferred to the State Board in 2014):

- Investigate and report to the Legislature on the feasibility of developing uniform water recycling criteria for direct potable reuse, considering among other things the availability and reliability of treatment technologies necessary to protect public health, multiple barriers and sequential treatment processes, mechanisms that should be employed to protect public health if problems are found in the recycled water served to the public as a potable water supply including failure of treatment, and monitoring needed to ensure protection of public health (Water Code, § 13563).
- Consider the recommendations from an expert panel appointed by the State Board comprised of a toxicologist, an engineer licensed in the state of California with at least three years' experience in wastewater treatment, an engineer licensed in the state with at least three years of experience in treatment of drinking water supplies and knowledge of drinking water standards, an epidemiologist, a microbiologist, and a chemist. (Water Code, § 13565).
- Consider the recommendations from an advisory group appointed by the State Board consisting of no fewer than nine representatives of water and wastewater agencies, local public health officers, environmental organizations, environmental justice organizations, public health nongovernmental organizations, the department [State Department of Public Health], the State Board, the United States Environmental Protection Agency, ratepayer or taxpayer advocate organizations, and the business community (Water Code, § 13565).
- Consider water quality and health risk assessments associated with existing potable water supplies subject to discharges from municipal wastewater, stormwater, and agricultural runoff, research, regulations, and guidelines from the State Board, other states, the federal government, or other countries.

In August 2016, the expert panel (hereinafter referred to as the "2016 Panel") found that it is feasible for California to develop and implement a uniform set of water recycling criteria for DPR and provided the reasoning for its opinion in a report titled "Evaluation of the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse". In its report, the 2016 Panel also provided recommendations to the State Board on the features and attributes of water recycling criteria for DPR that would ensure protection of public health, and a set of research recommendations related to the development of DPR criteria. The advisory group (2016 Advisory Group) concurred with the 2016 Panel findings on the feasibility of developing uniform water recycling criteria for DPR and provided its own set of recommendations to the State Board in its 2016 report "Recommendations of the Advisory Group on the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse".

In December 2016, the State Board issued a report to Legislature on its investigation of the feasibility of developing uniform water recycling criteria for direct potable reuse, which recommended the development of criteria for DPR be initiated concurrently with the research recommended by the 2016 Panel such that the findings from the parallel efforts can be used to inform the development of criteria.

In October 2017, Assembly Bill 574 (AB 574) was signed by the Governor and filed with the Secretary of State, amending Chapter 7.3 (renamed to "Potable Reuse") under Division 7 of the Water Code. Specific to the proposed DPR regulations and among other things, AB 574:

- expanded on the definition of direct potable reuse to include and add definitions for two forms of direct potable reuse – raw water augmentation and treated water augmentation.
- authorized and mandated the State Board to develop and adopt uniform water recycling criteria for direct potable reuse through raw water augmentation, as defined by AB 574, by December 31, 2023, if an expert panel (hereinafter referred to as the "2022 Panel"), convened and administered by the State Board pursuant to the bill's statutory requirements, found that the State Board's criteria would adequately protect public health. (Water Code, § 13561.2)

AB 574 additionally recommended that the State Board establish a framework for the regulation of potable reuse projects on or before June 1, 2018, that should among other things include the following:

- consideration of recommendations provided in the state board's "Investigation on the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse."
- a schedule for completing the recommended research described in "Investigation on the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse."
- a regulatory framework for potable reuse projects that will be protective of public health (Water Code, § 13560.5).

Furthermore, AB 574 required the State Board to use information from the recommended research in its development of DPR criteria and provided an 18-month extension of deadline to adopt the uniform water recycling criteria, along with other contingencies to extend the deadline further to consult with the expert panel on the need for additional research if the recommended research is insufficient.

In April 2018, the State Board produced a proposed framework for regulating direct potable reuse, which provided the State Board's thoughts on the DPR criteria being considered at the time and summarized the risk assessment and risk management approach for DPR criteria. The State Board solicited stakeholder feedback on the framework document, and based on public comments, provided a revised edition of the framework document in August 2019 for stakeholder feedback. The State Board

provided an addendum to the framework document in March 2021, which consisted of an early draft of the anticipated DPR criteria, for stakeholder feedback.

In July 2018, the State Board convened a panel of source control experts to advise the State Board on the metrics that can be developed to quantify the effectiveness of wastewater source control strategies to control chemicals of concern when treated municipal wastewater is used as a source of water for DPR projects, key elements of an enhanced source control program for DPR, the realistic objectives that can be achieved by an enhanced source control program, and metrics that can be used to judge when an enhanced source control program is optimized for DPR. Also in 2018, the State Board developed a contract with the Water Research Foundation to direct the completion of five recommended research projects, with most of the research projects initiated by December 2018. The source control panel submitted its recommendations to the State Board in a report "Enhanced Source Control Recommendations for Direct Potable Reuse in California" dated March 2020. The State Board received the research findings for most of the recommended research projects by June 2021, and the information from the research was considered in the development of the draft criteria.

On June 23, 2022, the 2022 Panel made a preliminary finding that the State Board's early draft of anticipated criteria dated August 17, 2021, adequately protects public health (State Water Board, 2022). The 2022 Panel also provided a set of comments and recommendations suggesting various changes to the draft criteria, some of which were included in the revised draft criteria. Proposed revisions to the draft criteria were sent to the panel; and it is anticipated that the panel will provide a final finding on the DPR regulations proposed to be adopted by way of this regulatory action prior to adoption by the State Board.

Section 13567 of the Water Code (Chapter 7.3, Potable Reuse), added via SB 918, also requires the criteria development authorized by the chapter to be consistent with the federal Clean Water Act (33 U.S.C. Sec. 1251 et seq.), the federal Safe Drinking Water Act (42 U.S.C. Sec. § 300f et seq.), Division 7 of the Water Code, and the California Safe Drinking Water Act, Chapter 4 of Part 12 of Division 104 of the Health and Safety Code.

Water Code section 13560 specifies that the requirements of Chapter 7.3 are not intended to delay, invalidate, or reverse any study or project, or development of regulations by the State Board or the Regional Board, regarding the use of recycled water for potable reuse, including DPR, nor ongoing reviews by the State Board of projects consistent with Health and Safety Code section 116551. Health and Safety Code section 116551 mandates that the State Board is not to issue a permit for a reservoir, as a source of supply for drinking water, which is directly augmented with recycled water, unless the State Board:

- Performs an engineering evaluation;
- Evaluates treatment technology;

- Find the recycled water used for augmentation meets all applicable maximum contaminant levels (MCLs) and secondary MCLs;
- Determines that the recycled water used for augmentation poses no significant threat to public health; and
- Holds at least three public hearings for the purpose of obtaining public testimony, with information being made available to the public at least ten days prior to the initial hearing.

In addition to the 2022 Panel review of the criteria and their finding of the DPR criteria being protective of public health as mandated by the Water Code, Health and Safety Code section 57004 requires a regulation proposed for adoption by the State Board to undergo an external scientific peer review of the basis of the scientific portions of the regulation. Coordination and oversight of the scientific peer review was conducted by California's Environmental Protection Agency's (CalEPA) Scientific Peer Review Program, in the Office of Research, Planning, and Performance. The scientific peer preview was completed on June 21, 2021 (Appendix D).

In accordance with the aforementioned mandates and pursuant to Water Code sections 13521 and 13562, and Health and Safety Code sections 116271 and 116375, the State Board proposes the following changes to Title 22 of the California Code of Regulations:

- Adopt Article 10, Chapter 17, Division 4, to establish criteria applying to public water systems that engage in direct potable reuse and are responsible for a direct potable reuse project that treats municipal wastewater to produce water that supplies a drinking water treatment plant or is placed into a drinking water distribution system.

    - Section 64669.00 (Application), establishing the general applicability for the requirements of the Article;
    - Section 64669.05 (Definitions), establishing definitions related to DPR;
    - Section 64669.10 (General Requirements), establishing general requirements, including overarching requirements and those criteria that do not fall within the more specific subject matter in subsequent sections;
    - Section 64669.15 (Permit), establishing the requirement for a direct potable reuse responsible agency, and the permitting requirements for the agency as well as other public water systems that receive water from a DPR project;
    - Section 64669.20 (Joint Plan), establishing the requirement for a Joint Plan that clarifies the roles and responsibilities of all partner agencies in a DPR project;
    - Section 64669.25 (Public Meeting), establishing the minimum requirements related to holding a public meeting for a DPR project;
    - Section 64669.30 (Technical, Managerial, and Financial Capacity), establishing minimum requirements for technical, managerial, and financial capacity necessary for a DPR project;

- Section 64669.35 (Operator Certification), establishing minimum requirements for operator certification;
- Section 64669.40 (Wastewater Source Control), establishing minimum requirements related to the origin and control of raw wastewater to be ultimately treated and used for DPR projects;
- Section 64669.45 (Pathogen Control), establishing minimum requirements for the control of pathogenic microorganisms;
- Section 64669.50 (Chemical Control), setting forth minimum treatment criteria for the control of chemical risks;
- Section 64669.55 (Water Safety Plan), establishing minimum requirements for project-specific risk assessment for water safety;
- Section 64669.60 (Regulated Contaminants and Physical Characteristics Control), establishing minimum requirements for the control of regulated contaminants and physical water quality characteristics that are commonly regulated in drinking water;
- Section 64669.65 (Additional Monitoring), establishing requirements for the monitoring of chemicals beyond regulated contaminants and pathogenic microorganisms;
- Section 64669.70 (Laboratory Analysis), establishing minimum requirements related to the analyses of chemicals for a direct potable reuse project;
- Section 64669.75 (Engineering Report), establishing minimum requirements for the information contained in an engineering report;
- Section 64669.80 (Operations Plan), establishing minimum requirements for an operations plan for a direct potable reuse project;
- Section 64669.85 (Pathogen and Chemical Control Point Monitoring and Response), establishing requirements for pathogen and chemical control points to address treatment failure conditions and control system requirements;
- Section 64669.90 (Monitoring Plan), establishing requirements to develop a monitoring plan;
- Section 64669.95 (Compliance Reporting), establishing requirements to report compliance data and information for DPR projects;
- Section 64669.100 (Annual Report), establishing requirements to provide an annual summary for the public record of the status of a DPR project and its ability to comply with regulations;
- Section 64669.105 (Cross-Connection Control), establishing requirements to assess DPR projects to reduce contamination from cross-connections;
- Section 64669.110 (Corrosion Control and Stabilization), establishing requirements for corrosion control and stabilization of the water produced by DPR projects;
- Section 64669.120 (Independent Advisory Panel), establishing requirements related to the review of DPR projects by independent advisory panels;
- Section 64669.125 (Public Notification), establishing requirements for public notification for specific conditions unique to DPR projects;

- Section 64669.130 (Consumer Confidence Report), establishing requirements for information unique to DPR projects to be included in consumer confidence reports.

The net effect of the proposed regulations would be to establish specific regulatory criteria for general application by public water systems choosing to engage in the planned placement of recycled water into a public water system as drinking water or into a raw water supply immediately upstream of a water treatment plant.

None of the proposed regulations would affect California's SDWA primacy delegation granted by U.S. EPA because no federal regulations exist that specifically address DPR. The net effect of these amendments is that the proposed state regulation would not be less stringent than any existing federal regulation.

PURPOSE AND RATIONALE OF PROPOSED REGULATION

The proposed regulations would be incorporated into Title 22, Division 4, of the California Code of Regulations; specifically, proposed Article 10 of Chapter 17. The following provides a detailed discussion of the proposed regulations, its purpose and necessity.

CCR Title 22, Division 4, Chapter 17, Article 10 (Direct Potable Reuse)

Section 64669.00. Application.

Section 64669.00 clarifies that Article 10 would specifically apply to direct potable reuse and it also clarifies that a public water system that is subject to regulation under Article 10 is also subject to other requirements under Chapter 17, Surface Water Treatment. This provision is necessary to avoid any confusion regarding the application of Article 10 and how compliance with Article 10 affects other requirements under Chapter 17. Article 10 establishes requirements for a public water system using treated municipal wastewater to augment a source of supply for a public water system's drinking water treatment plant (raw water augmentation or RWA) or for placement into a drinking water distribution system (treated water augmentation or TWA). Article 10 includes the requirements necessary to produce safe drinking water from municipal wastewater and would be applied in conjunction with other drinking water regulations adopted under the SDWA to ensure safe drinking water is delivered to the public.

Water Code chapter 7.3, section 13560, et seq., (Chapter 528, Statutes of 2017, AB 574, Quirk) allows for staging of the adoption of DPR criteria, setting a deadline for the adoption of criteria for the RWA form of DPR of December 31, 2023. Upon developing the criteria concepts and attempting to develop a logical progression of criteria from indirect potable reuse to RWA to TWA, it became apparent to the State Board that in order to develop distinct criteria for RWA, it was necessary to identify RWA scenarios to distinguish between the RWA and TWA forms of DPR. Additionally, in order to develop

criteria for DPR that is protective of public health, it was necessary to determine the criteria needed for the TWA form of DPR, and then determine what criteria is needed for RWA by considering the features of a RWA project that provide some risk management benefits. Since criteria for TWA needed to be known in order to determine the RWA criteria to preserve a logical progression of criteria, the State Board developed TWA criteria that was health protective using recommendations of the 2016 Panel and findings from the DPR research that was conducted.

A separate but important conclusion was made during criteria development after careful consideration of RWA scenarios and the features of RWA that can be quantified to provide risk management benefits. The definition of RWA in the Water Code allows for a wide variation of project scenarios including the type and quality of the raw water being augmented, the amount or extent of the augmentation in terms of the blending ratio, and the type of water treatment plant. The wide variation of project scenarios possible under RWA also means that there is a wide range of risk management benefits that can be provided by the individual features of RWA scenarios.

Additionally, once the features of RWA were quantified in terms of public health protection, the State Board found that some of those same features and benefits could also apply to TWA scenarios. For example, for chemical control, the blending and mixing benefits that can be achieved in a RWA scenario can also be present in a TWA scenario. Because of these findings, the criteria were not developed specifically for the TWA and RWA definitions, but in terms of the health protective features such as blending, mixing, and treatment that can be quantified and verified through demonstration studies.

Once the distinctions between TWA and RWA were understood and quantified, the State Board concluded that a single criteria development and regulation adoption process for both the RWA and TWA forms of DPR is possible, and there was no reason to postpone development of a separate TWA criteria. The State Board found the RWA form of DPR is by far the more complex situation to regulate because of the spectrum of RWA project features that must be considered.

The 2016 Panel on the Evaluation of the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse found that it is feasible for California to develop and implement a uniform set of water recycling criteria for DPR that would be protective of public health. Subsequent feedback from stakeholders indicated support from the regulated community to proceed with development of a single uniform set of water recycling criteria for DPR. A comprehensive set of criteria that addresses both RWA and TWA is consistent with the mandate set forth in AB 574.

Section 64669.05. Definitions.

Section 64669.05 would be added to establish definitions for terms used in Article 10. These definitions are reasonably necessary to create structure and clarity for these complex regulations, and to avoid confusion regarding terms that may be susceptible to multiple interpretations. Subsection (a) provides definitions for the following terms:

(1) “Acute exposure threat” is defined to characterize those water quality or treatment deficiencies that could pose a severe hazard to the public with just a brief exposure. Urgent action is required by the regulations to end the exposure. The term is used in the regulations to identify the acute exposure threats and describe the required actions.

(2) “Advanced treated water” is defined to identify the water that has been satisfactorily treated to deal with organic chemicals that may pose a health risk but do not have maximum contaminant levels. The term for this level of treatment is used to clarify where certain water quality or type of water quality monitoring is required, or when certain water quality issues must be addressed.

(3) "AWTO™” is an acronym used in the regulations to refer to the Advanced Water Treatment Operator certification program of the California-Nevada Section of the American Water Works Association and the California Water Environment Association.

(4) “AWT5™” is defined to identify a specific certificate issued by the AWTO™ certification program.

(5) "BAC” is an acronym used in the regulations to refer to biologically activated carbon.

(6) “Challenge test” is defined to describe the type of study to be used to determine the capacity of the treatment process to remove pathogens or chemical contaminants.

(7) “Chemical control point” is defined to help clarify the specific feature and purpose of the activity, procedure, or process used to ensure control of chemicals of concern. “Critical control point” is a term commonly used in food safety and water risk management situations and a more focused term promotes a better understanding of the purpose of specific requirements.

(8) “Chronic exposure threat” is defined to characterize those water quality, treatment, or monitoring deficiencies that pose a hazard to the public from long term exposure. Action is required by the regulations to limit the exposure. The term is used several times in the regulations to identify chronic exposure threats and describe the required actions.

(9) “Critical limit” is defined to make it clear that although the term is broadly used in food safety and water risk management, the use of the term in the regulations is to address pathogen and chemical risk management.

(10) “Direct potable reuse project” or “DPR project” is defined to make it clear that it refers to a specific project implementing DPR.

(11) “DPR project water” is defined to make it clear that it includes the wastewater being used in the project regardless of the level of treatment.

(12) “Direct potable reuse responsible agency” or “DiPRRA” is defined to refer to the single agency responsible for compliance with the regulation for a specific DPR project. It makes it clear that the agency must be a public water system because they must have a public water system permit – the mechanism for enforcement of requirements in this Article.

(13) “Finished water” is frequently used in the regulations and has the same meaning as that in existing section 64400.41, Chapter 15, Division 4, Title 22 of the California Code of Regulations. It is used to make it clear that water so designated is of sufficient quality to be put into the drinking water system. It further makes it clear that any following treatment is necessary only to maintain water quality in the distribution system.

(14) “Indicator compound” is defined because it is frequently used in the regulations and the term can include numerous chemical types and properties. The specific compound and use for a particular requirement of the regulations are to be described and justified for the DPR project as called for in the regulations.

(15) “Local limits” is defined because it is used in the regulations, because it may be susceptible to multiple interpretations, and because establishment of local limits by the entity providing wastewater to a DPR project is an important component of providing treated wastewater of as a good quality as possible to the DPR project for its drinking water consumers.

(16) “Log reduction” is defined to quantify the level of treatment necessary to meet a water quality objective or the level of treatment provided by a treatment process or treatment train and refers to the logarithm base 10 of the ratio of the concentration before treatment to the concentration after treatment. A 1-log reduction means a 90 percent reduction in concentration, a 2-log reduction means a 99 percent reduction, and a 3-log reduction means a 99.9 percent reduction.

(17) “Log reduction value” or “LRV” is defined to indicate the specific organism density reduction needed or used to comply with the pathogen log reduction requirements. The definition makes it clear that LRV is the measure of reduction performance assigned to a treatment process or the entire treatment train (depending on context) based on a validation study.

(18) “Maximum contaminant level” or “MCL” is defined to identify the Health and Safety Code section that defines it and to identify the chapters in Title 22 of the California Code of Regulations that describe its purpose and use.

(19) “Municipal wastewater” is defined to identify the type of wastewater that is the source water for a DPR project. The wastewater must be predominantly domestic wastewater – meaning wastewater characteristic of household wastewater (e.g., toilet flushing, laundry wastewater, bath and shower water). This type of wastewater may also be generated by hotels, commercial laundries, and public restrooms. A smaller component of the wastewater flow may be from commercial and industrial activities. Hazards associated with wastewater not meeting the definition may not be adequately controlled by the regulations, therefore it is necessary for the protection of public health to avoid wastewater which does not meet this definition. The definition also clarifies that municipal wastewater is a surface water, and like other surface waters, is exposed to contamination with protozoa, and therefore, is subject to the surface water rule (54 Federal Register 27486 et seq. (June 29, 1989)).

(20) “Notification level” is defined to identify the Health and Safety Code section that describes its purpose and use.

(21) “Operating envelope” is defined to clarify how certain operational parameters are used in the operations and control of treatment processes.

(22) “Operational parameter” is defined to clarify that the regulations make use of a property or properties that are able to be measured, and that are used to assess the operation of a process involved in water treatment.

(23) “Ozone/BAC” is used in the regulations to refer to treatment that uses ozonation immediately followed by biologically activated carbon.

(24) “Partner agency” is defined because it is used several times in the regulations and to make it clear that the entities other than a DiPRRA may have a role in a DPR project joint plan.

(25) “Pathogen control point” is defined to help clarify the specific features and purpose of activities, procedures, or processes used to ensure control of pathogens. “Critical control point” is a term commonly used in food and water risk management situations and a more focused term for DPR regulations promotes a better understanding of the purpose of specific requirements.

(26) “Regional monitoring consortium” is defined to describe the entities that operate DPR projects, which agree to join together to comply with the monitoring requirements of this Article.

(27) “Response level” is defined to identify the Health and Safety Code section that describes its purpose and use.

(28) “SCADA” is an acronym used in the regulations that refers to supervisory control and data acquisition, which is the interconnected automated system that provides supervisory control of equipment and processes, as well as data acquisition for treatment operators within the DPR project.

(29) “Surrogate parameter” is defined because it can take many forms and perform several functions in the regulations. The definition identifies the types of contaminant or water properties that may qualify as a surrogate parameter. The definition also describes the circumstances for which a surrogate parameter can be used to indicate the compliance state of a treatment process.

(30) “TOC” is an acronym used in the regulations that refers to total organic carbon, which is the concentration of organic carbon detected in water by appropriate laboratory or online analyses.

(31) “Treatment mechanism” is defined to make it clear that it identifies the fundamentally different ways treatment processes can reduce contaminant concentrations in water.

(32) “Treatment train” is defined because it is used in the regulations and describes the assemblage of processes that are used to produce a water of a certain quality.

(33) “UV” is an acronym used in the regulations to refer to ultraviolet light.

(34) “Validation” is defined to indicate the demonstration of the potential of treatment to reduce contaminants, to distinguish it from verification.

(35) “Verification” is defined to indicate the routine monitoring of treatment to determine the treatment efficacy at any point in time, to distinguish that from validation.

(36) “Wastewater contribution” or “WWC” is defined to make it clear how the WWC is to be calculated and the types of dilution water that can be used in the WWC calculation, namely that the dilution water is from a source that has been permitted by the State Board.

(37) “Water treatment plant” is defined to identify the Health and Safety Code section that defines it.

Section 64669.10. General Requirements.

Section 64669.10 establishes overarching requirements that are not included in the other proposed sections. These requirements are necessary for the implementation of DPR projects that are protective of public health.

Subsection (a) clarifies that DPR projects involve the planned use of municipal wastewater as the source of water. This clarification is needed because many conventional water supplies in California have a small municipal wastewater discharge component that is considered unplanned (de facto) potable reuse; public water systems using conventional water supplies are not considered DPR projects.

Subsection (b) requires that there be no bypass of untreated or partially treated municipal wastewater from the DPR project to the finished water point of use. Untreated or partially treated municipal wastewater is a contaminant threat to the distribution system of a public water system and a health risk to consumers who are served by the distribution system, so it is essential that the municipal wastewater does not bypass any treatment step in an approved treatment train designed, constructed, and operated in accordance with the requirements of this Article.

Recognizing the potential complexity of a DPR project when a DiPRRA proposes to use facilities owned and operated by different partner agencies to meet the requirements in the regulation, subsection (c) requires that the DiPRRA, as the agency responsible for the DPR project, ensure that all facilities and operations used to comply with the requirements of this Article are accessible for inspection by the State Board. Subsections (c)(1) through (c)(5) identify the types of facilities and operations that would be inspected by the State Board for which physical access may be required. These include the inspection of sources and treatment, wastewater source control operations, cross-connection control operations, technical, managerial, and financial (TMF) capacity of the agencies participating in the DPR project, and the operations, monitoring, and water safety plans prepared for the DPR project. The inspection of these facilities and operations of a DPR project is needed to verify compliance with regulations and to satisfy statutory requirements for supervision of public water systems.

Section 64669.15. Permit.

Direct potable reuse (DPR) means the planned introduction of recycled water either directly into the water distribution system of a public water system, as defined in section 116275 of the Health and Safety Code, or into a raw water supply immediately upstream of a water treatment plant. Consistent with the definition of a public water system, an entity that distributes DPR project water in accordance with the proposed requirements of this Article is a public water system.

Multiple agencies may be involved in a DPR project due to existing authorities, jurisdictions, and ownerships. To streamline the overall organization and permitting of a DPR project, subsection (a) establishes that only one entity, the DiPRRA, must be designated as being responsible for complying with the requirements of this Article. It is necessary to have one permitted point of contact for enforcement purposes.

The SDWA mandates that no person shall operate a public water system unless they first receive an operating permit (Health and Safety Code, § 116525). Subsection (b) establishes that the DiPRRA would be responsible for applying to the State Board for a permit or to amend an existing permit to deliver the water from the DPR project and for obtaining the permit prior to operating the DPR project.

Subsection (b) also establishes the information that must be submitted with the permit application for a proposed DPR project and requires a DiPRRA to submit a permit application to the State Board in compliance with existing regulations. The information required to be included with a permit application can be presented in a manner that facilitates review by the State Board; for example, the documents required to demonstrate TMF can be contained in the engineering report at the convenience of a DPR project or as distinct documents, as long as the required information is present. The information required to be submitted is reasonably necessary in order for the State Board to determine whether to issue a permit or permit amendment for a particular DPR project.

Subsection (b)(1) requires an engineering report to be included that contains the technical information needed for the State Board to evaluate the project for compliance with this Article, as described in section 64669.75.

Subsection (b)(2) requires a joint plan developed pursuant to section 64669.20 be included in the permit application.

Subsection (b)(3) requires that documents demonstrating technical, managerial, and financial (TMF) capacity be included in the permit application.

Subsection (b)(4) requires an operations plan pursuant to section 64669.80 be included in the permit application so that it can be approved and referenced in the permit.

Subsection (b)(5) requires a monitoring plan prepared pursuant to section 64669.90 be included in the permit application so that it can be approved and referenced in the permit.

Subsections (b)(6) and (7) refer to requirements in existing regulations regarding information to be included in the permit application for an initial permit (for a new public water system) or a permit amendment (amending the permit for an existing public water system).

Subsection (c) requires the DiPRRA to obtain a permit prior to operation of the DPR project to avoid misunderstandings about when operation may commence.

Subsection (d) establishes that the DiPRRA must comply with the conditions of the permit, at all times, and that the DiPRRA may be subject to an enforcement action if the conditions are not met. This is necessary because failure to comply with the issued permit would jeopardize public health.

Certain partner agencies may have a significant role in providing treatment to meet the DPR project water quality requirements. Subsection (e) establishes that a partner agency that provides that level of treatment may meet the definition of a public water system pursuant to section 116275(h) of the Health and Safety Code. Accordingly, the partner agency may be considered a public water system and be required to obtain a domestic water supply permit. This provision is necessary because some partner agencies who are not public water systems may not realize that participating in a DPR project as a partner agency may subject the partner agency to regulation as a public water system under the SDWA.

Section 64669.20. Joint Plan.

Establishing the legal authorities, roles and responsibilities, and structure of the overall organization for the DPR project is necessary to ensure safe drinking water. Extensive coordination and communication are necessary when two (or more) separate entities, overseen and regulated by different government programs, have complicated and differing responsibilities with the shared goal of ensuring that municipal wastewater can be treated to produce water that supplies a drinking water treatment plant or a public water system's drinking water distribution system in a manner that is protective of public health. Therefore, subsection (a) requires that the DiPRRA develop a joint plan that contains all the components described in the subsequent subsections. The joint plan, and the components therein, are necessary to coordinate all aspects of a DPR project to ensure that a DPR project successfully produces water that meets all drinking water standards and is protective of public health.

Subsections (a)(1) through (a)(15) describe the required components of the joint plan that are necessary to ensure coordinated and unified project management, planning, and operation of a DPR project under the DiPRRA. Forward looking planning based on a 20-year planning horizon ensures that the DiPRRA can anticipate potential future needs including possible operational changes.

Subsection (a)(1) requires the joint plan to include identification of the partner agencies in the DPR project, as well as their roles and responsibilities, and the legal authority that addresses each agency's role. The joint plan will also include the overall structure of the DPR project's organization, and a 20-year life cycle planning horizon for the DPR project's implementation. It is critical that partner agencies understand their roles and

responsibilities to ensure the safe operation of the DPR project and that they have the legal authority to carry out their required functions. An organizational structure needs to be established to clearly define the roles and responsibilities of the partner agencies and the DiPRRA.

Subsection (a)(2) requires the joint plan to include procedures that ensure that the partner agencies participating in the DPR project's operations follow the approved operations plan. This provision is necessary to ensure that all aspects of the DPR project are operated in a manner that complies with the requirements of this Article.

Subsection (a)(3) requires the joint plant to include procedures that ensure the DiPRRA, which would hold the water supply permit for the DPR project, will have up-to-date knowledge of the status of treatment for the entire DPR project. Having such knowledge is necessary so that the DiPRRA can track operational performance and take immediate action if there are trends that indicate performance may not be optimal.

Subsection (a)(4) requires a description of corrective actions to be taken if water delivered from a treatment plant fails to meet the requirements of this Article. This is necessary for the protection of the health of consumers of drinking water produced by the DPR project.

Subsection (a)(5) requires the joint plant to include procedures to ensure that the DPR project's water quality monitoring activities are carried out according to the approved monitoring plan. Meeting the monitoring requirements described in the sampling plan is necessary so that the quality of the water at all points in the DPR project is well understood and any changes that may have public health implications are detected and expeditiously addressed.

Water quality monitoring pursuant to this Article may be conducted by a partner agency in the joint plan (e.g., monitoring at facilities not owned by the DiPRRA). Subsection (a)(6) specifies that the joint plan must include procedures to ensure that the DiPRRA will have current knowledge of the status of water quality monitoring and monitoring results. This provision is necessary so that the DiPRRA will have up-to-date knowledge of monitoring and water quality compliance status.

Optimization of wastewater treatment is needed for a DPR project to improve public health protection. Thus, subsection (a)(7) requires a plan to be included in the joint plan that focuses on the investigation and implementation of specific areas of wastewater treatment improvement that would enable the DiPRRA and downstream DPR project treatment plant(s) to reduce the level of contaminants of health concern to the lowest achievable concentrations.

Wastewater source control pursuant to this Article may be conducted by a partner agency in the joint plan, and close coordination between the DiPRRA and the agency responsible for wastewater source control is necessary to ensure protection of public

health. Subsection (a)(8) requires that the joint plan include procedures to implement source control requirements pursuant to section 64669.40.

All facilities that are included in the DPR project that are needed to comply with requirements in this Article might not be owned by the DiPRRA. In order to facilitate inspection of all the DPR project facilities by the State Board, subsection (a)(9) requires the joint plan to include procedures for providing physical access to all DPR project facilities, operations, and records for inspection at any time by the State Board. This access is necessary so that the State Board can carry out its public water system supervision program under the SDWA and to ensure public health is protected.

Subsections (a)(10) and (a)(11) contain requirements related to planning coordination needed to ensure clear communication among the DiPRRA and partner agencies in several critical aspects of public health protection.

Where multiple entities are conducting monitoring for which the results of the monitoring may be used by a different partner agency in the joint plan, subsection (a)(10) requires a plan to communicate water quality status and monitoring results among the DiPRRA and partner agencies be included in the joint plan. For example, if a partner agency (e.g., a downstream public water system, or one that is nearer the consumer) receiving DPR project water for treatment or distribution has a water quality issue, it should notify the DiPRRA so that the DiPRRA in turn can determine whether the issue is related to the DPR project. Similarly, it is important for the DiPRRA and the wastewater management agency responsible for the wastewater industrial source control program to share water quality data gathered by one with the other in order to facilitate industrial source control investigations or to conduct risk characterization of unregulated chemicals.

Subsection (a)(11)(A) requires that the joint plan include procedures a DiPRRA will implement for notifying partner agencies and the State Board of any operational changes that may adversely affect the quality of water delivered by a DPR project treatment plant. Notification of such changes is necessary to ensure that the quality of water ultimately delivered to consumers meets all requirements and will not have negative public health implications. Notification of the State Board also ensures that the State Board has current information on the operation of the DPR project.

Subsection (a)(11)(B) requires the joint plan include procedures for coordinating notifications for any treatment failure incidents and the corresponding corrective actions taken. Timely and adequate notification is necessary to provide downstream public water systems receiving DPR water with information that would enable them to take appropriate remedial actions, should they be needed, and to allow the State Board to be appropriately informed about changes in operation and water quality, treatment failures, and corrective actions that have been taken.

Subsection (a)(12) requires that the joint plan include procedures for coordinating customer notifications pursuant to the public notification requirements set forth for public meetings (section 64669.25), monitoring of regulated chemicals and compounds (section 64669.60), and other public notification requirements set forth in 64669.125, as well as procedures for receiving customer water quality complaints and reports of gastrointestinal illness pursuant to section 64669.95. A timely and coordinated public notification is essential to ensure the DiPRRA and other public water systems involved in the issuance of public notices provides the consumers with clear and accurate information about the DPR project, and to allow the public to take appropriate actions to protect themselves, should there be issues with drinking water quality or reports of illness.

Subsection (a)(13) requires the joint plan to include procedures for implementing requirements for control of cross connections. Cross connections can cause a degradation in DPR project water quality. Thus, measures that prevent cross connections must be identified and implemented in a clearly defined manner.

Subsection (a)(14) requires that the joint plan include procedures to coordinate how to optimize corrosion control to reduce lead and copper levels in the distribution system. The quality of the water delivered by a DPR project may affect elements of the distribution system of downstream public water system(s) including customer plumbing and impact the quality of the drinking water delivered to customers. Thus, it is important for the DiPRRA to coordinate with public water systems that receive DPR water to address any distribution system-related water quality issues associated with the DPR project. Distribution system-related water quality issues that are attributed to upstream conditions or activities must be assessed and managed where possible at the site of such conditions or activities.

Utilizing municipal wastewater as a source of supply for a public water system presents unique challenges with respect to potential contaminating events that may impact a drinking water treatment plant or directly impact the drinking water provided to customers. Such events need quick, well-planned, remedial actions on the part of the DiPRRA and the public water system, to ensure each public water system is capable of continuing to reliably provide a safe and wholesome supply of drinking water, which may include the need to provide an alternative supply or additional treatment. Existing regulations for indirect potable reuse require a reuse project to address contingencies for supplying an alternative source of drinking water if the reuse project contributes to the inability of a public water system to reliably provide a safe and wholesome supply of drinking water. Similarly for DPR, subsection (a)(15) requires that the joint plan address the steps a DiPRRA and partner agency(ies) will take to provide an alternative source of domestic water supply or drinking water in the event that a DPR project is unable to supply water.

Subsection (b) requires that entities that collect the municipal wastewater, provide municipal wastewater to a DPR project, provide wastewater source control, provide

treatment pursuant to the requirements of this Article, or uses DPR project water as a source of supply for a water treatment plant that delivers water to a water distribution system of a public water system shall participate in the joint plan as a partner agency. Each of these entities plays a critical role in ensuring that the DPR project is properly operated such that the water delivered to consumers meets quality requirements and is protective of public health. A public water system that receives finished water from a DPR project but that has been determined to not have a role in complying with this Article is not required to be part of the joint plan. However, a DiPRRA may propose to include such public water systems in the joint plan, or such public water systems may elect to be part of the joint plan for the purposes of addressing public notification planning and submittal of customer complaints.

The DiPRRA will need to coordinate with the partner agency(ies) in the development of the joint plan. In addition, each partner agency must understand its role and responsibility under the joint plan to ensure the effective operation of the DPR project. Subsection (c) requires the joint plan be signed by the individuals responsible for ensuring their agency's compliance with this Article and other responsibilities assigned to their agency as described in the joint plan. Subsection (c) also requires that the DiPRRA ensure that each partner agency commits to implementing the actions designated in the joint plan. This assurance can be in the form of contracts, agreements such as Joint Powers Authority or bilateral agreements, that were entered into to facilitate the operation of a DPR project in compliance with this Article.

Subsection (d) requires that the joint plan include copies of contracts and agreements so that the State Board can evaluate compliance with subsection (c) and confirm compliance with subsection (a).

The State Board recognizes that, over time, a joint plan may need to be updated and revised when circumstances delineated in subsection (e) occur. However, there needs to be time for adequate review of revisions by the State Board prior to implementation of the proposed changes. Thus, subsection (e) requires submittal of such a revised joint plan to the State Board at least 60 days prior to the effective date that the changes are proposed to take place.

Section 64669.25. Public Meeting.

Prior to the issuance of a permit for a DPR project, the State Board will conduct one or more public meetings to obtain additional public comment on the project. The requirement for public meetings is consistent with current drinking water permit review procedures for a public water system proposing to use an extremely impaired source. Similar requirements for public meetings are contained in regulations for indirect potable reuse (IPR) projects. More than one public meeting may be necessary depending on the project. For instance, section 116551 of the Health and Safety Code mandates that prior to issuing a permit or permit amendment to a public water system for utilizing a

reservoir as a drinking water supply that is directly augmented with recycled water, the State Board must hold at least three noticed public hearings in the area where recycled water is proposed to be used or supplied for human consumption. The primary purpose of holding the public meeting is to educate and inform the public and to receive public testimony on the proposed use. It is necessary so that the State Board may obtain additional information related to protection of public health that may not have been presented to the State Board through the permitting process before a permit is issued for a DPR project.

Subsection (a) requires at least one public meeting be held by the State Board before a permit or permit amendment can be issued for a DPR project and establishes the responsibilities of the DiPRRA to facilitate and provide information for the public meeting(s). More than one public meeting might be held, for example if a DPR project includes reservoir augmentation, where existing law (Health and Safety Code section 116551) requires three public meetings to be held.

Subsection (b) establishes general requirements regarding the purpose and nature of the information about the DPR project to be presented to the public. To properly educate and inform the public about the proposed project in a manner that enables the public to provide well-informed comments and questions during a meeting, subsection (b) includes the minimum information to be provided. The required topics, in subsection (b)(1) through (b)(6), are a project description, identification of source or sources of municipal wastewater to be used in the project, description of treatment processes, monitoring, and contingency plans, anticipated provisions of the State Board-issued permit, the expected start date for project operations and delivery of DPR project water to customers and consumers; contact information for the project. Subsection (b)(7) allows for the requirement of additional information on a project specific basis, if the State Board finds it necessary to properly elucidate the nature of a DPR project to the public. All of the required information is necessary to provide the public with sufficient information about a particular proposed DPR project so that the public can be informed about the project and meaningfully participate in the meeting.

Subsection (c) requires the DiPRRA to provide the information it has developed pursuant to subsection (b) and subsection (e)(1) to the State Board prior to the public meeting, which is necessary so that the State Board can determine if the information complies with regulatory requirements.

Subsections (d) and (e) establish logistical requirements for notifying the public of a public meeting and ensuring the public has reasonable access to the information and ample time to review the information prior to the public meeting. These provisions are necessary to provide the public with sufficient time, notice, and opportunity to review material regarding a proposed DPR project and to meaningfully participate in a public meeting.

Subsection (d) requires timely distribution of materials for the public meeting(s) and its availability a publicly accessible location, and on the DiPRRA's website, as well as websites of public water systems with receive DPR project water, and all DPR partner agency websites. The DiPRRA is required to make information available to members of the public who request it.

Subsection (e) requires notice to be given at least 30 days prior about a public meeting, and about the availability of information about the DPR project that is the subject of the meeting.

Subsection (e)(1) establishes the minimum requirements for the content of the public notice in subsections (e)(1)(A) through (e)(1)(E). The notice is required to include the subject of and the reason for the meeting, the location of the document repository where the public can access the DPR project-related information, and its hours of operation, the location of website or websites at which DPR project information is available, how the public can submit comments on the DPR project, and the date, time, and location of the public meeting.

Subsection (e)(2) establishes the means by which the notice of the public meeting is to be distributed. The public notified would at minimum mean the customers to be served by the proposed DPR project, including customers of the DiPRRA and customers of the public water system(s) receiving DPR project water. The DiPRRA is required to coordinate the public notification with public water systems that distribute DPR project water.

Subsection (e)(2)(A) requires the distribution of the public notice by mail or direct delivery to each customer that will receive drinking water from the proposed DPR project. Among the required customers are those that provide drinking water to others, such as schools, apartment buildings, and offices.

Subsection (e)(2)(B) requires distribution of the public notice by other methods, for consumers not likely to receive the notice distributed by mail or direct delivery. Those methods, in subsection (e)(2)(B)1 include local newspapers, television, radio, and/or social media, posting of notices in conspicuous places accessible to the public, and delivery of notices to community organizations.

Section 64669.30. Technical, Managerial, and Financial Capacity.

Technical, managerial, and financial (TMF) capacity is the measure of a water system's ability to conduct a safe DPR project. Although TMF capacity is used to evaluate all new public water systems, DPR requires extraordinary drinking water system TMF because municipal wastewater is a heavily contaminated source. Whereas most systems rely on prudent source selection and protection to minimize reliance on treatment, DPR projects must commit to an extensive treatment and monitoring burden. A decision to undertake

use of municipal wastewater, an extremely impaired source, requires an exceptional recognition of the need to prioritize public safety. The demonstration of TMF is necessary to allow the State Board to judge the adequacy of the TMF capacities for each DPR project.

The technical capacity is demonstrated by identifying and providing for the facilities, operations and support services required to comply with each element of the regulations. The financial capacity is demonstrated by identifying the costs necessary to implement the operations plan and identifying ongoing funding to cover the costs. It is a responsibility of management (the managerial capacity) to implement procedures to make sure resources are available when and where necessary to enable compliance with the regulations.

Subsection (a) requires the DiPRRA to demonstrate that it and all agencies involved in the DPR project have sufficient TMF capacity to carry out their respective roles in the project as set forth in the joint plan.

The engineering report prepared pursuant to section 64669.75 is used in this section to define the magnitude of the technical challenge.

Subsection (a)(1) requires that all elements of a DPR project described in the engineering report that are necessary to comply with the regulations and have associated costs be identified and provides information on the types of costs that must be considered, such as operation and maintenance costs, capital replacement costs, energy costs, personnel costs, 20-year life-cycle costs of equipment, and other costs specified by the State Board on a project-specific basis. This evaluation is necessary to define the scope and magnitude of the financial responsibilities that are part of a particular DPR project.

Subsection (a)(2) requires identification of a reliable funding sources to cover those costs identified in subsection (a)(1) to demonstrate the financial capability to sustain the project. This is necessary to ensure that a DPR project has sufficient funding.

Subsection (a)(3) requires a description of the project resources that are available for deployment at the time and place needed and a description of known or foreseeable supply chain issues and how the project would address these issues. This is necessary for evaluating the ability of agencies involved in the DPR project to address contingencies.

Subsection (a)(4) requires a description of specific tools that are available for management and accounting to support the managerial and financial capabilities. This is necessary to evaluate management resources.

Section 64669.35. Operator Certification.

Drinking water treatment plants must be operated by water treatment operators who are sufficiently educated, trained, and who pursue continuing education. Existing drinking water regulations require that each water supplier designate at least one chief operator and one shift operator that meet the minimum requirements specified in the operator certification regulations (Title 22, section 63765 *et seq*.) for each water treatment facility, and that each water treatment facility be classified based on the size and complexity of the treatment (Title 22, section 64413.1 et seq). A water treatment facility means "...a group or assemblage of structures, equipment, and processes that treat or condition a water supply, affecting the physical, chemical, or bacteriological quality of water distributed or otherwise offered to the public for domestic use by a public water system…" (Title 22, section 63750.85).

Section 64669.35 clarifies how existing drinking water operator certification requirements would apply to a DPR project. A water treatment facility for a DPR project may consist of treatment installed at different physical locations owned and operated by different entities, some of which may not be public water systems. This section also contains additional requirements specific to DPR projects necessary to ensure that these complex treatment facilities are operated in a manner that protects public health.

Subsection (a) clarifies that each treatment facility that provides treatment for the DPR project for pathogen control (section 64669.45), chemical control (section 64669.50), and corrosion control (section 64669.110) is a water treatment plant as defined in the Health and Safety Code (section 116275(w)), and therefore must comply with the operator certification requirements. This clarification is needed in order to ensure the regulation of DPR does not conflict with the statutory definition of a water treatment plant and the federal requirements for operator certification under the federal SDWA. A water treatment plant meeting the statutory definition of a water treatment plant may also be subject to other laws and regulations, which may include other requirements for certification of personnel.

A DiPRRA is a public water system and thus, for operator certification, must comply with the drinking water regulations for operator certification, as well as the requirements in this Article. Subsection (b) requires that a DiPRRA designate at least one chief operator who holds a valid T5 drinking water treatment operator certification and at least one shift operator for each operating shift who holds at minimum a valid T3 drinking water treatment operator certification. This is to ensure that the DiPRRA has designated operations personnel who understand and have current knowledge of the operations of the DPR treatment, can evaluate whether the operations are conducted in accordance with the operations plan, and can determine the compliance status of the DPR project. The designated chief and shift operators must hold minimum T5 and T3 operator certificates respectively because the personnel must have the necessary level of expertise to oversee the operations of a complex treatment such as a DPR treatment train.

Subsection (c) requires the DiPRRA ensure, through its authority under the joint plan, that each partner agency under the joint plan that owns and/or operates a treatment plant that provides treatment pursuant to section 64669.50 require operators to possess valid certification that demonstrates adequate education, training, and experience in the operation of advanced treatment processes for production of drinking water.

The State Board provided input to the California-Nevada Section of American Water Works Association (AWWA) and the California Water Environment Association (CWEA) in the development of a voluntary certification program, the Advanced Water Treatment Operator (AWTO™) certification, which requires applicants to hold either a wastewater treatment grade 3 or a water treatment grade 3 certification in good standing as a minimum qualification for testing and certification at the AWT3™ level. The program offers certification at the AWT4™ and AWT5™ levels with progressively higher experience, training, and testing requirements for each subsequent level. Operators holding AWTO™ certification provide additional assurance of competency in advanced treatment operations with emphasis on drinking water safety. Subsection (c) requires that operators designated as chief operators hold valid AWT5™ certifications, and operators designated as shift operators hold at least valid AWT3™ certifications. This requirement is needed because the treatment technologies used in the treatment of wastewater for potable reuse are typically advanced technologies not commonly used in drinking water treatment. Specialized operator training beyond those required by the state operator certification program is needed to ensure operation of such advanced treatment technologies in DPR projects continues to reliably provide safe drinking water.

Subsection (d) requires the chief operator or shift operator of a water treatment plant that provides treatment for pathogen control (section 64669.45) or chemical control (section 64669.50) pursuant to this Article to be physically present at the water treatment plant at any time the treatment plant is operating as part of the DPR treatment train. The physical presence of the chief and shift operator(s) while the plant is operating allows for the most timely response to any alarms; enables the assessment of any issues in the operation of the treatment processes, continuous analyzers and other monitoring equipment, control system and other treatment plant activities; and allows for process control quality checks to be conducted. This kind of close observation of the treatment by operators of the operation of a new treatment plant is a necessary measure to ensure public health protection.

Subsection (e) allows for the DiPRRA to request a waiver from the requirement in subsection (d) after 12 months of operation, that is, to submit a request to remove the requirement that a chief or shift operator be physically present at the treatment plant when the plant is operating. The DiPRRA must submit an operations plan that demonstrates an equivalent degree of operational oversight and reliability with either unmanned/remote operation or operation under reduced operator oversight. If the waiver is approved, the chief operator or shift operator would not be required to be on-site at all times but must be able to monitor operations and exert physical control over

the treatment plant within the period specified in the operations plan, or within one hour, whichever is shorter.

Section 64669.40. Wastewater Source Control.

DPR projects utilize municipal wastewater as the source of drinking water. As discussed elsewhere in this initial statement of reasons, wastewater contains pathogenic viruses and microorganisms that can cause human illness and death. Thus, there is a need to treat the water to reduce the concentrations of various pathogens to levels that would be safe for consumers.

Wastewater also contains chemicals from industrial, commercial, and business operations. It also contains chemicals from households, from toilets, sinks, showers, tubs, and dishwashing and laundry machines. Some of the chemicals that are discharged into the sewer system, when they exist at high enough concentrations, can pose risks to human health. These risks can be in terms of elevated cancer risk and increased risk of other adverse outcomes, such as effects on reproduction, growth and development of the very young, and on the endocrine system and other human organ systems. Hence, it is important to limit the concentrations of chemicals to which people will be exposed.

Section 64669.40 establishes requirements regarding the control of chemical contaminants in the wastewater system prior to discharge to a receiving water, such as the municipal wastewater used by a DPR project, focusing on the actions and activities that would protect and improve the quality of the wastewater for subsequent treatment and thereby reducing the health risks attributed to chemicals and serving to protect public health. The section also requires that a program be established to receive early warning of a potential unexpected degradation in wastewater quality such as a spike in contaminants that may adversely affect DPR project treatment plants, focusing on actions and activities that would improve awareness of potentially fast-changing wastewater quality conditions that may impact subsequent treatment and thereby serving to protect public health.

The overall intent of section 64669.40(a) is to ensure that the quality of the municipal wastewater to be used in a DPR project is well controlled and relatively predictable, and that any known or potential variability is monitored and controlled. To ensure that drinking water consumers receive adequate public health protection, it is necessary to take steps to provide wastewater that, despite its origin as sewage, is of as high a quality as is practicable before it enters the DPR project for drinking water treatment.

Subsections (a)(1) – (a)(3) outline the required features of a source control program and require that the wastewater proposed to be used in the DPR project is from an entity that has the capability to carry out the source control program.

Subsection (a)(1) requires that the entity providing wastewater to a DPR project is subject to regulatory oversight, and that it is complying with all requirements that pertain to the operations of a wastewater treatment facility as set forth in its wastewater discharge permit. Regulatory oversight and compliance with existing permit requirements provide assurance of an ongoing baseline capacity of monitoring and control for wastewater to be used in the DPR project.

Subsection (a)(2) requires that the wastewater provider is an entity that is legally authorized to implement an industrial pretreatment and pollutant source control program. This includes ensuring that the wastewater provider has legal authority for oversight and inspection of dischargers, to control the discharge of industrial and commercial wastes into the wastewater collection system. This oversight includes the review of new connections to the wastewater collection system and changes to the ownership or use of sewer connections. This authority is necessary for an effective pretreatment program.

Subsection (a)(3) requires the source control program include certain minimum components set forth in subsections (a)(3)(A) through (a)(3)(F) to establish minimum requirements of a program to minimize the chemical discharge burden of the wastewater on the treatment processes, and to reduce the uncertainty and variability of chemicals in the wastewater. The concept for the requirements is analogous to the source water assessments and watershed sanitary surveys that are required for new sources of drinking water and the steps taken for protection of existing drinking water sources, which are necessary for minimizing drinking water source contamination and ultimately protecting public health.

Subsection (a)(3)(A) requires that the source control program identifies chemicals that are discharged into its wastewater and takes steps to limit their concentrations in wastewater destined to be used for DPR, including the use of local limits, local ordinances, or other discharge control methods. An effective program that limits and controls industrial discharge is necessary to protect the DPR project’s treatment train from potential interference by chemicals present in its wastewater supply, and from the pass-through of chemicals that may adversely affect drinking water quality and ability to protect public health.

Subsection (a)(3)(B) requires that the source control program include the ability to assess the fate of State Board specified chemicals in the wastewater treatment system. The assessment of the fate of chemicals is necessary to evaluate the adequacy of pretreatment and treatment steps. The emphasis on State Board specified chemicals, because of their high concentrations or their potential for causing human health effects at low concentrations, ensures that the source control program will focus on substances that pose a risk of adverse health effects in a DPR project and is necessary for protection of public health.

Subsection (a)(3)(C) requires that the source control program include the ability to conduct contaminant source investigations for chemicals identified in the chemical control and monitoring sections of the regulations (sections 64669.50, 64669.60, and 64669.65). This is necessary to enable verification of the environmental fate assessment and provide insight regarding the origin of particular chemical contaminants so that they can be controlled.

Subsection (a)(3)(D) requires that the source control program include an outreach program to industrial, commercial, and residential communities within the portions of the wastewater collection agency's service area that serves as the source of water for the DPR project. The purpose of the outreach program to dischargers is to manage and minimize the discharge of chemicals into the sewershed. The program is intended to inform and educate dischargers about the importance of and need to limit chemical releases into their sewers, and about the relationships of their chemical wastes, the wastewater treatment facility, and the use of treated wastewater in production of drinking water by the DPR project.

Subsection (a)(3)(E) requires that the source control program maintains a current inventory of chemicals identified and evaluated pursuant to the requirements of the section. The requirement for a current inventory of chemicals assures necessary consideration is given with respect to information on the types and amounts of chemicals in the wastewater and any potential adjustments to treatment that are necessary to address particular contaminants. Important within this inventory is the inclusion of new chemicals resulting from new industrial sources or other sources or changes to existing industrial sources or other sources, that may be discharged into the wastewater collection system, and therefrom into wastewater that feeds the DPR project.

Subsection (a)(3)(F) requires that the source control program is audited by an independent party at least every five years. The purpose of the audit is to assess the effectiveness of industrial source control program in limiting the discharge of contaminants into the wastewater treatment system. The required five-year cycle is the same time frame that is required for drinking water systems with surface water sources of drinking water to perform their watershed sanitary surveys, as well as the cycle length of the federal pretreatment program. The audit can be done by a Regional Board, U.S. EPA pretreatment program auditor, or an independent advisory panel, for example. An audit is necessary for the protection of public health to inform the State Board how well the source control program is operating, how effective the program is in controlling the discharge of contaminants, and to identify any deficiencies or areas of improvement.

Subsection (b) requires submittal to the State Board of documentation related to the establishment of local limits and other methods to control industrial discharge into the sewershed associated with the DPR project. It also requires the summary of that documentation to be included in the DiPRRA's Annual Report for the DPR project, as required by section 64669.100. These documents will demonstrate the steps taken to

reduce the concentrations of chemicals released into the sewershed and into the wastewater treatment facility, and ultimately to the DPR project.

Subsection (c) requires the DiPRRA, to implement a program to receive early warning of a potential occurrence that could adversely affect the DPR treatment, either by interfering with treatment processes or resulting in an increase in contaminant concentrations. This early warning program is necessary to provide time for operators to adjust treatment operations accordingly to respond to elevated levels of contaminants and for the DiPRRA to take appropriate actions to protect public health. The early warning program includes a number of components, described in subsections (c)(1) through (c)(4).

Subsection (c)(1) requires online monitoring instrumentation that measures indicator compound(s) or surrogate(s) that may indicate an increase in chemical contamination that may interfere with the operations of a treatment process or cause degradation of treated water quality. Online monitoring is necessary to track changes in wastewater quality that may occur due to an unpermitted discharge, such as might result from an accidental release of a chemical or from an illicit disposal of hazardous materials.

Regarding subsection (c)(1), an independent expert panel (Neemann et al., 2020) examined existing research and case studies on enhanced source control programs for DPR. This panel considered the question, “What is the feasibility of developing an early-warning system of increased chemical loading based on high-frequency monitoring in the sewer collection system or municipal WWTP influent?”

The panel’s report states, “Wastewater collection system monitoring to deter illegal discharges and detect the effects of infiltration has been tested in Australia, the United States, Israel, Greece, and Singapore.” The report sites case studies, stating “Nodal monitoring can occur in the wastewater collection system at nodal points in the system and in the headworks at the WWTP.” Examples include the following online analyzers: pH, conductivity, temperature, flow, and oxidation reduction potential.

Based upon recommendations by the source control panel (Neemann et al., 2020), the State Board has determined that it is necessary to include the requirement in section 64669.40 (c)(1).

A DiPRRA would implement a sewershed surveillance program that includes online monitoring instrumentation that measure surrogate(s) that may indicate a chemical peak resulting from an illicit discharge, an accidental release, or some other occurrence. A variety of monitoring options are available, and a utility would make an assessment of monitoring options that are effective and appropriate to the project.

Subsection (c)(2) requires notification by the pretreatment program to the DiPRRA of any discharge that results in the release of contaminants above allowable limits that are established in section (a)(3)(A). This is a necessary requirement that provides additional

means of early warnings from upstream entities to the downstream drinking water treatment facilities. Such information would enable the drinking water treatment facilities to take appropriate action, if needed.

Subsection (c)(3) requires tracking the results of local county public health disease surveillance programs or community raw wastewater surveillance monitoring programs to identify when community outbreaks of disease occur. Where disease surveillance programs or wastewater monitoring programs are taking place in the local community, it is necessary that the DiPRRA make use of the findings of those programs to follow the disease status of local communities and to be informed about the presence of pathogens in those communities' wastewater. The DiPRRA can follow up on information of local community waterborne disease outbreaks to verify that its DPR project is providing adequate public health protection, and to respond to inevitable inquiries from drinking water consumers and other interested parties.

Subsection (c)(4) requires the DiPRRA to utilize other early warning measures that are determined to be necessary by the State Board on a project-specific basis. This could include other types of new, innovative online instrumentation or other technologies that may become available in the future.

Subsection (d) requires the DiPRRA to form and maintain a source control committee. This committee is to include representatives of agencies that supply wastewater to a DPR project, including industrial users and others that discharge into the wastewater collection system, and wastewater management agency(ies) that supply wastewater to the DPR project. It is also to include representatives from the DiPRRA and its partner agency(ies) that operate the drinking water treatment operations. Thus, those entities who are discharging chemical wastes into wastewater, those responsible for operations of the wastewater treatment plant(s), and those who are operating DPR project drinking water treatment plant(s) will be represented, and they will evaluate wastewater treatment operations as they relate to the DPR project and make recommendations to improve the wastewater treatment operations and outreach program. Input and recommendations from the entities involved in the various aspects of the DPR project are necessary to ensure that the drinking water provided by the project is protective of the public health. (Neemann et al., 2020)

Section 64669.45. Pathogen Control.

Overview of the Pathogen Control Approach

Microbiological pathogens (viruses, bacteria, parasites) in raw municipal wastewater pose a significant public health risk in direct potable reuse projects. The concentration (i.e., density) of these pathogens must be greatly reduced continuously by removal or inactivation in the environment and/or engineered treatment barriers to yield safe drinking water.

The approach State Board used to control the threat from pathogens is to identify a set of reference pathogens that represent the threat, determine the concentrations of those pathogens in wastewater, set a public health risk goal for pathogens, determine the required level of treatment necessary to meet the health goal for each pathogen, and validate treatment processes for treatment trains that will achieve the required level of treatment with the required reliability. The treatment is operated and controlled with qualified staff and automatic shut-offs to make sure inadequately treated water does not reach the public. The level of treatment required for each reference pathogen is calculated by comparing the organism concentration that can occur in raw wastewater and the organism concentration in finished drinking water that will result in an appropriate level of public health protection.

The regulation uses a standard risk assessment/risk management approach to developing the pathogen control requirements. The organisms in municipal wastewater that can cause disease are identified and their infectivity (dose-response relationship) and their concentration in wastewater is determined. An allowable risk of illness from those pathogens in drinking water is set. Establishing the maximum allowable risk from pathogenic organisms is a role of the regulatory agency – it is a policy decision. The DPR risk goal is based on the 1 in 10,000 risk of infection per person used in the Federal and California surface water treatment regulations and California IPR regulations. We determine the concentration of the pathogens in drinking water that would pose the allowable risk using the dose-response relationship and risk goal – the safe pathogen level. The reduction in concentration necessary to get from the wastewater concentration to the safe drinking water concentration (log reduction) is calculated and becomes the basis for the pathogen control treatment requirements.

The measure of required treatment and treatment effectiveness is log reduction value (LRV). Individual treatment processes are validated for a specific LRV in a manner that assures they will be achieving the credited LRV reliably. A treatment train LRV is the sum of the individual process LRVs for the train. The treatment train LRVs must meet or exceed the log reduction required for each reference pathogen. The log reduction required takes into account the log reduction treatment capacity needed to allow for the possibility that some treatment deficiencies may go undetected by the control system for short periods.

A two-step process was used to determine the log reduction treatment objective for each reference pathogen. The first step involved identifying the appropriate reference pathogens and determining the minimum LRVs that must be provided continuously to manage the risk from potential concentrations of these pathogens.

The set of reference pathogens should be comprehensive enough to represent the risk posed by all potential pathogens in raw wastewater. Reference pathogens are selected based on factors including pathogenicity, potential occurrence in the source wastewater, and susceptibility to treatment. By using the organism from each pathogen type with the

greatest infectivity and concentration, and by validating the treatment with a representative of the type that is resistant to the mechanism, we provide control for the entire type of pathogen. *Giardia lamblia* cyst, *Cryptosporidium* oocyst, and enteric virus have been selected as the reference pathogens for the regulations. *Giardia lamblia* cyst, *Cryptosporidium* oocyst, and enteric virus are used in California regulation of indirect potable reuse. They are also the pathogens regulated in the Federal and California surface water treatment regulations and, therefore, must be addressed in potable reuse regulations because municipal wastewater is considered a surface water. The only other pathogen type that poses a threat to health in potable reuse is bacteria. It is not necessary to regulate bacteria because the treatment required to control the hardier pathogen types selected will easily deal with the bacteria threat. To avoid underestimating virus risk, norovirus was used to determine the required log reduction for enteric virus. Norovirus, an enteric virus, is the most common cause of acute gastroenteritis in the United States, is found in high concentrations in raw wastewater, is a highly infectious virus and has the greatest potential to exceed a 1:10,000 annual risk of infection and an equivalent 2.7E-07 daily risk of infection (Teunis et al., 2020; CDPH, 2018; Eftim et al., 2017; Kirby et al., 2015). Using Norovirus as the virus to determine the virus density is consistent with the approach used to determine the tolerable virus concentration in drinking water, where Rotavirus was used (Regli et al., 1991). As norovirus are not readily culturable, data from molecular methods are considered appropriate for use to estimate the concentration of infectious norovirus in raw wastewater (Gerba et al., 2017; Gerba et al., 2018; Soller et al., 2018).

Exposure to pathogenic microorganisms is controlled in the criteria by requiring a total of 16-log enteric virus, 10-log *Giardia lamblia* cyst, and 11-log *Cryptosporidium* oocyst reduction between the raw wastewater and finished drinking water. These log reductions were determined by identifying the highest organism density that could be expected in raw municipal sewage and calculating the reduction necessary to achieve the allowable densities in drinking water as determined by the U.S. Environmental Protection Agency (U.S. EPA) or using accepted dose-response relationships (54 Federal Register 27486 et seq. (June 29, 1989)). The allowable drinking water densities are calculated to limit the annual risk of infection to 1 in 10,000 (which is equivalent to a 2.7E-07 daily risk of infection). Water consumption of 2 liters per day for 365 days per year is used in the calculation.

A comprehensive review of available studies on the concentration of the reference pathogens in raw municipal wastewater was undertaken. The goal of the review was to identify the maximum concentration of each reference pathogen that could be expected in wastewater. Maximum concentrations are important in assessing the daily risk to which consumers would be exposed. The objective is to ensure that at the maximum concentration the reference pathogens can be reduced daily to a level that does not pose a risk to public health. The review involved studies reported in the United States, as well in European countries and Australia, including the recent study co-sponsored by the State Board known as DPR-2 (Pecson et al., 2021b).

The raw wastewater maximum densities are shown below for the three reference pathogens along with the literature sources from which the densities were derived. The maximum density used for *Cryptosporidium* oocyst was somewhat higher than that reported in DPR-2, while the maximum density for *Giardia lamblia* cyst was the same as that reported in DPR-2.

The norovirus maximum density that was used was significantly greater than that reported in DPR-2. As noted in the DPR-3 report (Wigginton et al., 2021), which the State Board also co-sponsored, the lower DPR-2 norovirus concentrations may be due to the impact that the SARS-CoV-2 pandemic had on communicable illnesses. Public health data indicated that norovirus disease outbreaks were significantly lower in 2020 than in other years. In addition, according to the Centers for Disease Control (CDC), "COVID-19 mitigation measures such as wearing face masks, staying home, hand washing, school closures, reduced travel, increased ventilation of indoor spaces, and physical distancing, likely contributed to the decline in 2020-2021 flu incidence, hospitalizations and deaths" (https://www.cdc.gov/flu/season/faq-flu-season-2020-2021.htm#anchor_1627000307956). As a result, the concentration of norovirus would be expected to be lower. The DPR-2 results appear to confirm that expectation, as the concentrations were significantly lower than literature values of norovirus concentrations in non-pandemic years.

All validated treatment barriers between the raw sewage and finished drinking water may be credited toward the total log reduction required. The following table includes the values used in the calculation of the required log reductions.

	Enteric virus	***Giardia***	***Cryptosporidium***
Raw sewage maximum density	1E09 virus GC/L [(a)]	1E05 cysts/L [(b)]	1E04 oocysts/L [(c)]
Tolerable drinking water density	3.3E-07 virus/L [(d)]	6.8E-06 cysts/L [(e)]	1.4E-07 oocysts/L [(f)]
Ratio of drinking water to sewage density	3.3E-16	6.8E-11	1.4E-11
Required log reduction	16	10	11

(a) The maximum norovirus concentration in gene copies per liter (GC/L) based on a literature review and meta-analysis presented by Eftim et al. (2017), Table 2.
(b) The high cyst concentrations found in untreated wastewater presented in Water Reuse, Metcalf and Eddy, 2007, Table 3-7 (Asano et al., 2007).
(c) An oocyst concentration based on Norway (Robertson et al., 2006) and Melbourne (Tetra Tech, 2011) data, rounded up.
(d) Calculated using the dose-response model described by Teunis et al. (2008), page 1471.

(e) Calculated using the exponential dose-response model described Regli et al. (1991), Table 1.
(f) Calculated using the beta-Poisson dose-response model described by Messner et al. (2016), Table II.

The second step involves identifying the LRVs required to compensate for possible brief lapses in treatment performance that may go unnoticed by the operators or the SCADA system.

The DPR 2016 Panel called for achieving reliability by "[u]sing a treatment train…with multiple, independent treatment barriers (i.e., redundancy) that meet performance criteria *greater than* (emphasis added) the public health threshold $\log_{10}$ reduction value (LRV) goals established for microorganisms" (Olivieri et al., 2016, p. 3, executive summary). For the treatment train to reliably provide microbiologically safe drinking water, the treatment train must be designed to include log reduction capacity beyond the minimum required log reductions.

A treatment train has sufficient log reduction capacity to reliably achieve the required log reductions when it is designed for a total of 20-log enteric virus, 14-log *Giardia lamblia* cyst, and 15-log *Cryptosporidium* oocyst reduction between the raw wastewater and finished drinking water. These log reductions were determined by conducting a quantitative microbial risk assessment of a treatment train and applying a conservative critical treatment failure scenario for each reference pathogen, calculating the resulting risk of infection associated with the failure scenario, and then adjusting the total log reduction value (LRV) required to be provided by the treatment train to ensure the calculated risk of infection does not exceed a daily threshold of 2.7×10^{-7} (which is equivalent to a 1:10,000 annual risk of infection).

The failure scenario is analyzed using a quantitative microbial risk assessment tool called DPRisk, developed by The Water Research Foundation in a research study funded by the State Board that incorporates a probabilistic analysis of treatment train performance (PATTP) to determine the pathogen exposure concentration. The PATTP allows for failure scenarios to be modeled. The tool calculates the risk of infection based on the pathogen exposure from water consumption and the applicable dose-response curve for the reference pathogen. A final draft of the study report provides an overview of the research scope, DPRisk tool guidance document, and training presentations (Pecson et al., 2021a). The DPRisk tool is available at: https://cawaterdatadive.shinyapps.io/DPRisk/.

The conservative critical failure scenario includes a set of health protective assumptions: (a) the critical treatment process identified is the advanced oxidation process using ultraviolet light (UV/AOP), which is capable of providing a maximum 6-log reduction for each reference pathogen; (b) the critical failure of the UV/AOP is a power interruption that shuts down all UV lamps; and (c) a reasonable UV/AOP failure duration of 15 minutes is applied to the scenario based on standard design of UV/AOP treatment

which typically includes a supervisory control system that continuously monitors and controls the quality of the power supply, condition of the UV lamp ballast, UV lamp output, and other electrical components, such that any treatment failure is identified and controlled accordingly within minutes or seconds; and (d) the critical failure is an infrequent to rare occurrence, which is characterized in this analysis as occurring once per year.

	Enteric virus	***Giardia***	***Cryptosporidium***
Required log reduction to ensure microbiologically safe drinking water (see topic 1)	16	10	11
Critical treatment train failure scenario modeled:			
- Critical Process	UV/AOP	UV/AOP	UV/AOP
- Maximum loss of LRV	6 log	6 log	6 log
- Process failure magnitude	100% (loss of all 6 logs)	100% (loss of all 6 logs)	100% (loss of all 6 logs)
- Process failure duration	15 minutes	15 minutes	15 minutes
- Process failure frequency	Once a year	Once a year	Once a year
Excess log capacity needed to achieve a 2.7E-07 daily risk of infection with failure scenario	4	4	4
Minimum required design LRV	20	14	15

Individual pathogen control section and subsection requirements

The DiPRRA is given the responsibility for ensuring that the municipal wastewater receives continuous treatment prior to becoming drinking water. The DiPRRA is the lead agency in the project and is a public water system. As a public water system, it must comply with all drinking water regulations and the requirements of its permit authorizing the direct potable reuse project. The treatment requirements must be met continuously because the pathogen threat is always great.

Subsection (a) requires that the DPR project treatment train be designed and constructed to meet specific requirements. During the project approval process the treatment designs will be reviewed and the final construction will be evaluated for conformance with approved designs. This subsection refers only to design and construction – not operation, which is addressed in the next subsection.

Subsection (a)(1) requires that the treatment train LRVs be at least 20 log for enteric virus, 14 log for *Giardia lamblia* cyst, and 15 log for *Cryptosporidium* oocyst. These LRVs represent the minimum LRVs required to produce safe drinking water (16 log for enteric virus, 10 log for *Giardia lamblia* cyst, and 11 log for *Cryptosporidium* oocyst) plus the four-log reduction to compensate for brief unobserved treatment lapses.

Subsections (a)(2) and (a)(3) require that for each reference pathogen, the treatment train must consist of at least four separate treatment processes utilizing at least three diverse treatment mechanisms. A treatment process may be credited with no more than 6 log reduction, and at least four processes must each provide at least 1.0 log reduction for each reference pathogen. A single treatment process may receive log reduction credits for one or more pathogens. The following treatment mechanisms must be included: a membrane physical separation mechanism, a chemical disinfection mechanism, and a UV disinfection mechanism, with each mechanism validated for no less than 1.0 log reduction.

The 2016 Panel called for multiple independent diverse barriers (p. 219, finding #8-1, p. 244, finding #9-3, Olivieri et al., 2016). A variety of treatment processes will be involved in the conventional and advanced wastewater treatment. These treatment processes utilize diverse organism removal and inactivation mechanisms. The criteria further encourage effective multi-barrier treatment by requiring several substantial barriers (four barriers each capable of providing at least 1-log reduction) and place a limit on the log reduction that can be claimed for any single barrier (6-log).

The three treatment mechanisms specified are the three that are being used by projects to provide the bulk of the log reductions for indirect potable projects. The 2016 Panel used a treatment train with the three specified treatment mechanisms in its analysis of regulatory feasibility for DPR (Olivieri et al., 2016). The 2022 Panel's preliminary finding for the regulations, which include the requirement for the three treatment mechanisms, is that the regulations are adequately protective of public health. These are evidence that three treatment mechanisms are practical and effective choices for DPR and would be protective of public health. Specifying four or more mechanisms may necessitate the use of mechanisms that are not cost effective. Three are sufficient to ensure mechanism diversity. The mechanism diversity requirement only requires that the three cumulatively provide 3-log reduction and should not restrict the use of innovative treatment mechanisms in the future.

Multi-barrier treatment to control a contaminant can achieve a number of desirable objectives that improve the overall reliability of a treatment train. The multi-barrier concept is embedded in federal and state drinking water standards (54 Federal Register 27486 et seq. (June 29, 1989)). Should one treatment barrier fail, others should still be effective. A water quality challenge that impairs the performance of one treatment barrier may not affect a dissimilar barrier.

Subsection (a)(4) requires that each treatment process must have the LRVs validated by a study. Validation is a rigorous process for determining under what conditions the treatment will be effective. The requirement is necessary to demonstrate the capability of a treatment process to remove or inactivate a pathogen and under what conditions the pathogen removal or inactivation is effective, in order to ensure protection of public health. This subsection provides options that a DiPRRA may use to satisfy the requirement for validation of pathogen log reduction.

Subsection (a)(4)(A) allows a validation study previously approved by the State Board to be used when the validation study followed an approved protocol addressing elements described in subsection (a)(5)(C). These include the validations for alternative filtration technologies that used protocols approved by the State Board pursuant to the U.S. EPA Membrane Filtration Guidance Manual (2005) and validations of UV reactors following the U.S. EPA UV Disinfection Guidance Manual (2006). The State Board has also previously approved technology validations for IPR projects conducted using approved protocols meeting the requirements of subsection (a)(5)(C). Allowing flexibility to use existing validations to satisfy the requirement can help streamline the review process.

Subsection (a)(4)(B) allows the use of the U.S. EPA log inactivation tables for virus, *Giardia lamblia*, and *Cryptosporidium* oocyst inactivation in the surface water treatment rules that are widely used in the water industry (54 Federal Register 27486 et seq. (June 29, 1989), 71 Federal Register 537 et seq. (January 5, 2006)). These log inactivation tables are based on validation studies using validation study protocols that include the elements described in subsection (a)(5)(c). These log inactivation tables specify the type of water for which the tables are valid and the operational envelopes within which the tables are valid.

Subsection (a)(4)(C) refers to the subsection that identifies the necessary components of a protocol for a validation study.

Subsection (a)(5) provides the criteria for a validation study protocol. These protocol components are necessary to make sure the validation has a sound scientific basis.

Subsection (a)(5)(A) requires that the validation study protocol be submitted to the State Board prior to conducting the study so that the State Board can verify that the study contains the required elements to minimize the chance that resources will be wasted on a study that cannot be accepted.

In subsection (a)(5)(B) the qualifications of the person preparing the protocol are selected to ensure that they understand the science involved. The validation study protocol may rely on ones previously approved by the State Board. The types of existing protocols that can be used to satisfy the requirement, and testing required under certain circumstances, are identified to streamline the process. These include procedures and protocols used to validate treatment for surface water treatment and indirect potable reuse.

Subsection (a)(5)(C) identifies the required validation protocol elements and the information to be included in the subsequent validation study report. The validation study protocol elements are necessary to ensure that the study will be focused on the measures appropriate to the technology being tested, will result in a quality data set for evaluation, and will draw usable conclusions from the data. The protocol elements are a refinement of the validation procedures used for indirect potable reuse treatment.

Subsection (a)(5)(C)1 requires the treatment mechanism(s) to be identified and is necessary to make sure everyone understands fundamentally how the treatment reduces pathogenic organism densities and, therefore, what measurements must be made to characterize the operation during the study.

Subsection (a)(5)(C)2 requires that a resistant pathogen, or its surrogate, must be measured to determine the log reduction. This is necessary to assure the log reduction is based on direct evidence of reduction and to assure that the performance would also be effective for pathogens that are less resistant to the treatment.

Subsection (a)(5)(C)3 requires that the pathogen or surrogate challenge must be high enough to allow calculation of the log reduction claimed. This is necessary to ensure that the data collected is able to be analyzed.

Subsection (a)(5)(C)4 requires that any factors that can affect the performance of the treatment be determined and measured and is necessary so that the factors can be included as conditions of the validation.

Subsection (a)(5)(C)5 requires that the log reduction be correlated with some operational parameter that can be measured continuously to be used to determine in real time if the treatment is providing the validated log reduction. This is necessary to ensure treatment performance can be continuously monitored to demonstrate efficacy and protection of public health.

Subsection (a)(5)(C)6 requires the study methodology to be described and is necessary so that the study can be compared to the required study elements, including the need for a challenge test and identification of the validation acceptable operational envelope.

Subsection (a)(5)(C)7 requires a description of how the data will be evaluated to allow a review of the basis for the results. This is necessary to ensure data collected by the study is analyzed using sound scientific principles.

Subsection (a)(5)(C)8 requires a description of how the critical limit and control strategy will be determined and this is necessary to make sure these are consistent with the critical control point operational approach.

Subsection (a)(5)(C)9 requires a description of the method used to calculate the validated log reduction. This is necessary to make sure that the log reduction is properly justified.

Subsection (a)(5)(C)10 requires identification of circumstances that indicate the need to revisit the certification, and this is necessary so that they can be identified in the operations plan or in some other fashion.

Subsection (a)(5)(D) requires a validation study report that describes the study and presents the results. The study report evaluates the data generated by the validation study and identifies the treatment log reduction value(s) and critical limit(s) attributed to each validated treatment process, the operational monitoring and control strategy, and the circumstances that would require a re-validation or additional on-site validation. This requirement is necessary to provide all the information the State Board needs to review the study. The subsection identifies the required qualifications for the preparer of the report to make sure the preparer has the knowledge and experience to fully understand the issues. For projects that rely on a previously approved validation study to satisfy the requirement in subsection (a)(4), subsection (a)(5)(D) requires the validation protocol and study report to be included in the engineering report to allow for a technical review by the DPR project engineer as to the technical merit of using an existing validation to satisfy the regulatory requirement. Under these conditions, a separate validation study report need not be prepared. Subsection (a)(5)(D) is necessary to provide flexibility for a DPR project to use a treatment that has been previously validated if the treatment has been evaluated by the DPR project engineer to be suitable for use.

Subsection (a)(6) makes it clear how the treatment train LRV is to be determined.

Subsection (a)(7) requires that the UV disinfection described in subsection (a)(1) included in the treatment train be designed to provide a dose of at least 300 millijoules per square centimeter (mJ per cm^2). This is necessary to ensure effective control of viruses regardless of the particular virus posing the greatest threat. The validation of UV treatment pursuant to subsection (a)(4) must be a virus resistant to UV disinfection as required by subsection (a)(5)(C)2. (U.S. EPA, April 2020).

Subsection (b) identifies the operation requirements of the pathogen control treatment. Proper operation of the treatment trains pursuant to these standards is necessary to ensure safe drinking water is provided by the DPR project.

To determine compliance with the microorganism log reductions pursuant to subsection (b), subsection (b)(1) requires that treatment train LRVs must be tracked continuously with a SCADA system utilizing online monitoring for each treatment process that was approved to receive credit for validated pathogen reduction.

Subsection (b)(2) requires continuous treatment that achieves 16-log reduction of enteric virus, 10-log reduction of *Giardia lamblia* cyst, and 11-log reduction of

Cryptosporidium oocyst because these are the reductions that are necessary to get from the pathogens that could be in wastewater down to safe drinking water levels. The derivation of these log reductions is described in the first step of the Overview of Pathogen Control Approach above. The 16-log reduction of enteric virus, 10-log reduction of *Giardia lamblia* cyst, and 11-log reduction of *Cryptosporidium* oocyst is required to be met using validated treatment LRVs because it is necessary that the treatment used to reduce the pathogen LRVs for protection of public health has been tested rigorously to demonstrate its efficacy to remove or inactivate the pathogen. The 16-log reduction of enteric virus, 10-log reduction of *Giardia lamblia* cyst, and 11-log reduction of *Cryptosporidium* oocyst may also be met using the options set forth in subsection (d) that may be available to a project. This is to allow flexibility for projects to use these options to provide redundancy and address a failure of a validated treatment.

Subsection (b)(3) requires that the treatment train be operated to achieve 20-log reduction of enteric virus, 14-log reduction of *Giardia lamblia cyst*, and 15-log reduction of *Cryptosporidium* oocyst not less than 90 percent of the time in any month while conforming to the operations plan prepared pursuant to section 64669.80. These LRVs, as stated above, are the minimum LRVs necessary to produce safe drinking water plus treatment to satisfy recommendations of the 2016 Panel and the 2022 Panel to account for potential treatment lapses. The derivation of these log reductions is described in the second step of the Overview of Pathogen Control Approach above.

It is recognized that treatment lapses may occasionally occur, and four-logs of redundancy is built into the design requirement of a DPR train. Therefore, an occasional lapse in treatment below 20-log reduction of enteric virus, 14-log reduction of *Giardia lamblia cyst*, and 15-log reduction of *Cryptosporidium* oocyst would not pose a threat as long as the minimum 16-log reduction of enteric virus, 10-log reduction of *Giardia lamblia* cyst, and 11-log reduction of *Cryptosporidium* oocyst is being provided. Although the full 20-log reduction of enteric virus, 14-log reduction of *Giardia lamblia cyst*, and 15-log reduction of *Cryptosporidium* oocyst may not be achieved at all times, DiPRRA must endeavor to operate the pathogen treatment train to reliably achieve the full 20-log reduction of enteric virus, 14-log reduction of *Giardia lamblia cyst*, and 15-log reduction of *Cryptosporidium* oocyst, to minimize the chance that a brief unobserved treatment lapse occurs when the full 20-log reduction of enteric virus, 14-log reduction of *Giardia lamblia cyst*, and 15-log reduction of *Cryptosporidium* oocyst is not operating. Ninety percent availability of the full treatment, including redundant LRVs, is consistent with the objective and with the 2022 Panel's recommendations for allowing operational flexibility (2022 Panel preliminary findings dated June 23, 2022).

Subsection (b)(4) identifies steps that must be taken if the full 20-log reduction for enteric virus, 14-log reduction for *Giardia lamblia* cyst, or 15-log reduction for *Cryptosporidium* oocyst is met less than 90 percent of the time in a month for two consecutive months. In this case the full log removal treatment is losing some of the redundancy required. The steps include actions to reduce future lapses and notify the State Board on the status of treatment reliability. The first step involves identification of

the cause of the reliability failure to enable remediation. The second step requires that the cause of the failure be corrected to restore the necessary reliability. The final step requires that the preceding steps be reported to the State Board to allow tracking of operational issues that may indicate insufficient technical, managerial, or financial capacity.

Subsection (b)(5) requires a DiPRRA to discontinue delivery of DPR project water if the 16-log reduction of enteric virus, 10-log reduction of *Giardia lamblia* cyst, and 11-log reduction of *Cryptosporidium* oocyst are not met. This is the minimum treatment to ensure consistently safe drinking water and a lapse in this level of treatment could lead to a waterborne disease outbreak (National Research Council, 2012).

Subsections (b)(6) and (b)(7) require that the number of treatment processes and treatment mechanisms specified in subsections (a)(2) and (a)(3) for the treatment train be operated as continuously as feasible by requiring that interruptions be addressed immediately, which is necessary to ensure water safety. The DiPRRA shall notify the State Board whenever the pathogen control treatment train operates with fewer than four processes or fewer than three mechanisms or without using the treatment mechanisms specified in subsection (a)(3). Notification of the loss of the minimum number of mechanisms is necessary for the State Board to know when a DPR project becomes more vulnerable to not meeting the minimum 16-log reduction of enteric virus, 10-log reduction of Giardia lamblia cyst, and 11-log reduction of Cryptosporidium oocyst. Notification of the loss of the minimum number of treatment processes is necessary as it may indicate that the project is having difficulty providing the necessary TMF described in section 64669.30.

Subsection (b)(8) requires notification of the State Board and each public water system receiving water directly from the DPR project within 60 minutes upon discontinuing delivery of DPR project water pursuant to subsection (b)(5) for a failure to meet the minimum pathogen log reduction of 16-log for enteric virus, 10-log for *Giardia lamblia* cyst, or 11-log for *Cryptosporidium* oocyst. This notification is necessary to allow water systems and the State Board the opportunity to identify possible risks and take any action necessary to protect the public.

A condition serious enough to cause a disruption in service must be fully evaluated and corrected prior to resumption of service. Subsection (b)(9) requires that the State Board be notified before commencing delivery of finished water after a shutdown pursuant to subsection (b)(5) occurs. Restarting service must be in conformance with the protocol in an approved operations plan. An incident report, including corrective actions, is necessary and must be submitted to the State Board to document the incident so that the State Board can follow up with the DiPRRA on the actions taken, and what can be done to prevent the failure in the future.

Subsection (c) requires that the minimum pathogen LRVs necessary to reduce pathogens to safe drinking water levels are continuously provided. Because of the

potential proximity of the finished drinking water to the wastewater source for direct potable reuse, subsection (c) requires that the treatment control system be able to identify the failure of a process and automatically shut down the delivery of water if the treatment train does not meet the minimum removals of 16 log for enteric virus, 10 log for *Giardia lamblia* cyst, or 11 log for *Cryptosporidium* oocyst reductions. The control system must be able to discontinue water delivery within the time provided by the downstream flow path as determined in section 64669.85(b)(3). This will ensure that inadequately treated water will not be distributed before the control system can fully shut off the flow. The control system must have alarms that notify the operator when the process is not operating as designed so that they can take corrective action.

Subsection (d) identifies the circumstances for which blending and mixing, may be proposed by a DPR project in lieu of engineered treatment for a portion of the log reduction requirements in subsections (a)(1), (b)(2), and (b)(3), which refer to the design and operations criteria of 20 log for enteric virus, 14 log for *Giardia lamblia* cyst, and 15 log for *Cryptosporidium* oocyst, and the operations criteria of 16 log for enteric virus, 10 log for *Giardia lamblia* cyst, and 11 log for *Cryptosporidium* oocyst. A two-log limit is placed on the sum of the three options for the reasons discussed in the following paragraphs.

LRV is defined as a measure of the ability of a treatment train or a treatment process to remove or inactivate microorganisms such as bacteria, protozoa and viruses. Blending treated wastewater with another water source or mixing it in a reservoir does not remove or inactivate organisms - they do not provide LRVs - they simply disperse pathogens in a greater volume of water. The objective of the pathogen control criteria, however, is to reduce the concentration of pathogens to consistently safe levels. Blending, or mixing in some cases, can reduce pathogen densities and may be used as a substitute for treatment LRVs in certain limited circumstances.

The minimum removals of 16-log for enteric virus, 10-log for *Giardia lamblia* cyst, and 11-log for *Cryptosporidium* oocyst in Section 64669.45(b)(2) and following subsections are intended to reduce wastewater pathogen densities to safe drinking water levels even when the wastewater densities are at peak levels. These log reductions are necessary to comply with the surface water treatment regulations when municipal wastewater is the surface water source for DPR projects. Consistent with the use of log removals in surface water treatment, these log reductions must be met with validated treatment LRVs – the infectious agents must be eliminated from the water.

The four-log difference between the 16-log for enteric virus, 10-log for *Giardia lamblia* cyst, and 11-log for *Cryptosporidium* oocyst and the 20-log for enteric virus, 14-log for *Giardia lamblia* cyst, and 15-log for *Cryptosporidium* oocyst in Section 64669.45 (a)(1) and following subsections is the assumed log reduction that could possibly be lost due to a temporary treatment lapse that could go unnoticed by the SCADA system or operators. This redundant four-log removal can also be used to minimize the possibility that the minimum removals of 16-log for enteric virus, 10-log for *Giardia lamblia* cyst,

and 11-log for *Cryptosporidium* oocyst might not be met due to treatment shortcomings. The redundant log removal can be met with validated treatment LRVs or with any combination of the three options that may be demonstrated to achieve the same goal of minimizing the possibility of an unnoticed treatment lapse or shortcoming that may cause the 16-log for enteric virus, 10-log for *Giardia lamblia* cyst, and 11-log for *Cryptosporidium* oocyst to not have been met. It should be noted however that these other options may also experience unnoticed operations failures that can diminish their ability to provide redundancy for the unnoticed treatment lapse or shortcomings. To limit the impact of the unnoticed operations failures from these options on the overall four-log redundancy, it is necessary for subsection (d) to limit the total credit from these options to two log, with the balance of the four-log redundancy provided by 2 log of redundant validated treatment LRV.

Blending and mixing are two options that can be substituted for up to two-log reduction by satisfying the requirements of subsection (d)(1) and (d)(2) respectively. In these regulations, blending is used to refer to the comingling of multiple water sources to produce a water of intermediate quality. Mixing is used to refer to the comingling of segments of water flow over time as they pass into and through a reservoir. The benefit of mixing is to attenuate any short duration spike in pathogen concentration due to treatment lapses by mixing it with DPR project water in the reservoir treated at other times.

Subsection (d)(1) describes how the allowed log reduction substitution is quantified for continuous blending of DPR project water with another surface or ground water source of drinking water. The substitution is the negative $\log_{10}$ of the fraction of the total flow that is treated DPR project wastewater. Up to two-log credit for blending may be granted to meet the minimum log removals for each reference pathogen if it can be shown that the blending is continuous (uninterruptible) and complete for the credit being sought, and the blend can be verified, as required in subsection (e).

Blending treated wastewater with other water sources produces an intermediate pathogen density that depends on the relative flows and densities. It is not practical to use actual densities to calculate blended density because the values vary and cannot be known in real time. The greatest possible LRV substitute would be the blend without factoring in diluent water densities, where the LRV substitute can be approximated by the calculation specified in the regulations (the negative log of the WWC). This occurs when the difference between peak wastewater pathogen densities and densities in approved sources (diluent water) are so great that the approved source contribution will not affect the rounded result. However, when the diluent water densities approach DPR water densities, the LRV substitute is not well approximated using the WWC calculation at higher LRVs. It is therefore necessary to limit the LRV substitute for blending to two logs. No limits on the method of calculation in the regulation are needed.

The blend water must be an approved drinking water source. This is necessary to ensure that the blend water is of known water quality and suitable to be used to produce

a blended water that is protective of public health. The approval process by the State Board for a drinking water source is an assessment of the water quality that identifies the harmful contaminants in that source and operations that could introduce contaminants into that source, as well as the necessary treatment for that source to ensure a safe drinking water supply.

The use of continuous mixing in a reservoir as a substitute for log reductions is addressed in subsection (d)(2). Mixing in a reservoir or other facility averages the variations of pathogen concentration that may occur over time. If a quantity of off-spec water enters a reservoir the elevated pathogen concentration can be attenuated as a function of reservoir hydrodynamics and capacity. The mixing can only attenuate elevated pathogen densities resulting from deficiencies in treatment occurring prior to the mixing. Subsection (d)(2) requires that the treatment train prior to mixing be designed and constructed to provide at least 16 log for enteric virus, 10 log for *Giardia lamblia* cyst, and 11 log for *Cryptosporidium* oocyst. This is necessary to ensure that fluctuations in the treatment necessary to meet the minimum log reductions can be attenuated by the mixing in the reservoir.

Whereas treatment and continuously blending with other sources can be effective indefinitely, the attenuation effectiveness of mixing in a reservoir diminishes as excessive contaminants from off-spec discharge are mixed into the reservoir reducing the diluent capacity. The LRV substitute for mixing in a reservoir must be adjusted to allow for the possibility of multiple or long duration off-spec events. The four-log redundant removal is based on a 15-minute loss of UV (6-log) treatment. Basing the LRV substitute value of mixing on a 1-hour off-spec event makes the mixing sufficiently resilient relative to treatment LRVs. Impoundment mixing to continuously achieve more than a two-log attenuation of contaminants from a 1-hour discharge of elevated concentration pushed the limit of confidence in the demonstration used as the basis for this regulation subsection and could not be justified.

Subsection (d)(2) also requires that the basis for the mixing substitution be demonstrated with hydrodynamic modeling and tracer studies that is reviewed by an independent advisory panel pursuant to section 64669.120. Hydrodynamic modeling with model calibration and validation by tracer tests is necessary to demonstrate that the continuous mixing commensurate with the credit sought will occur over the range of proposed operational conditions. The demonstration will provide assurance that the benefit of reservoir mixing is not overstated and provide information on reservoir mixing operations what would allow for the operation to be defined and controlled to justify the credit granted for the operation. An independent advisory panel conducts similar review of reservoir hydrodynamic modeling and tracer studies for IPR projects, and it is appropriate to require a panel to review the types of reservoirs that might be proposed for DPR, as these reservoirs are likely smaller, more complex to model, and experience more variability than might be found for IPR projects.

Virus inactivation in an aquifer is a third option that can be substituted for a portion of the redundant four-log reduction by satisfying the requirements of subsection (d)(3).

Subsection (d)(3) addresses the substitution of LRV for virus only when DPR project water is retained in a groundwater basin. The calculation in the regulation (0.033 log per day times the retention time in days, Yates et al., (1985)) is the virus decay rate that was used as the basis for the virus log credit for the groundwater replenishment indirect potable reuse regulation. A limit of two-log removal is allowed for this subsection because retention longer than two months is considered indirect potable reuse (Title 22, Chapter 3, § 60320.124 and § 60320.224). An independent advisory panel is necessary to review the groundwater modeling and tracer testing to provide technical expertise on groundwater models developed for DPR applications, which involve short retention times, different groundwater operations and flow regimes than may be found in IPR, and potentially more complex models and tracer tests, and technical expertise in interpreting model and tracer study results. Although a different issue, a panel can also provide technical expertise regarding potential water quality issues with the recharge or storage of DPR project water in an aquifer.

Subsection (e) requires that the operation of the options in subsection (d) be defined and controlled through the use of control points and critical limits. This is necessary so that the State Board can review when operations are within the approved operating envelope which indicates that the operations are demonstrating the credit. A DPR project proposing to use an option in subsection (d) must identify the monitoring locations and objectives that verify that the conditions justifying the log removal credit are present. The project must identify the conditions that require reassessment of the log removal credit so that the State Board can review when a credit granted must be re-evaluated. This is necessary to ensure that operations accurately reflect the credit that can be achieved, to ensure protection of public health.

Subsection (f) calls for actions in the event alternatives are proposed for the decay rate for virus based on time and temperature. The requirements for a demonstration and IAP review make the approval of these alternatives as rigorous as other alternative approvals in the regulation. Subsection (f) allows a higher substitute credit limit for the specified option in subsection (d)(3). It is necessary for protection of public health for the DiPRRA to demonstrate that an alternative proposed credit for option (d)(3) provides virus control at least as health protective as a treatment process validated to the same log reduction because these options must provide equivalent benefits as a treatment it is substituting. It is necessary to protect public health that these alternatives be reviewed by an IAP because an IAP can provide the necessary specialized technical expertise to scrutinize the scientific and technical basis for an alternative proposed credit that may not otherwise be provided.

Subsection (g) makes it clear that the DPR project water must also comply with a disinfection requirement in the surface water treatment regulations. The requirement is

necessary to reduce ambiguity over the need to comply with those regulations when engaged in a DPR project under this Article.

Section 64669.50. Chemical Control.

Drinking water regulations include water quality standards for contaminants that may be found in typical sources of drinking water supply. However, current drinking water regulations do not address many chemicals of potential concern to public health at levels that are present, or can occasionally occur, in municipal wastewater. The municipal wastewater can contain a wide variety of ever-changing known and unknown chemicals that may occur at concentrations that pose a health risk. These chemicals, lacking regulatory drinking water limits, are commonly called “chemicals of emerging concern” or “constituents of emerging concern” (CECs).

Public health risks from chemicals that lack a regulatory drinking water limit, for which analyses are not practical and/or health risks have yet to be adequately identified, can be addressed using treatment techniques in lieu of a regulatory drinking water limit. Concentrations of known and unknown chemicals in municipal wastewater may vary widely, and the public health risks due to this variation of municipal wastewater quality can also be addressed using treatment techniques. The treatment techniques specified in section 64669.50 would reduce the health risk of these chemicals to levels that are below public health concern in order to yield safe drinking water and are accordingly necessary as part of this Article. The treatment techniques include a requirement that continuous treatment be provided prior to the distribution of water as provided in subsections (a) through (q).

Subsection (a) requires treatment with a combination of ozonation paired with biologically activated carbon (ozone/BAC), reverse osmosis (RO), and advanced oxidation treatment (AOP) to limit and control the concentrations of CECs. RO and AOP are required for most indirect potable reuse projects for the same purpose. The 2016 Panel stated that “regulations specifying DPR practices need to provide…features in addition to requirements already specified in the IPR regulations for California” (page 258, Olivieri et al., 2016). Ozone/BAC is added for DPR projects to address a concern of the 2016 Panel for an additional barrier to address low molecular weight CECs, which have been shown to pass through RO and a combination of RO and AOP treatment (Figures 4-1 and 4-2, Chapter 4, Olivieri et al., 2016). The demonstration of the effectiveness of ozone/BAC is largely based on a study done for San Diego, which demonstrated effective removal of formaldehyde and acetone, two chemicals that are used in studies to represent low molecular weight CECs (Chapter 8, Olivieri et al., 2016). Ozone/BAC treatment in the treatment train will also be able to attenuate a sudden appearance of high CEC concentrations (Figure 8-3, Chapter 8, Olivieri et al., 2016).

The requirements in subsection (a) that the treatment train consists of at least three separate treatment processes using diverse treatment mechanisms for chemical reduction and the selection of treatment processes address the Panel's recommendations as to the necessity for multiple barriers and diverse treatment mechanisms to be provided in a DPR treatment train. (Figure 8-7, and Chapter 11, Section 11.1, Overall expert panel findings relative to the feasibility of developing uniform water recycling criteria for direct potable reuse, Olivieri et al., 2016).

Subsections (a)(1) through (a)(3) make it clear that the processes must conform to the design and operational criteria in the section. Subsection (a)(1) further clarifies that there is a specific circumstance in subsection (c) under which the requirement to provide ozone/BAC may be reduced or eliminated.

Subsection (b) requires that the sequence of the treatment processes in the treatment train follow the order specified (ozone/BAC, followed by RO, followed by AOP). The order of treatment processes is specified to make sure each will receive the quality of water that was used in demonstration studies. Ozone will break down organic molecules into smaller organic molecules, some of which will be biodegraded by the biological filter organisms in the BAC. The ozone/BAC process will reduce the amount of low molecular weight chemicals like acetone and formaldehyde that are not removed by the downstream RO and AOP treatment. The ozone/BAC treatment must precede the RO treatment in the treatment train so that there is enough organic material to support the biological activity of the ozone/BAC. Next in the treatment train is RO, which will remove all sizable molecules. Then AOP degrades most of the remaining low molecular weight material.

Subsection (c) provides an alternative to the treatment required in subsection (a)(1). Blending the wastewater with an approved conventional drinking water source or drinking water will reduce the concentration of contaminants targeted by ozone/BAC as effectively as the treatment would, as long as the blending is continuously provided. The design criterion for ozone/BAC treatment in subsection (d) is a 1-log reduction of the specified indicator chemicals. A 9:1 blend (wastewater contribution, WWC = 0.10) does the same thing and is thus allowed by subsection (c) as a substitute for the ozone/BAC treatment. The fraction of the municipal wastewater flow that must be treated with ozone/BAC, when combined with a blend less than 9:1, such that 1-log reduction can be met, is determined by the equation in subsection (c). This allows flexibility for designing the capacity of the ozone/BAC treatment when continuous blending is available for a range of blends while achieving an equivalent level of public health protection.

Subsections (d), (e) and (f) provide the design, design validation, and operational requirements for the ozone/BAC, each of which is necessary to ensure the ozone/BAC process is providing chemical control as designed, and therefore ensuring the provision of safe drinking water from a DPR project.

Subsection (d) provides the design requirements for the ozone/BAC, which are necessary to ensure the provision of safe drinking water. The combined ozone/BAC process must be able to achieve a 90 percent reduction of the four specified indicator chemicals. These chemicals are representative of the types of chemicals the processes are intended to control, and a 90 percent reduction is sufficient to limit exposure to these classes of chemicals (2022 Panel recommendation 8, State Board, 2022). Additionally, subsection (d) provides design requirements for each the ozone process and the BAC, because each provides a quantifiable benefit to the overall treatment and the design of each can affect the efficacy of the combined ozone/BAC treatment.

Subsection (d)(1) requires that the ozone process be designed to be able to provide a ratio of the applied ozone dose to the design feed water TOC concentration of greater than 1.0 because that ratio has been shown to be effective in demonstration studies (Sari et al., 2020).

Subsection (d)(2) requires that the BAC be designed to be able to achieve an empty bed contact time of 15 minutes at minimum. The minimum ozone to feed water TOC ratio dose capability and the minimum BAC filter empty-bed contact time are specified to make sure the designs conform to the design of processes that have been demonstrated to be effective at controlling CECs (Bukhari et al., 2022).

Subsections (d)(1) and (d)(2) also allow a different ozone dose to TOC ratio and/or a different empty-bed contact time to be used if a DPR project can demonstrate the reductions of the indicator chemicals during the pilot scale testing as part of the design of the ozone/BAC process. This allows flexibility for some projects to be able to conduct a study to verify a different ozone/BAC design that would achieve the indicator reduction design requirements, while allowing other projects that do not choose to conduct these studies to use the default design criteria for ozone-TOC ratio and empty bed contact time.

Subsection (e) requires individual testing (validation) of the proposed ozone process and BAC designs at full scale to demonstrate their effectiveness in achieving the indicator chemical reductions specified in subsection (d) and to identify appropriate surrogates and/or operational parameters. This is necessary to ensure that the as-built treatment process is capable of achieving the reduction of indicator chemicals as designed for each process and verify the reliability of operation of each process (State Water Board, 2022). Subsection (e) is necessary to specify a robust chemical treatment barrier for the reduction of CECs for the protection of public health.

Subsection (e)(1) requires at least a 90 percent (1.0 log) reduction of specific indicator chemicals across each process to demonstrate the individual efficacy of each process complies with the design standard. This requirement is necessary to set forth a performance standard for each component of ozone/BAC that assures that, when combined, a certain degree of treatment (a ten-fold reduction) is being provided by the ozone/BAC process to reduce those CECs in the wastewater that are as susceptible, or

more susceptible, to the treatment as the specified indicator compounds (Bukhari et al., 2022, State Board, 2022).

The test protocol developed pursuant to subsection (e)(2) must include the specified challenges to the processes and must be approved by the State Board prior to performing the testing to ensure it can satisfy the requirements for design approval set forth in this section. The subsection further requires that the testing demonstrate that proposed process performance measures to be used in full-scale operation correlate well with treatment effectiveness. Subsection (e)(2) requires the DiPRRA to perform the testing again when the full-scale operating conditions or the treatment control strategy becomes inconsistent with the conditions or control strategy used during the demonstration test. This is necessary to ensure that the treatment efficacy continues to meet design requirements when operating conditions change or the treatment control strategy changes, such as a change in the limits of the operational parameters or a change in the surrogate used.

Subsection (e)(3) requires the DiPRRA to include all results generated by the validation testing in the validation study report submitted to the State Board for review. The test report shall establish the surrogate and/or operational parameters, for State Board review, that indicate whether the design criteria are being met for each process during full-scale operation. These performance measures, for ozonation and BAC in subsections (3)(A) and (3)(B), respectively, must be able to be monitored online continuously, which is necessary so that the SCADA system can alert the operators and take appropriate actions promptly in the event of a failure. The validation study report is necessary to provide essential information to evaluate the contaminant removal efficacy of each treatment process and the operating conditions under which the validation study was conducted. The information is necessary for the State Board to establish the approved operating conditions for the ozone/BAC treatment process, including the approved operating envelope, the approved continuous monitoring, and the approved critical limits. The ozone/BAC process, when operating in conformance with the approved operating conditions, verified with online monitoring and controlled by the SCADA system and alarms, is deemed to achieve the specified design standard (e.g., the 1.0 log reduction of the four indicator compounds). This also means that when the ozone/BAC process is not operating within the approved operating conditions, the treatment is not providing the necessary chemical control.

Subsection (f) requires that the project continuously monitor for the surrogate or the operational parameters that verify process performance, as determined in (e)(4), to indicate if treatment requirements are being met. Continuous monitoring of nitrite is required to monitor the impact of radical scavengers which exert a demand on the advanced oxidation process. The advanced oxidation process will transform some nitrite into nitrate. Both nitrite and nitrate are strong scavengers of hydroxyl and chlorine radicals, which reduce the effectiveness of the process to degrade the chemicals of concern (2022 Panel recommendation 8, State Board, 2022).

Subsections (g), (h) and (i) provide the minimum criteria for the RO membrane used in a DPR project, the performance verification, and the operational requirements for the RO process, each of which necessary to ensure the RO membrane process is providing chemical control as designed, and therefore ensuring the provision of safe drinking water from a DPR project.

To ensure a DiPRRA utilizes membranes for RO that will adequately achieve the desired treatment goals (in particular, sufficient removal of CECs), subsection (g) establishes minimum criteria for the selection of an RO membrane to be used by a DiPRRA for a DPR project and the initial testing requirements for the RO membrane.

Subsection (g)(1) identifies the requirements for rejection of sodium chloride by each membrane element. Sodium chloride rejection is commonly utilized as an overall measure of an RO membrane's effectiveness, since several of its properties (ionic charge, size of the solvated ion, etc.) reflect the rejection of the organic chemicals of concern (ASTM, 2023). In addition, American Standard for Testing Materials (ASTM) International method D4194-23 is used by membrane manufacturers as a standard test method for determining the operating characteristics of RO and nanofiltration membranes. Subsection (g)(1) is necessary to provide clarity on the specific RO membrane specifications required to ensure effective reduction of CECs to protect public health.

Along with specifying minimum sodium chloride rejection criteria to be demonstrated under ASTM D4194-23 for adequately achieving the desired treatment goals, subsection (g)(1) also specifically requires utilizing Method A (for Brackish Water Reverse Osmosis Devices) of ASTM D4194-23, which is the most directly analogous of the three methods included in the ASTM standard to treating recycled municipal wastewater and has been shown to be effective for CEC reduction for IPR. In addition, when testing under ASTM D4194-23, specific test conditions are commonly used and reported by manufacturers when membranes are to be used for potable reuse. The narrower and/or more specific test conditions are established in paragraphs (A) through (E) of subsection (g)(1), which help ensure membranes are tested in the same manner, with comparable results indicating the membranes' ability to adequately reject the types of organic chemicals found in municipal wastewater.

To verify proper installation and to demonstrate the intended general effectiveness of the RO membrane under full operating conditions, subsection (g)(2) requires the DiPRRA monitor the membrane permeate during the first 20 weeks of operation to ensure that no more than five percent of the sample results have total organic carbon (TOC) concentrations greater than 0.25 mg/L, with monitoring occurring no less frequently than weekly. Subsection (g)(2) allows for an alternative surrogate parameter and corresponding limit, provided the DiPRRA has received approval for their use from the State Board.

Because there are a number of parameters that may be monitored to confirm that the membrane is performing as designed and intended, subsection (h) requires the DiPRRA to propose the manner in which it intends to monitor membrane integrity. The proposal, which is subject to State Board review as part of the engineering report, must include at least one form of continuous monitoring, along with the corresponding surrogate and/or operational parameter critical limits and alarm settings that will indicate when a membrane's integrity has been compromised, so that appropriate corrective action may be taken in a timely manner.

Subsection (i) requires that the project continuously monitor for the surrogate or the operational parameters that verify when the integrity of the reverse osmosis membrane is compromised. These requirements ensure the RO membranes are operating as intended on an on-going basis.

The 2005 U.S. EPA Membrane Filtration Guidance Manual (MFGM) provides pertinent guidance used by regulators nationwide on membrane filtration. There are two types of membrane integrity monitoring, direct and indirect. Direct includes pressure decay testing, which are standard methods used for microfiltration and ultrafiltration. Because pressure decay testing is not feasible for RO membranes, indirect methods are necessary. The MFGM recommends molecular markers. Online TOC monitoring has been demonstrated at existing reverse osmosis plants to be sensitive and indicative of RO integrity. Optimized RO systems produce permeate TOC concentrations less than 0.1 mg/L. While TOC monitoring does not indicate which specific organic chemical, it does indicate potential integrity issues that could include a toxic chemical. TOC setpoints can be used to indicate more extensive testing should be performed to verify integrity, such as a conductivity profile or a total trihalomethane formation potential analysis.

In the 2020 Water Research Foundation report 4771 "Characterizing and Controlling Organics in Direct Potable Reuse Projects" (Schimmoller et al., 2020), TOC monitoring is recommended. "As discussed above, online monitoring of bulk organics in the finished water of DPR plants is important to ensure adequate removal of organics by the AWT [advanced water treatment] process. Ideally, measurement of the selected parameter would be directly correlated to the presence of potentially hazardous organic chemicals in the potable reuse water. In addition, reliable and commercially available online instruments for the selected parameter are necessary to provide real-time monitoring. Online TOC analyzers were considered for real-time organics monitoring in this research because of their availability and successful application at drinking water and potable reuse plants. In addition, TOC can be measured with a high degree of accuracy over a wide range of concentrations (e.g., the GE M5310C online analyzer has a range of four parts per billion (ppb) to 50 parts per million with an accuracy of +/- 2% or +/- 0.5 ppb, whichever is greater)."

Subsection (j) identifies the RO performance triggers that indicate the need for investigation and submission of the results of the investigation to the State Board in the

monthly compliance report prepared pursuant to section 64669.95. This is necessary to ensure integrity of the RO membrane and clarify which investigation may be necessary to ensure the provision of safe drinking water from DPR projects.

Subsection (j)(1) addresses one kind of performance issue. When the RO permeate TOC exceeds 0.15 mg/L continuously for more than five days there may be a membrane or O-ring failure that is repairable (Trussell et al., 2017). By specifying a continuous exceedance of 0.15 mg/L for 120 hours, this allows for temporary fluctuations and time for operators to verify the accuracy of the TOC monitors. A conductivity profile is a direct integrity test to identify the location of a discrete failure. It is performed on individual RO vessels, allowing for other RO trains to continue to produce permeate (Walker et al., 2016).

Subsection (j)(2) addresses another kind of performance issue. If the RO permeate exceeds TOC concentrations of 0.1 mg/L continuously for more than 24 hours (96 fifteen-minute periods in a row) there may be a risk of elevated levels of disinfection byproducts (DBPs). Some chemicals that form DBPs like chloroform may pass RO systems at very low concentrations. The subsection requires that a sample be tested for the potential for a specific class of disinfection byproducts to inform the DiPRRA and State Board on the need for further study or maintenance. The link between TOC and DBPs was evaluated in Water Research Foundation report 4771 “Characterizing and Controlling Organics in Direct Potable Reuse Projects.” (Schimmoller et al., 2020) Toxicity was significantly lower when TOC was very low. Additionally, it stated, “RO treatment significantly reduced THM4 and HAA5 formation”.

Subsections (k) and (l) provide the validation and operational requirements for the advanced oxidation process (AOP) portion of the treatment train, which are necessary to ensure the AOP process is providing chemical control as designed, and therefore ensuring the provision of safe drinking water from a DPR project.

AOP treatment is required to address potentially harmful low molecular weight chemicals that may pass through the RO membrane. For example, N-nitrosodimethylamine (NDMA) and 1,4-dioxane - two contaminants for which notification levels (NLs) have been established pursuant to Health and Safety Code section 116455 - are non-ionic constituents that have low molecular weights and that are not substantially removed via ozone/BAC and RO treatment, but are effectively addressed by AOP. In general, ozone/BAC, RO and AOP in combination do not provide multiple barrier treatment for each chemical that may be problematic; however, they offer dissimilar treatment mechanisms to mitigate unknown organic chemical contaminants. To address chemicals like NDMA and 1,4-dioxane (i.e., chemicals similarly reduced with AOP treatment, without NDMA and 1,4-dioxane necessarily being present), AOP treatment is required.

The effectiveness of AOP for CEC reduction is reported in Section 2.3.3, UV Disinfection and Advanced Oxidation, of the Advanced Water Purification Facility Study

Report (pages 2-24 to 2-27, City of San Diego, 2013) for the City's Indirect Potable Reuse/Reservoir Augmentation Demonstration Project. Because the effectiveness of AOP treatment is dosage-dependent, in order to ensure an AOP treatment process is designed to be substantively effective, subsection (k)(1) requires a demonstration that the AOP treatment is designed and will be operated to achieve no less than what would be required to provide at least a 0.5-log reduction of 1,4-dioxane; a minimum treatment threshold found to be effective and utilized at several groundwater replenishment IPR projects (Table 8-2, Olivieri et al., 2016). In other words, even in the absence of 1,4-dioxane, a DPR project must utilize AOP treatment capable of providing as robust a barrier as an AOP treatment that would reduce 1,4-dioxane by at least 0.5- log.

Recognizing that there may be varying types and configurations of AOP treatment available to achieve the treatment standard (equivalent to no less than 0.5-log reduction of 1,4-dioxane), the regulations do not require a specific type or configuration for AOP treatment. Rather, the DiPRRA is required to demonstrate that its chosen design for the DPR project will achieve the treatment standard. Subsection (k)(1) requires the DiPRRA to submit a test protocol that complies with the requirements of the subsection to the State Board, for review and approval, describing the means by which the DiPRRA intends to demonstrate that its AOP treatment will achieve the treatment standard under normal full-scale operating conditions and the proposed surrogate and/or operational parameters to be used.

Subsection (k)(2) requires that the DiPRRA submit a validation study report that includes all the results generated by the testing, to the State Board for review. The report must identify the surrogate and/or operational parameters that will be monitored and establish critical limits for the surrogate and/or operational parameters that indicate whether the design criterion is being met. At least one form of continuous monitoring must be proposed, along with the corresponding surrogate and/or operational parameter limits and alarm settings that will indicate when the AOP's process integrity has been compromised or otherwise not operating as designed. These requirements clarify that the proposed operating criteria for the treatment must be contained in the report to facilitate State Board review. This review is necessary to provide the State Board with oversight of DPR projects to ensure the provision of safe drinking water to consumers.

Subsection (l) requires the full-scale operation of the AOP treatment to be continuously monitored and recorded to ensure that the operations are within the approved operational envelope described in the operations plan. Continuously monitoring the surrogate and/or operational parameters and recording when critical limits are exceeded is the ongoing verification necessary to ensure that the AOP treatment is operating in accordance with the design. This is necessary to ensure compliance with the AOP standards set forth in this section.

Subsections (m) and (n) address the threat posed by a short-duration episodes of elevated concentrations of chemicals that might result from illegal dumping or

unintentional discharge occurring in the sewered area (2016 Panel Findings 4-7 and 8-1(h), and Research Recommendation 8-3, Olivieri et al., 2016). The threat from short duration episodes relates to the resulting exposure of pregnant consumers who could be exposed to and ingest very high levels of teratogenic or fetotoxic chemicals that can result in adverse pregnancy outcomes.

Subsection (m) requires that the project treatment, storage, and piping/conveyance facilities provide mixing in the direction of flow that will reduce a one-hour spike in concentration of a chemical by a factor of ten. This longitudinal mixing will reduce the peak concentration of a chemical by spreading it out over a longer time, and concomitantly reduce the concentration of a chemical spike that would pose a health risk to drinking water consumers (Debroux et al., 2021). Longitudinal mixing occurring anywhere between the terminus of the wastewater collection system and the entry point to the drinking water distribution system must be demonstrated to satisfy the mixing requirement. To further describe the interval where a DPR project may propose to demonstrate the mixing, subsection (m) clarifies where the first practical mixing opportunity after the terminus of the wastewater collection system would be at the wastewater treatment plant inlet chamber (i.e., a grit chamber or equivalent). The location of the final mixing would be before the finished water compliance point, which is at or before the entry point to the drinking water distribution system. While TOC monitoring provides the necessary information required by the regulations, an instrument measuring TOC does not measure all organic chemicals equally well and does not measure inorganic chemicals. Subsection (m) is necessary to provide a safety factor for a chemical spike that is not captured with TOC monitoring (Section 8.5.2, Olivieri et al., 2016).

Subsection (n) limits the threat posed by a short duration spike of organic chemicals by limiting the TOC concentration of wastewater origin in the finished drinking water. To be effective in limiting a short duration spike of organic chemicals, TOC monitoring must be conducted on a regular and frequent basis. Subsection (n) requires that a control point be established for TOC for the advanced treated water and requires a monitoring frequency of no less than once every fifteen minutes, which is necessary for the DPR project to avoid missing brief elevated levels of chemical contamination, as might occur with a chemical spike (page 29, Debroux et al., 2021). High-frequency monitoring of TOC was recommended by the 2016 Panel (Section 4.3.1.2 and Section 4.5, Panel Recommendation #4-3, Olivieri et al., 2016).

Subsection (n)(1) identifies the method used to calculate the TOC critical limit when treated wastewater is blended with an approved water and what the TOC critical limit is when blending is not occurring. When DPR project water is being blended with either an untreated source of water previously approved by the State Board, or a finished drinking water previously approved by the State Board, the allowable TOC concentration of wastewater origin, that is the TOC limit, is equal to 0.5 mg/L TOC divided by the wastewater contribution, as defined in section 64669.05(a)(37). The wastewater contribution is determined at the same time a TOC concentration measurement is

made. The TOC limit is a critical limit, and the TOC concentration of the advanced treated water prior to distribution is measured to determine compliance with the TOC limit. When DPR project water is not being blended, the wastewater contribution is equal to 1, and the TOC limit is equal to 0.5 mg/L. This 0.5-mg/L level is well above what the RO permeate should contain during normal operation. Blending with another source of water can be used to adjust the allowable TOC level (TOC limit) in the advanced treated water such that the overall contribution of TOC of wastewater origin in the finished drinking water does not exceed 0.5 mg/L.

Subsection (n)(2) requires that the DiPRRA immediately discontinue flow to the distribution system if the TOC limit is not met as determined in subsection (n)(1). Exceedance of the TOC limit is considered an exposure to organic material in wastewater that may indicate an immediate threat to public health. The requirement is necessary for the protection of public health. The subsection also requires prompt notification of the State Board and downstream public water systems of a failure to meet the TOC limit in subsection (n) to allow them the opportunity to keep track of the situation and implement additional monitoring if necessary.

Subsection (n)(3) sets a performance trigger for TOC measured pursuant to subsection (n)(1) in the advanced treated water, which is required to ensure the provision of safe drinking water in DPR projects. Subsection (n)(3) specifies that if the TOC monitoring of advanced treated water exceeds one half of the TOC limit specified in subsection (n)(1) for more than 60 minutes, a DiPRRA shall sample to investigate and identify the cause of the elevated TOC, in coordination with partner agencies in the joint plan as needed. The TOC trigger is necessary so that operators can be alerted of a spike of organic chemicals in a timely manner and steps can be taken to address the chemical threat, before TOC critical control point is exceeded. In cases where the elevated TOC might originate in the wastewater collection system, for example, the DiPRRA would coordinate with a wastewater management agency that is responsible for the industrial pretreatment and pollutant source control program as part of its investigation. In other cases where the elevated TOC might originate within the treatment system, the DiPRRA would coordinate with partner agencies responsible for providing treatment. The DiPRRA shall report the exceedance of the TOC trigger and provide an estimated time frame for completion of the investigation in the monthly compliance report. The DiPRRA shall subsequently report the findings of its investigation to the State Board. Information from the investigation on the cause of the elevated TOC can be used to improve the treatment process and source control programs.

When any or all of the chemical control treatment processes of a treatment train do not operate in conformance with their respective monitoring requirements or validated limits for more than 10% of the time in a month, subsection (o) requires the DiPRRA to investigate the treatment process(es) for the cause(s) of the nonconformance and take corrective action to reduce the chance of CECs getting into the drinking water produced by the DPR project. Put in another way, the chemical control treatment technique as described in this subsection requires that the chemical control treatment train operate to

comply with all critical limits for at least 90 percent of the time the treatment train was producing water in a calendar month. If the treatment technique is not met, the DiPRRA must take the specified corrective actions to restore the reliability of the chemical control treatment to reduce CECs.

Subsection (p) requires the DiPRRA to submit a report to the State Board that documents the performance of the chemical control treatment during the first 12-months of operation. The report will confirm efficacy and reliability of the treatment processes used in the DPR project over the long term, provide information on the operation and maintenance requirements, and provide information on the performance of the treatment train necessary to determine areas of improvement. This information is necessary for the State Board to learn of any operational and maintenance issues that may warrant a change in treatment process operations and to confirm whether the operation of the treatment train over the long term conforms with design and operations requirements to protect public health.

Subsection (p)(1) requires that the report describe the RO efficacy, failures, and process integrity problems. The report shall also include actions taken to address problems identified by ongoing monitoring of the treatment process.

Subsection (p)(2) requires the report to describe the efficacy of the ozone/BAC and AOP processes. For each treatment process, the report must present the results of performance monitoring, discuss the suitability of the performance measures for indicating the removals the treatment was designed for, and describe the actions taken for various events that indicate performance inadequacies.

Subsection (q) requires the DiPRRA to conduct a study that includes the characterization of precursor chemicals and treatment byproducts, including disinfection byproducts, that are in DPR project water. Further, the DiPRRA must consider options for optimizing the various treatment operations to limit the presence of treatment-related chemical byproducts in drinking water produced by the DPR project. “For DPR systems that employ oxidants prior to or after reverse osmosis treatment, the State Water Board should require the monitoring of low molecular weight oxidation or disinfection byproducts beyond those for which drinking water standards have already been established." (Recommendation #4-2 based on Finding #4-5, Olivieri et al., 2016). This requirement is necessary to minimize the public health impact of treatment byproducts. Based on consideration of the options for optimization developed in the study, the DiPRRA is required to develop an approach for the optimization of its chemical control and to incorporate that approach into the DPR project’s operations plan.

Subsection (r) provides that a DiPRRA may use an alternative for the chemical control treatment requirements in section 64669.50. The specified technologies, along with their sequence in a treatment train, design, and operational requirements, have been demonstrated to limit wastewater chemical contaminants and precursor transformations to safe levels. The chemical control treatment is a case where the 2016 Panel on the

feasibility of DPR agreed that the treatment train identified in regulations would be effective, but that there might be other treatment techniques that could be demonstrated in the future to be equally effective. Other treatment technologies or designs or sequences may eventually be demonstrated to be equally effective.

Subsection (r)(1) requires a DiPRRA to demonstrate to the State Board that a proposed alternative provides an equivalent or better level of protection with respect to the efficacy and the reliability of the removal of contaminants of concern to public health, and that the alternative assures at least the same level of protection to public health. Equivalent treatment performance and public health protection are required for alternatives because an alternative cannot be allowed to reduce the effectiveness of the regulations to protect the public from the threats posed by chemicals in the wastewater.

Subsection (r)(2) requires that each alternative treatment process have monitoring locations and performance measures comparable to those required for the specified treatment processes to ensure that an alternative can be controlled pursuant to the control point requirements of section 64669.85.

Subsection (r)(3) requires a DiPRRA to receive written approval from the State Board before an alternative can be implemented. Written approval of an alternative is required because it must be clear when the project is authorized to implement an alternative.

Subsection (s) requires that an independent advisory panel review the demonstration conducted pursuant to subsection (r)(1). A review by an independent advisory panel is required when determining the suitability of an alternative treatment technique or modifying the sequence of treatment for the reasons described in section 64669.120. Additionally, independent advisory panels have been shown to provide value in various IPR projects over the past decades. Drinking water regulators have used this process or a similar one on the national and international level to address new developments and innovative technologies. Lastly, independent advisory panels provide specialized expertise that may not otherwise be available. An independent advisory panel is tasked with considering numerous factors in conducting its review. Subsections (s)(1) through (s)(5) describe specifically what a panel must consider.

Subsection (s)(1) requires that consideration be made into how “equivalent performance” and “equivalent level of protection to public health” as described in subsection (r)(1) are to be determined. This would require the development of a way to show equivalence and requires that the level of public health protection being provided by the alternative treatment and/or alternative sequence of treatment be considered. In determining equivalence, a panel must first consider the level of public health protection that is provided by the treatment and sequence specified in regulations. It is not obvious at this time how to quantify the level of public health protection provided by the treatment for the purposes of identifying relative performance or comparative benefits of one treatment process compared to another. However, future research may lead to new

treatment processes or to the comparative evaluation of treatment processes that may be helpful in this regard.

Subsection (s)(2) requires consideration be made in how the level of treatment performance and treatment reliability be measured for a proposed alternative in the context of the overall removal of chemical contaminants. The chemical control treatment processes in the regulations were selected and sequenced because the combination effectively controls the range of chemical contaminants found in wastewater and minimizes the hazard caused by chemical transformations that occur in some treatment processes. Chemical control relies on treatment requirements because the hazard is posed by such a diverse mix of chemicals that controlling the threat with a manageable set of water quality standards is not feasible. For the same reason, it is not possible to define the level of public health protection provided by a treatment process or treatment train in strict quantifiable terms such as by setting water quality objectives. The judgement of an independent advisory panel will help inform the State Board in this effort.

Subsection (s)(3) requires consideration be made on the alternative's effect on downstream treatment processes and distribution system water quality, that is, how the alternative will affect downstream processes. An upstream change in process or sequence will alter the water quality received by a downstream treatment process, possibly decreasing its effectiveness.

Subsection (s)(4) requires consideration be made on the alternative's effect on the fate of wastewater contaminants and treatment byproducts through the treatment train. A particular combination of treatment processes may produce a water quality that may not be apparent or predictable by simply studying the individual processes separately from the others in the treatment train.

Subsection (s)(5) requires consideration be made on how the alternative will affect the overall treatment train reliability. Treatment techniques vary in their ability to produce a consistently high-quality product, and it is necessary to evaluate how this affects the reliability of the overall treatment when an alternative is being considered, in order to ensure the provision of safe drinking water.

Subsection (t) requires that an alternative to a chemical control treatment required pursuant to 64669.50(a) have no less than three separate treatment processes with no less than three diverse treatment mechanisms included in the treatment train. The minimum number of treatment processes and treatment mechanisms specified in subsection (a)(1) are intended to satisfy the need for multiple barriers and diverse mechanisms identified by the 2016 Panel, as discussed with respect to section (a) above.

Section 64669.55. Water Safety Plan.

Subsection (a) requires a water safety plan be developed by the DiPRRA as part of the engineering report submitted for the DPR project. The purpose of the project-specific water safety plan is for the DiPRRA to identify project-specific hazards related to pathogens, chemicals, or other agents posing threats to human health in wastewater, assess the risks associated with the hazards and describe the controls designed to manage those risks. A review to identify any such risks is necessary to ensure that DPR project water is safe for consumption.

This evaluation adds an extra level of scrutiny to ensure local conditions are accounted for. The water safety plan becomes part of the engineering report to make it available for initial project review by the State Board. The plan must address risk assessment and risk management and include the information in subsections (a)(1) and (a)(2).

Subsection (a)(1) makes it clear that all steps in the production of drinking water by the DPR project must be evaluated for public health hazards. It is necessary for all steps to be considered as failure to consider all steps may result in failure to consider a hazard that could affect DPR water.

Subsection (a)(2) requires that the initial water safety plan describe the project-specific risk management controls necessary to address the hazards that were identified. The description of the controls shall include treatment effectiveness, critical limits, monitoring, corrective action in case of a lapse of control, and an operations plan for the control(s). Such a comprehensive description is necessary to allow for a clear understanding of the controls that are being applied and how they will manage the risks posed by the hazards.

Subsection (b) requires that the DiPRRA update the water safety plan at least every five years to describe any new or additional hazards that have been identified and the risk management controls that have been or are being implemented to address these hazards. Since there is the potential for new or additional hazards to arise after the development of the initial water safety plan, a periodic assessment of hazards is a prudent public health action necessary to protect against any new hazards that may pose a risk to consumers. A description of the risk management controls that have or are being implemented is necessary to understand whether existing controls are adequate to address the new hazards or if new controls are needed to protect public health. An independent advisory panel is required to review the updates to the water safety plan to give the site-specific situations scrutiny similar to the initial hazard review performed earlier in the DPR project development. It is necessary for an independent advisory panel to be involved with the five-year reviews to help identify any additional or new hazards since the development of the initial water safety plan and to recommend possible solutions to manage them. The DiPRRA is required to consider the recommendations of the independent advisory panel when revising the water safety plan, which is necessary to ensure adequacy of the plan to protect public health.

Section 64669.60. Regulated Chemicals and Physical Characteristics Control and Monitoring.

The use of treatment techniques, such as those required in sections 64669.45 and 64669.50, are ideal for addressing some contaminants and chemicals (e.g., pathogenic organisms, chemicals of emerging concern, etc.) where, for example, on-going analyses of such constituents are not practical and/or health risks have yet to be adequately identified. However, treatment techniques are unnecessary when standards and practical analytical methods exist for a contaminant. Section 64669.60 addresses the control of contaminants and physical characteristics when drinking water standards exist for chemicals and physical characteristics, a necessary component of the treatment of drinking water under current regulations, in the DPR context.

Existing drinking water regulations require public water system monitoring to comply with drinking water standards, including monitoring at the source, monitoring of treated water, monitoring in the water distribution system, and monitoring at the consumer's tap. Section 64669.60 clarifies the monitoring requirements specific to the planned placement of treated municipal wastewater into a source of supply for a public water system's drinking water treatment plant or into a public water system's drinking water distribution system, i.e., this section clarifies monitoring specific to DPR projects, which is necessary given the wastewater source and the distinctive characteristics of the DPR treatment regime.

Subsections (a) and (b) require a DiPRRA to ensure that contaminants and constituents for which drinking water standards exist are monitored, as well as the locations of such monitoring.

Subsection (a) requires monthly monitoring. This requirement is substantially consistent with the frequency at which vulnerable sources with known contamination are monitored under existing drinking water regulations. Monthly monitoring is necessary to provide water quality information at a frequency sufficient to confirm the quality of water being treated, the fate of the chemical through advanced treatment, and the quality of the water produced by a DPR project.

Three key locations of monitoring are specified in subsection (a). A DiPRRA will propose where the representative samples will be collected that meet the requirements in this section, among other information, in the sampling plan required to be submitted pursuant to section 64669.90.

Subsection (a)(1) requires monitoring of the municipal wastewater feeding the DPR project to provide the necessary on-going knowledge of the source water quality being treated by a DPR project. This information is necessary to ensure that chemicals present in the municipal wastewater are identified for subsequent drinking water

treatment for the health protection of consumers of drinking water produced by a DPR project. This information is also used to inform source control activities described in section 64669.40.

Subsection (a)(2) requires the advanced treated water immediately after advanced oxidation be monitored, which is necessary to verify whether the chemical control treatment processes are effectively reducing concentrations of regulated contaminants.

Subsection (a)(3) requires monitoring of the quality of finished water produced by the DPR project, which is consistent with drinking water requirements to determine the water quality delivered to customers. Finished water quality may be different than the quality of the advanced treated water when other sources of water are introduced prior to delivery to the customer. The monitoring data generated at the location identified in subsection (a)(3) is used for reporting in the annual consumer confidence report, the requirements for which are in section 64669.130.

Subsection (b) requires that the monitoring performed pursuant to subsection (a) is done for chemicals with a primary MCL, secondary MCL, or regulatory action level (for lead and copper).

Primary maximum contaminant levels (MCLs) and action levels are health-based standards. Primary MCLs, which are identified in existing regulations in Chapter 15, sections 64431, 64442, 64443, and 64444, address risks to human health posed by specific chemicals and are required to be met by public water systems in the drinking water provided to consumers. Action levels for lead and copper (in existing Chapter 17.5, section 64678) are additional standards that must be met by public water systems.

Subsection (b) also requires monitoring of constituents having secondary MCLs, which are identified in two tables (64449-A and 64449-B) located in existing section 64449 of Chapter 15. Secondary MCLs, although not health-based standards, address certain physical characteristics of water such as pH and hardness, and are required to be met by public water systems in the drinking water provided to consumers. Monitoring these fundamental water quality characteristics ensures consumer acceptance and often provides necessary information for water treatment operations. Because public water systems serving DPR project water to their customers are required to meet secondary MCLs, it is necessary for the DiPRRA to ensure that water from locations set forth in subsection (a) are monitored for chemicals and characteristics with secondary MCLs. The requirement parallels the requirements of drinking water sources that must be monitored periodically for chemicals and characteristics having secondary standards.

Monitoring for lead and copper pursuant to subsection (b) from the sampling locations set forth in subsection (a) is different and in addition to sampling by public water systems under the Lead and Copper Rule (Chapter 17.5). Under current drinking water regulations lead and copper are monitored at locations (consumers' taps) other than drinking water sources. It should be noted that the addition of advanced treated water

directly into a drinking water distribution system or into a source of supply to a water treatment plant may ultimately affect the corrosive nature of the drinking water supplied. Therefore, it is necessary for the public water system to conscientiously assess potential impacts and implement the requirements of the existing Lead and Copper Rule. The concern about the potential for corrosivity, as well as other concerns related to the introduction of advanced treated water directly to a distribution system of a public water system or through a public water system's water treatment plant prior to distribution is also addressed in the proposed requirements of section 64669.110.

Beyond the chemicals and physical characteristics mentioned above, there are also other chemicals for which monitoring in the required sampling locations is necessary. Current drinking water regulations require the monitoring of disinfection byproducts (Chapter 15.5, section 64533). Public water systems typically monitor disinfection byproducts within the distribution system, rather than within the source of drinking water (and will still be required to do so under existing drinking water requirements for public water systems). However, this regulation is necessary to require sampling at the three locations of (a)(1), (a)(2), and (a)(3) to characterize the municipal wastewater source with regard to disinfection byproducts present in the wastewater feeding the DPR treatment plant, and the need to monitor the fate of the disinfection biproducts through treatment and the finished water. This is necessary to evaluate the potentially adverse impact to the DiPRRA's ability to ultimately meet all applicable drinking water standards, and to protect the health of the DPR project's water consumers.
Subsections (c) through (e) provide exceptions to the monitoring locations and monitoring frequencies specified in subsection (a) to accommodate different DPR scenarios, which are necessary to allow for flexibility in the design of DPR projects while at the same time maintaining necessary monitoring requirements as described above.

Subsection (c) allows for monitoring conducted at the location specified in (a)(3) to be used to satisfy the monitoring requirement for the location specified in (a)(2) if the DiPRRA can demonstrate to the State Board that water at the two locations have the same or substantially the same water quality. If the water quality at the two locations are the same or very similar, it is appropriate to allow for the sampling conducted at the location specified in (a)(3) to be used to satisfy the sampling requirement for the location specified in (a)(2).

Subsection (d) allows for a complex DPR project scenario proposed in an engineering report wherein the representative sampling at locations described in subsections (a)(1) through (a)(3) may not provide all the necessary representative water quality information about a project. Subsection (d) clarifies that the State Board may specify additional locations to be monitored in these cases, based on the State Board's review of information in the engineering report to accommodate different project scenarios described in an engineering report. This is necessary because while representative monitoring of DPR project water at the locations specified in subsection (a) is adequate for most DPR projects, there may be complex DPR project scenarios not contemplated by the minimum monitoring requirements in the regulations, including projects that

include treatment installed in addition to the chemical control treatment train specified in the chemical control section, or discharge into a reservoir or groundwater storage immediately upstream of a water treatment plant (where projects do not meet the requirements of indirect potable reuse), where monitoring at the locations identified in subsection (a) may not be able to provide the necessary representative water quality information.

Subsection (e) clarifies that a more frequent monitoring may be required by the State Board, based on the State Board's review of the engineering report and evaluation of the treatment process used, the treatment effectiveness and efficiency, and the concentration of the chemical in the water source, consistent with section 64445.2. The chemical control treatment train specified in section 64669.50 addresses unknown chemicals that may be present in wastewater and while the treatment train is generally robust enough to effectively remove many chemicals that have a MCL or action level (regulated chemicals), the treatment train may not be designed or optimally operated to remove a specific regulated chemical, especially if the chemical is found at a higher concentration or with a greater degree of variability than the treatment can handle. Additionally, even if the chemical reduction treatment was designed to remove a regulated chemical, the chemical reduction treatment may not be shown to be as effective or efficient as originally installed, and accordingly, subsection (e) is necessary to provide an allowance for increased monitoring as needed to reduce the health risk.

Subsections (f) and (g) require high-frequency monitoring for chemicals that are present in wastewater and that pose an acute health risk.

Subsection (f) requires grab samples to be collected at least once a week in the finished water to provide sufficient data to confirm the finished water quality for nitrate, nitrite, nitrate plus nitrite, perchlorate, and lead. Subsection (f) also clarifies that a monthly nitrate, nitrite, nitrate plus nitrite, perchlorate or lead sample collected pursuant to subsection (a) can be used to satisfy the weekly requirement if the sample dates of the monthly and weekly sampling coincide. These chemicals pose an acute health risk and are known to be present in wastewater. The increased frequency of monitoring required by this section for the specified chemicals is necessary for more frequent verification of whether these acute hazards are continually addressed by the treatment.

Nitrate and nitrite are chemicals that can be reliably measured with high-frequency monitoring. Subsection (g) requires that a nitrate and nitrite control point be identified and continuously monitored, with the control point established prior to the entry point to the distribution system, or another location downstream of the RO process. Nitrate and nitrite are known to occur in wastewater at high concentrations, and online monitoring will reduce the risk from nitrate and nitrite. Subsection (g)(1) clarifies that the critical limit that is set for the control point must not be greater than the respective MCLs for nitrate, nitrite, and nitrate plus nitrite. Subsection (g)(2) clarifies that if the MCLs for nitrate, nitrite, or nitrate plus nitrite is exceeded at the control point, the DiPRRA must immediately take the action to notify the State Board and discontinue delivery of water

to the distribution system. These requirements are necessary to ensure the protection of public health with respect to the acute hazards associated with the chemicals in that if these MCLs are exceeded, delivery of project water should immediately cease, and notification of the State Board should occur.

Subsections (h) and (i) describe actions to be taken if a primary MCL or action level is exceeded, pertaining to different points in the water intake and treatment process.

Subsection (h) describes the actions to be taken in the event a result of the monitoring of the municipal wastewater feed required in subsection (a)(1) exceeds a primary MCL or action level for lead and copper. An exceedance of a primary MCL or action level prompts a requirement to report the finding to the State Board and to take a follow-up sample, as confirmation of the initial elevated result. The confirmation sample must be collected within 24 hours of notification by the laboratory to determine as quickly as possible whether an exceedance is confirmed so that actions can be taken as soon as possible. These actions are necessary for the protection of public health. The DiPRRA must provide a timely notification to the State Board about the MCL exceedance so that the State Board can assess the compliance status.

Under subsection (h)(1), if an exceedance of a primary MCL or action level is confirmed (or if no follow-up sample was collected), the DiPRRA must increase the sampling of the source, treatment system and finished water to once a week. The DiPRRA must evaluate the treatment system to verify whether treatment would be effective at reducing the chemical and conduct a source control investigation per the joint plan to determine the source of the contamination. The DiPRRA must report the findings of the source control investigation and treatment evaluation to the State Board. The requirements are necessary to protect consumers, and to determine whether the contamination is continuing and increasing or decreasing. Weekly monitoring must continue until the report is submitted to the State Board with a request to resume monthly sampling and the State Board has determined weekly monitoring is no longer necessary.

Subsection (h)(2) additionally requires the DiPRRA to take corrective action and notify the State Board within 24 hours if the monitoring of the municipal wastewater feed required in subsection (a)(1) indicates that a chemical concentration exceeds ten times a primary MCL or action level for lead and copper, or if the concentration of the chemical may exceed the capacity of the treatment system to reduce the concentration to below the MCL or action level. If the treatment system does not have the capacity to treat for a regulated chemical, action must be taken to ensure that an MCL or action level will not be exceeded in the water delivered to customers, and the State Board must be notified of a potential public health risk as soon as possible. These requirements are necessary to protect consumers, as well as to ensure prompt action by the DiPRRA.

Subsection (i) describes the actions to be taken in the event a result of the monitoring of the advanced treated water or the finished water, required in subsections (a)(2) and (a)(3) respectively, exceeds a primary MCL or action level for lead and copper. An exceedance of these drinking water standards at these locations prompts a requirement to take a follow-up sample for analysis, as confirmation of the initial elevated result, and to notify the State Board.

Subsection (i)(1) requires the DiPRRA to notify the State Board within 24 hours, take corrective action, and increase weekly sampling of the source, treatment system, and finished water if the exceedance is confirmed (or if no follow-up sample was collected) in the advanced treated water, that is, at the location identified in subsection (a)(2). The DiPRRA must conduct a source control investigation per the joint plan to determine the source of the contamination, an investigation of the treatment process, and determine compliance with drinking water standards. The DiPRRA must describe the corrective actions taken and report the findings of the source control and treatment process investigations to the State Board. The DiPRRA may submit a request to the State Board to resume monthly monitoring pursuant to section (a) after submitting the report summarizing the corrective actions taken, and the treatment and source investigations. These requirements are necessary for the protection of consumers, and to ensure prompt actions to address concerns related to the treatment processes.

Subsection (i)(2) requires several prompt actions if the exceedance is at the location identified in subsection (a)(3). The prompt actions are required because the sampled water has reached the distribution system for delivery to consumers, and it is necessary to discontinue water delivery and inform various entities, including consumers, of the issue so that they may guide their actions with respect to the DPR project water accordingly.

Subsection (i)(2)(A) requires the DiPRRA to notify the State Board within 24 hours and immediately discontinue delivery of water to the distribution system if the exceedance is confirmed (or if no follow-up sample was collected) in the finished water, that is, at the location identified in subsection (a)(3). This requirement is necessary to ensure that inadequately treated water is not delivered to consumers.

Subsection (i)(2)(B) requires the DiPRRA to notify partner agency(ies) in the joint plan, any public water system that directly receives the DPR project water, and the local governing bodies (that is, county board of supervisors, city council, or both) overlying the areas served by the DPR project. This requirement is necessary to ensure that partner agencies and governing bodies are informed about the discontinuance of water delivery,

Subsection (i)(2)(C) requires the DiPRRA to provide public notification to customers who are served by the DPR project pursuant to section 64669.125, and to coordinate with a public water system in the public notification of customers served by the public

water system. This is necessary to provide customers with information about the status of their drinking water supply.

Subsection (j) describes the requirements for actions following an exceedance of a secondary MCL. The DiPRRA must evaluate the treatment system, continue monthly monitoring, report the exceedance in the monthly compliance report, calculate the quarterly average, and determine compliance pursuant to the requirements in section 64449 (Secondary Maximum Contaminant Levels and Compliance). The less stringent nature of the requirements in subsection (d) reflects the fact that secondary MCLs are consumer acceptance levels and are not health-based regulations for chemicals. However, secondary MCLs are enforceable, and meeting them is necessary to ensure that the drinking water supply provided by the DPR project is not interrupted by failure to provide water that is acceptable to consumers.

Section 64669.65. Additional Chemical Monitoring.

Sources of drinking water in California are subject to periodic on-going monitoring of chemicals – more so when the source is vulnerable to contamination or when there is a known presence of chemicals. This monitoring occurs even though subsequent treatment processes may remove or reduce the concentrations of those substances to levels considered to be protective of public health. The specific chemicals required to be monitored under current drinking water standards and other regulatory requirements are largely determined from the likelihood of their presence in typical sources of drinking water, along with associated health risks.

For DPR projects, the source is municipal wastewater, which is not a typical source of drinking water. Municipal wastewater treatment plants receive wastes from a variety of different types and proportions of industrial, commercial, and residential dischargers such that the water quality characteristics of wastewater can vary widely between one wastewater treatment plant and the next. As a result, it is prudent and consistent with existing drinking water and IPR regulations, and necessary for the protection of public health, for DPR regulations to have additional monitoring requirements specific to chemicals that may be present in municipal wastewater, as well as additional monitoring requirements that are project specific.

The identification of chemicals that may pose a risk to drinking water consumers is critical for the protection of public health. The regulations require the DiPRRA to be responsible for identifying specified chemicals in the wastewater source supplying the DPR project. A number of chemicals are already subject to drinking water regulations and are addressed in section 64669.60 of these regulations. In addition to those chemicals, there are requirements for the DiPRRA to monitor for chemicals that are not regulated, as presented in this section of the regulations. These chemicals in many cases will be determined by the State Board, as explained below, from information provided by the DiPRRA in its engineering report. Other selected chemicals will also be

required to be monitored, based upon reviews of technical and scientific publications, if their presence is considered to be likely in the wastewater used in the DPR project, especially at levels that may pose public health concerns.

In addition to the potential presence of many chemicals that can be of concern to public health, for DPR projects, the close proximity of the wastewater source to treated drinking water in terms of time must also be addressed. DPR projects lack the environmental buffer present in IPR projects; the environmental buffer provides the benefit of a longer response time, should problems arise. Consequently, it is also prudent and consistent with drinking water regulations and necessary for the protection of public health to specify a monitoring frequency that provides a project sufficient time to respond to the water quality results.

Section 64669.65 establishes requirements for chemicals monitoring beyond those commonly required of drinking water (e.g., the regulated chemicals in section 64669.60). The monitoring of additional chemicals is necessary to assure and confirm protection of public health, address the uncertainty regarding the presence of unregulated chemicals, affirm the efficacy of the treatment processes, and to potentially help determine the origin of their presence if found in the raw water feeding a DPR project, in the advanced treated water, or in the finished water of a DPR project.

Subsection (a) requires monthly monitoring. This requirement is substantially consistent with the frequency at which vulnerable sources with known contamination are monitored under existing drinking water regulations. Monthly monitoring is necessary to provide water quality information at a frequency sufficient to confirm the quality of water being treated, the fate of the chemical through advanced treatment, and the quality of the water produced by a DPR project.

Three key locations of monitoring are specified in subsection (a). A DiPRRA will propose where the representative samples will be collected that meet the requirements in this section, among other information, in the sampling plan required to be submitted pursuant to section 64669.90.

Subsection (a)(1) requires monitoring of the municipal wastewater feeding the DPR project to provide the necessary on-going knowledge of the source water quality being treated by a DPR project. This information is also used to inform source control activities described in section 64669.40.

Subsection (a)(2) requires monitoring the quality of treated water after advanced oxidation, which is consistent with drinking water requirements and necessary to confirm that the treatment train has achieved the water quality requirements set forth in the regulation.

Subsection (a)(3) requires monitoring of the quality of finished water produced by the DPR project, which is consistent with drinking water requirements to determine the

water quality delivered to customers. Finished water quality may be different than the quality of the advanced treated water when other sources of water are introduced prior to delivery to the customer.

Subsection (b) identifies seven categories of listed chemicals to be monitored at the locations identified in subsection (a). Some of the chemicals in (b)(1) are already required to be monitored because they are regulated drinking water chemicals. The requirements for monitoring in these regulations are necessary to assess the chemicals' presence as they move from wastewater, through the drinking water treatment processes, and into the distribution system, all to ensure that the DPR project is adequately protecting the health of consumers of DPR project water. The other categories represent groups of chemicals that lack drinking water standards. Though they are not regulated, there is nonetheless toxicological information on many chemicals that indicates a potential for adverse human health effects when the chemicals are present in drinking water at high enough concentrations.

Subsection (b)(1) requires monitoring of chemicals specified by the State Board from the list of Priority Toxic Pollutants found in Title 40, section 131.38, of the Code of Federal Regulations dated July 1, 2003. Waste dischargers are already required to monitor for applicable Priority Toxic Pollutants, some of which are also regulated drinking water chemicals and are already required to be monitored under section 64669.60. As mentioned above, it is necessary to follow chemicals from wastewater, through treatment and in the distribution system to enable the assessment of the treatment the DPR project is providing for the protection of consumers' health. Based on the State Board's review of the DiPRRA's engineering report for the DPR project, specific pollutants from the list will be required to be monitored in the locations identified in subsection (a).

Subsection (b)(2) requires chemicals that have notification levels (NLs) to be monitored. The list of chemicals with NLs is found on the State Board's website. NLs are health-based advisory levels that have been established by the State Board for chemicals in drinking water for which MCLs have not been established. Public water systems are required, pursuant to section 116455 of the Health and Safety Code, to take specific actions in the event of an exceedance of an NL (e.g., notifying the public water system's governing body – the county board of supervisors or city council or both -- and the public water systems that are directly supplied with that drinking water). However, public water systems are generally not required to monitor for chemicals with NLs, except under special circumstances, such as exploratory sampling for a particular chemical, when an extremely impaired source is used, or when a chemical has been identified in the water system or in a neighboring water system. The monitoring required by subsection (b)(2) is necessary to address the presence of chemicals with NLs, and to enable their presence to be followed from wastewater, through drinking water treatment, and into the distribution system for the protection of public health, and to take specific actions if an NL is exceeded. The State Board, under this regulation, will specify individual chemicals having NLs for which monitoring will be required, based on project-

specific information included in the DPR project's engineering report that indicates the likelihood of the presence of those chemicals. For example, there are chemicals used in explosives with notifications levels. If those chemicals are not used or produced by industrial dischargers into the sewershed, their presence in municipal wastewater for the DPR project would be unlikely. In addition, experience and knowledge gained from regulating IPR projects will also play a role in identifying the chemicals having NLs to be monitored.

Subsection (b)(3) requires monitoring of chemicals identified as potentially present in the municipal wastewater as a result of a review of the DPR project's engineering report and information from the source control program associated with the wastewater source, described in section 64669.40. The engineering report or source control program may identify a chemical or chemicals associated with a particular industrial application, which, for example, discharges to the sewer system that feeds the wastewater treatment facility. Monitoring of these chemicals at the required locations is necessary to provide information on the effectiveness of treatment for their removal as they flow from the wastewater source, through treatment, and into the distribution system for consumption. Effective treatment of industrial chemicals discharged into municipal wastewater is necessary for protection of the health of consumers of the DPR project's drinking water.

Subsection (b)(4) requires monitoring for four chemical solvents that have been identified to be present in wastewater and to persist through advanced treatment – acetone, N,N-dimethylacetamide, methanol, and methyl ethyl ketone. While the advanced treatment train is designed to effectively reduce the concentration of unknown chemicals, the treatment train is not a complete barrier, and low molecular weight, neutral or hydrophilic chemicals can remain even after advanced treatment. It is necessary for the protection of public health to specify these four chemicals to verify that this category of low molecular weight chemicals has been controlled through an optimized advanced treatment process.

Subsection (b)(5) requires monitoring for specified treatment byproduct precursors and treatment byproducts. Treatment byproducts are chemicals formed during a disinfection treatment or oxidation treatment process resulting from interactions with treatment precursor chemicals that are present in wastewater. The amount and diversity of organic chemicals in wastewater and the treatment train for pathogen reduction can result in generating disinfection byproducts. The precursors and byproducts specified will be determined from the results of the wastewater characterization, as well as from the types of disinfection processes that are used or are to be proposed. Their inclusion in monitoring requirements is necessary to address both the public health risks and the public health protection provided by drinking water disinfection to ensure that the risks and benefits are in balance.

Subsection (b)(6) requires monitoring for chemicals that have been found by other water monitoring programs, not necessarily associated with DPR projects. These can include

the findings from required wastewater monitoring, or the results of research projects done locally by others on wastewater constituents, chemical surveys, or studies of environmental chemicals, to name a few possibilities. “Locally” here refers to projects in nearby watersheds, or within nearby urban areas with similar demographics. The chemicals here include those that are associated with business or household hazardous substances, such as cleaning solutions that contain solvents, detergents, and surfactants, and other household products such as pharmaceuticals and chemicals in personal care products. It also includes other chemicals, such as home use pesticides, should they be included in the reports of analytical results of local monitoring programs or other projects. The review of the DPR project’s engineering report will enable identification of chemicals that likely to be present in wastewater that feeds the DPR project at concentrations that are appropriate for monitoring. This monitoring requirement is necessary to enable the evaluation of the presence of non-regulated chemicals in wastewater feeding the DPR project, as well as their presence through drinking water treatment and distribution to consumers, and to determine whether certain chemicals may need to be further addressed, for example, by public education to minimize their release into wastewater or by the establishment of NLs.

Subsection (b)(7) requires the DiPRRA to monitor other chemicals specified by the State Board that may pose a health risk, based on the State Board’s review of the data collected from the special monitoring conducted pursuant to subsection (h) and review of the source control program monitoring data and inventory of chemicals maintained pursuant to section 64669.40(a)(3). This allows chemicals identified for short-term special monitoring pursuant to subsection (g) or those identified by the source control program that may pose a health risk to continue to be tracked under routine monitoring described in subsection (b). The requirement is necessary to enable the collection of data on chemicals that may be new to the wastewater collection system, that are present in higher concentrations than previously observed, or that may have been found to have toxic characteristics not previously identified.

Subsection (c) allows for monitoring conducted at the location specified in (a)(3) to be used to satisfy the monitoring requirement for the location specified in (a)(2) if the DiPRRA can demonstrate to the State Board that water at the two locations have the same or substantially the same water quality. If the water quality at the two locations are the same or very similar, it is appropriate to allow for the sampling conducted at the location specified in (a)(3) to be used to satisfy the sampling requirement for the location specified in (a)(2).

Subsection (d) clarifies that the State Board may specify additional locations to be monitored in these cases, based on the State Board’s review of information in the engineering report to accommodate different project scenarios described in an engineering report. While representative monitoring of DPR project water at the locations specified in subsection (a) is adequate for most DPR projects, there may be complex project-specific scenarios not contemplated by the minimum monitoring requirements in the regulations, including projects that include treatment installed in

addition to the chemical control treatment train specified in the chemical control section, or discharge into a reservoir or groundwater storage immediately upstream of a water treatment plant (where projects do not meet the requirements of indirect potable reuse), where monitoring at the locations identified in subsection (a) may not be able to provide the necessary representative water quality information. Accordingly, this provision is necessary to allow the State Board to require additional, project-specific monitoring for complex situations, in order to ensure the project's complexity does not jeopardize the protection of public health.

Subsection (e) describes the actions that must be taken if a chemical with a NL is detected, if a NL is exceeded, or if a response level (RL) (see definition above) is exceeded. The requirements in this subsection are necessary to establish monitoring frequency for chemicals with NLs that are detected, and to ensure that monitoring is continued when a chemical is detected, that notification is provided when a chemical is present at concentrations higher than its health-based advisory level, the NL, and to ensure that delivery of water containing the chemicals at even higher concentrations, the RL, is discontinued to protect DPR project water consumers. If a chemical with a NL is detected, the DiPRRA is required to evaluate the treatment system and start a source control investigation as to the source of the chemical. This is necessary to obtain information about a potential new contaminant. The DiPRRA is required to undertake confirmation monitoring and, if necessary, based on the results, initiate weekly monitoring for the chemical until an evaluation of the treatment system is conducted, and a source control investigation is performed. Weekly monitoring must continue until a report is submitted to the State Board with a request to resume monthly sampling and the State Board has determined weekly monitoring is no longer necessary. This is necessary to obtain adequate initial occurrence, concentration, and treatability information on the new chemical and for the State Board to review the data and information about the chemical investigation.

Subsection (e)(1) describes the process by which the DiPRRA can address a chemical with a NL, when that chemical has been previously detected, and when it is present at concentrations within the range of known concentrations in the same water source, and when the chemical's source has been identified in source control investigations. Under those conditions, and when the DiPRRA has already addressed the chemical in subsection (e), a subsequent detection does not prompt a need to repeat the requirements of subsection (e).

Subsection (e)(2) requires the DiPRRA to report a detection of a chemical with a NL in finished water prior to the distribution system, in the consumer confidence report. The consumer confidence report is a means by which the DiPRRA and its partner agency(ies) can satisfy the public's right-to-know with regard to the quality of their drinking water. This requirement necessary to be consistent with existing drinking water regulations that require reporting detected unregulated chemicals in consumer confidence reports (e.g., requirements in 40 Code of Federal Regulations 141.40) and

with Health and Safety Code section 116378 requirements to report detections of per- and polyfluoroalkyl substances in consumer confidence reports.

Subsection (e)(3) describes the requirements when a sample result shows that a chemical's concentration exceeds a NL. A confirmation sample must be collected within 24 hours of notice of the exceedance, and notification to the State Board must be made within 48 hours. If the exceedance is confirmed by analysis of the confirmation, the DiPRRA must take steps delineated in the next subsections. Confirmation is necessary to determine if the initial result is accurate before additional action is required.

Subsection (e)(3)(A) requires several actions to be taken when a NL exceedance is confirmed. Within 24 hours the DiPRRA must notify the State Board and increase the sampling frequency to weekly. The increase is necessary to enable a determination to be made about whether the chemical's presence is continuing and whether its concentration is increasing or decreasing. Further, the DiPRRA is required to begin an investigation to determine the source of the contamination, what has caused the NL exceedance, and whether there has been a lapse in the function of the treatment process that is intended to reduce the concentration of the chemical so that it is below the NL. The investigation is necessary to identify the reason for the increase in contamination so that it can be addressed.

Subsection (e)(3)(B) requires the DiPRRA to provide notification about the NL exceedance. The DiPRRA must, within 24 hours, notify its partner agency(ies) and all public water systems that receive the water. Notification of these entities is a necessary requirement, so that those entities can take appropriate actions to address the contamination should they be needed. Also, within 24 hours, the DiPRRA must notify the governing body (e.g., county board of supervisors, city council, or both) of the DiPRRA and other governing bodies of local agencies within areas served by the DPR project. The notification of governing bodies is consistent with requirements in Health and Safety Code section 116455; the requirement to report within 24 hours is necessary to ensure timely transfer of water quality information to decision makers, public water systems, and the public. The DiPRRA is required to report the detections of the chemical with a NL in the consumer confidence report, as discussed above for subsection (e)(2).

Subsection (e)(4) describes the requirements when a confirmed sample result shows that a chemical's concentration exceeds a RL. In addition to the actions taken when a chemical's concentration exceeds a NL (set forth in previous subsections), the DiPRRA must notify the State Board within 24 hours and immediately discontinue delivery of water to the distribution system. This is necessary because a DPR project is specifically designed to reduce public exposure to chemicals that have their origin in sewage/municipal wastewater. An exceedance of a chemical's RL is an indication that the treatment train used to provide drinking water is not performing as expected, and that the exposure to DPR project water consumers is greater than the health based advisory levels (both NL and RL) for the chemical. Flow must be diverted in order to

investigate why the monitoring and control system of the treatment trains was not able to ensure the water quality to comply with a RL. The cessation of delivery is necessary because of the human health risks associated with ingesting inadequately treated drinking water. This requirement is consistent with the requirement of Health and Safety Code section 116455, which defines the RL and allows for additional steps beyond notification to be taken to reduce public exposure to chemicals. Under that law, the State Board usually recommends discontinuing use of the source when a single chemical's concentration exceeds its RL. Under this regulation, because of the potential for consumer exposure to many chemicals from municipal wastewater, including unknown chemicals, the requirement for delivery to cease is necessary.

Subsection (f) enables a DiPRRA to reduce the monthly monitoring for a chemical required in subsection (b) following the State Board's review of monitoring results indicating that such chemicals are not detected. At a minimum, monitoring results for the most recent two years of operation would be necessary to determine that chemicals are not present at levels of concern. This regulation is necessary to enable cessation of monitoring when a chemical is no longer detected.

Subsection (f)(1) enables the DiPRRA to reduce the monitoring from monthly to quarterly following the State Board's review of monitoring results of at least the most recent two years of monthly monitoring that continue to demonstrate that chemicals are not detected. This regulation is necessary to allow the reduction of the monitoring frequency when a chemical is no longer at a concentration high enough to be detected.

Further, subsection (f)(2) enables the DiPRRA to reduce the quarterly monitoring to annual monitoring following the State Board's review of monitoring results of at least the most recent three years of quarterly monitoring that continue to demonstrate that chemicals are not detected. This regulation is necessary to allow the further reduction of the monitoring frequency when a chemical is no longer detectable.

Lastly, subsection (f)(3) enables the DiPRRA to apply for a monitoring waiver after at least three years of annual monitoring that have been completed, with results that demonstrate that chemicals are not detected. The regulation is necessary to allow monitoring to no longer be required when the chemical hasn't been detected for a considerable length of time.

Subsection (f)(4) requires the DiPRRA to resume monthly monitoring at the direction of the State Board when monitoring or other operational information shows that the conditions that allow a monitoring reduction or a monitoring waiver to be approved no longer apply. This regulation is necessary to require monitoring to resume or to resume at an increased frequency for a chemical, when conditions such as, for example, use of the chemical by a new industry that discharges into wastewater, indicate that monitoring for the chemical is needed to provide information on its presence.

Requirements in subsections (g) and (h) provide a means to assess the presence of representatives of classes of chemicals identified as being of a public health concern for DPR as specified in subdivision (b)(7), which include chemicals other than those specified for required monitoring in subdivisions (b)(1) through (b)(6). Special attention to such chemicals was recommended by both the 2016 Advisory Group and the 2016 Panel on the Feasibility of Developing Criteria for Direct Potable Reuse.

The 2016 Advisory Group recommended that "the monitoring regimen should include a methodical and robust search for CECs [that is, chemicals of emerging concern] and other potentially harmful constituents." (p 11, Advisory Group report).

The 2016 Expert Panel on DPR feasibility made several recommendations and observations on the identification and monitoring of CECs (Olivieri et al., 2016):

- "Investigate what chemicals are used and disposed of by homeowners and/or commercial establishments (e.g., pesticides and cleaning products). Also, identify the potential for spills and other sources of chemicals (e.g., dry cleaners) that may enter the wastewater collection system episodically." (p 217)
- "Conduct (1) an initial survey of discharges into the system to determine what industrial contaminants already exist, and (2) sample the raw wastewater and secondary effluent of the current system for drinking water constituents and CECs. If done routinely, this sampling will provide valuable information about pollutants in the raw wastewater and the ability of the primary and secondary wastewater treatment processes to reduce these pollutants. The information then can be used to determine what advanced treatment processes and monitoring are necessary to protect public health." (p 217)
- "Higher frequency and a greater variety of monitoring are considered by many to be more important for DPR than for indirect potable reuse (IPR), largely because of DPR's lack of the use of an environmental buffer…" (p 94)

The prior subsections (b)(1) through (b)(6) dealt with chemicals not regulated but appropriate for monitoring due to their likely presence in wastewater to be used in the DPR project, based in most cases on the review of the engineering report required for the DPR project. Subsection (b)(7), which requires monitoring for chemicals selected from subsection (g) and monitored pursuant to subsection (h), deals with chemicals that may be of potential public health concern, but have not been identified for monitoring, based on review of the DPR project's engineering report.

Attention from the DiPRRA and the DPR project to additional chemicals that are not regulated is necessary for public health protection because of the many chemicals that can be introduced into the sewershed through normal human activities. In addition, because there may be changes in the inventory of chemicals that are released into the sewershed, it is important that the DiPRRA stays up to date on available information on chemicals of potential public health concern related to their health risks that might be important to the DPR project and to the protection of its drinking water customers.

Subsection (g) establishes a process by which the DiPRRA is to review information from a variety of available sources to identify potential problematic chemicals, from which a selection of specific chemicals will be made for additional monitoring The information to be considered includes the likelihood of a chemical's presence in municipal wastewater, the reported concentration of the chemical in a DPR project's wastewater source or in environmental waters, and their potential for causing human health effects, based on available human health risk assessments derived from epidemiological studies or toxicological studies on laboratory animals. This requirement is responsive to the recommendations regarding CECs of the 2016 Advisory Group and 2016 Panel cited above. It is necessary to ensure that the DiPRRA is vigilant and forward looking with regard to protecting the health of its consumers from potential risks.

To this end, subsection (g) requires the DiPRRA, on an annual basis, to identify chemicals that represent a potential health concern that are likely to be present in the sewershed but that are not otherwise required to be monitored. It requires the review of already existing information that will be used to assist the DiPRRA in selecting a limited number of chemicals for subsequent monitoring, as set forth in subsection (h).

Subsection (g)(1) requires the DiPRRA to review the chemicals from industrial sources identified from section 64669.40, this time from the perspective of considering their possible presence in DPR project water. There may be chemicals of interest that are considered in the source control program that are appropriate for follow-up with additional monitoring, owing to their high concentration in wastewater, their likelihood to pose health risks if inadequately treated water is consumed, or by virtue of certain physical characteristics, such as having low molecular weight, or being recalcitrant to treatment. There may also be new industrial activities that may contribute new chemicals to wastewater, or activities with greater discharges of chemicals already identified. This requirement is necessary to identify chemicals that are important to the DPR project, with regard to ensuring that public health is protected and that the DPR project will not be affected by heretofore unknown chemicals in the municipal wastewater.

Subsection (g)(2) requires the DiPRRA to review the results of water monitoring programs performed locally, not necessarily associated with DPR projects. These can include the findings of monitoring or research projects done by others analyzing other sources of municipal wastewater as well as local environmental waters. Chemicals identified by these monitoring programs will be reviewed to determine those that pose a risk to public health and are recalcitrant to treatment. As described above for subsection (b)(6), "locally" in this section refers to projects in nearby watersheds or within nearby urban areas with similar demographics. This requirement is necessary to ensure that the DiPRRA is informed about the presence of chemicals in other wastewater or in local waterbodies that receive wastewater. This can suggest the potential presence of similar chemicals in the DPR project.

Whereas the possible candidate chemicals for monitoring from subsection (g)(1) are based on already existing information and already available monitoring results associated with the municipal wastewater feeding the DPR project, those in subsection (g)(2) represent chemicals identified from information available from the broader local community.

Subsection (g)(3) requires the DiPRRA to review lists of chemicals that are or may be of public health concern, given the evidence of their toxicity. These chemicals may cause acute toxic effects, or longer-term effects, such as cancer or other chronic health effects. It is necessary to require this review to enable the identification of chemicals with known toxicity that are also present or likely to be present in municipal wastewater used in the DPR project. They may pose risks to public health to consumers if present in wastewater that feeds the DPR project. This requirement is necessary because chemicals that are present on both the lists of chemicals reported in wastewater and the lists of toxic chemicals are good candidates for additional monitoring.

There are many available sources of chemicals that may pose risks to public health, including those identified as having been found in wastewater in reviews by the State Board's expert panel on monitoring CECs for IPR "CEC Panel" (Anderson et al., 2010; Drewes et al., 2018); its reports are updated roughly every five years. Another panel, the State Board's expert panel on monitoring CECs in aquatic ecosystems (Anderson et al., 2012; Drewes et al., 2023), also identifies chemicals of potential concern; though the focus of that panel is on the aquatic environment, the chemicals that it identifies in its periodic reports may also have potential public health significance owing to their presence in environmental waters from wastewater discharges. Yet another several hundred chemicals appropriate to review in case any are likely to be found the DPR project water are those known to the state of California to cause cancer or reproductive toxicity, pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986. The list of chemicals is updated periodically by the Office of Environmental Health Hazard Assessment (OEHHA), as new chemicals are added (https://oehha.ca.gov/proposition-65/proposition-65-list). Other sources of chemicals of interest include the periodic lists of unregulated chemicals for which monitoring is required, in rules promulgated every few years by the U.S. EPA. These, as well as other compilations of chemicals of public health concern, provide information that will assist the DiPRRA in selecting chemicals for future monitoring.

Subsection (g)(4) requires the DiPRRA to use scientific publications for information that is pertinent to the identification of chemicals that may be of interest to the project, and to the protection of DPR project water and its consumers. The focus here is also on business and household hazardous substances, pharmaceuticals (including illicit drugs), and personal care products. Reviews of scientific papers and reports that focus on chemicals of public health concern in wastewater or that have been found in drinking water provide information that will be of value in selecting chemicals for monitoring. These documents can contain new and timely information. Accordingly, the review

mandated by this subsection is necessary to keep the DiPRRA and its partner agencies up to date on pertinent scientific findings.

Subsection (g)(5) requires the DiPRRA to seek information on pharmaceuticals that are likely present in the sewershed. It can do this through the use of Internet searches on most often prescribed pharmaceuticals on a national or regional level, or by localized research, through discussions with local medical or pharmaceutical professionals or associations, or by considering information obtained in the prior subsections. Since pharmaceuticals are routinely eliminated into household sewage and find their way into wastewater, including an additional way to consider pharmaceuticals beyond that identified in subsection (g)(4) as a component of the review process is a necessary step to contribute to conclusions that DPR project water is safe for consumption.

With regard to subsection (g), during the course of the development of these regulations, it was suggested by commenters on an early draft that the regulations regarding additional monitoring should be limited to only the chemicals designated by the State Board's expert panel for the monitoring of CECs. The commenters preferred a requirement with a narrow approach rather than requiring a wider scope of consideration of chemicals posing a risk to public health, which would be done for DPR projects on a case-by-case basis. The requirements in subsection (g) are for a wider scope of chemical selection.

The CEC Panel's recommendations are intended to inform the State Board's Recycled Water Policy and are focused on groundwater replenishment and surface water augmentation. The CEC Panel recommended four "health-based" chemicals for monitoring based on their toxicological relevance in their 2010 report – N-nitroso dimethylamine (NDMA), 17β-estradiol, caffeine, and triclosan (Anderson et al., 2010). In their 2018 report, the CEC Panel recommended for monitoring three "health-based" chemicals – 1,4-dioxane, NDMA, and N-nitroso morpholine (NMOR) (Drewes et al., 2018). It was acknowledged in the reports that NLs had already been established for 1,4-dioxane and NDMA. These chemicals would be monitored pursuant to subsection (b). Accounting for the CEC Panel recommendations from 2010 and 2018, then, the following four chemicals are required to be monitored pursuant to subsection (f): 17β-estradiol, caffeine, triclosan, and NMOR. Many of these chemicals have already been identified for monitoring by IPR projects, but the chemical data collected since 2018 have not yet been evaluated by the CEC Panel, and no new recommendations have been made by the CEC Panel since 2018.

While the chemicals recommended by the CEC Panel are appropriate chemicals for monitoring (and would enter into the additional monitoring process through subsection (b)(6)), it is clear that this small group of chemicals would be of only limited value in characterizing the array of chemicals that are likely present in wastewater destined to be used as drinking water via DPR. In addition, as described above in subsection (g)(3), a DiPRRA can use reports from State Board advisory bodies as a resource in complying with subsection (g).

Subsection (h) requires the DiPRRA, on an annual basis, to submit to the State Board an updated plan for special monitoring of DPR project water that includes chemicals identified pursuant to subsection (g) and proposed method(s) of analysis pursuant to section 64669.70. This requirement is necessary to demonstrate that the special monitoring is updated regularly, that it includes chemicals that have been identified pursuant to the prior subsection, and that there are analytical methods available for the planned monitoring.

Subsection (h)(1) requires that the DiPRRA conduct quarterly monitoring for not less than two years from the specified locations identified in subsection (a). This sampling schedule is consistent with other sampling requirements and is necessary to ensure sufficient sampling is conducted.

Subsection (h)(2) requires the DiPRRA to perform follow-up testing when a chemical is detected. The DiPRRA is required to collect a confirmation sample for analysis within 30 days following its notification of the initial result. This follow-up testing is necessary to demonstrate whether the chemical is present; if the confirmation sampling results in a detection, the chemical is considered to be present in the water, and the DiPRRA is required to follow the requirements of subsection (h)(3).

Subsection (h)(3) requires that the DiPRRA inform its partner agency(ies) about the results of its special monitoring, which is necessary to disseminate the information and allow appropriate responses. This information can be used by the DiPRRA and its partners to provide information to the public about the need to reduce or prevent the introduction of chemicals into the sewershed. Since business and household hazardous substances, over-the-counter drugs, prescription pharmaceuticals, illicit pharmaceuticals, personal care products and other materials that go down household drains will ultimately reach the wastewater treatment plant, and may affect their drinking water supply, it is necessary to encourage and to expect DPR project participants to provide information to the public that will help reduce the chemical load experienced by the project. The “No Drugs Down the Drain” programs that are present in some communities are good examples of attempts to reduce the levels of pharmaceuticals in wastewater.

Subsection (i) requires annual monitoring of State Board-specified indicator compounds from the location identified in subsection (a)(2). The use of indicator compounds is necessary to evaluate the treatment process for the removal of chemicals. Broadly, the monitoring of indicator compounds, whose presence may not necessarily have a direct public health concern, can be used to inform the State Board as well as the DiPRRA about the overall ability of treatment to adequately remove chemicals that may be relatively resistant to treatment and/or removal from wastewater. An indicator compound is defined in more detail in subsection 64669.05. Indicator compounds may vary on a case-by-case basis, depending largely on the wastewater and treatment processes used by a DiPRRA.

Subsections (i)(1) through (i)(5) list the specific items that must be considered in the selection of indicator compounds to be used in evaluating the treatment process for the removal of chemicals. Identification of indicator compounds may be from a review of the DPR project's engineering report and wastewater characterization data (subsection (i)(1)), from a review of the source control program and chemical inventory (subsection (i)(2)), or from monitoring carried out pursuant to subsection (h) (subsection (i)(3)). These requirements are necessary to identify the sources of chemicals associated with the DPR project that can be drawn from for selection of candidate indicator compounds. Consideration of subsection (i)(3) will allow potential indicator chemicals from non-industrial sources (that is, from business and household sources) to be evaluated. This regulation is necessary because consideration of these chemicals may result in a wider selection of candidates for the specific indicator compound or compounds.

The selection of a candidate indicator compound in subsection (i) also needs to take into account how well a chemical is able to characterize the performance of a DPR project treatment process for removal of the compound (subsection (i)(4)). This requirement is necessary because not all chemicals are useful as indicator compounds. An example is a chemical that is present in the wastewater feed and is also present in the treatment process effluent at the same level; this means that the chemical is not affected by the treatment process and therefore is not a good candidate as a treatment performance indicator compound for that particular treatment process. Lastly, the selection of a candidate indicator compound must consider the availability of a method to analyze for the chemical (subsection (i)(5)). This is necessary to ensure that a candidate indicator compound must have an available method for laboratory analysis. The ability to analyze the indicator compound is necessary to determine its concentration before and after treatment, which is the basis for its use as an indicator compound.

Section 64669.70. Laboratory Analysis.

Section 64669.70 addresses laboratory analyses of the municipal wastewater, advanced treated water, finished water, and other samples collected pursuant to this Article. To ensure the wastewater is treated adequately for the protection of public health, it is necessary that the chemicals monitored be analyzed by laboratories using analytical methods that are capable of detecting and quantifying the levels of chemicals at appropriate levels.

Subsection (a) requires that the laboratories performing those analyses be accredited pursuant to Health and Safety Code sections 100825 *et seq.* (Environmental Laboratory Accreditation Act). Laboratories that perform analyses of chemicals for regulatory purposes in California's water supplies - including drinking water, wastewater, and water in the environment such as groundwater and surface water - are required to be accredited by the State Board for such analyses. The State Board, through its

Environmental Laboratory Accreditation Program (ELAP), is responsible for accrediting the laboratories in accordance with the Environmental Laboratory Accreditation Act. ELAP accreditation provides assurance that a laboratory is capable of performing analyses as part of a quality management system using approved methods, proper equipment, and trained personnel, which enables the generation of data of known and documented quality. Although laboratories seeking to perform such analyses are aware of the requirement for accreditation by ELAP, subsection (a) ensures that the DiPRRA is aware of the requirement.

Subsection (b) requires that all analyses are performed using analytical methods that are proposed and described in the DPR project's monitoring plan. The requirements for the monitoring plan are in section 64669.90. This allows the State Board to review whether the requirements specified in this section are met.

Subsection (b)(1) requires that methods to be used are those approved by the U.S. EPA to comply with the Safe Drinking Water Act, as set forth in 40 Code of Federal Regulations part 141 or 143 (https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-141 or https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-143) to make it clear that it is necessary to use methods that have been approved and vetted for use for compliance with the SDWA to ensure data of known and documented quality is used to demonstrate compliance with regulatory requirements. Drinking water systems' laboratories already operate in accordance with these requirements for standardized methodologies under existing law, and the requirement is necessary also to clarify that the focus of the DPR project's laboratory analyses is on water that will be delivered to consumers as drinking water. This notwithstanding, there are exceptions to the requirement of subsection (b)(1), which are presented in subsections (b)(2) and (b)(3).

Subsection (b)(2) allows an exception to subsection (b)(1) for samples that are taken from locations identified in subsections 64669.60(a)(1) and 64669.65(a)(1). This sampling represents wastewater that is supplying the DPR project. Thus, for such samples, it is necessary to allow the use of methods approved by the U.S. EPA to comply with the Clean Water Act, as set forth in 30 Code of Federal Regulations part 136.

Subsection (b)(3) provides another exception to subsection (b)(1). It addresses methods for analyses for chemicals not included in subsection (b)(1) and (b)(2), which refer to the U.S. EPA methods approved for the Safe Drinking Water Act and the Clean Water Act, respectively. The existence of such chemicals necessitates the promulgation of this subsection. This subsection would apply to some chemicals that do not have MCLs or NLs, such as those required by the additional chemical monitoring requirements of section 64669.65, some indicator compounds, surrogates and/or operational parameters required to be monitored pursuant to sections 64669.50 or 64669.45, and other chemicals that are not regulated in drinking water supplies. For these chemicals, subsection (b)(3) requires the DiPRRA to propose methods that would be used in the

monitoring plan. This allows the State Board to review whether the requirements specified in this section are met.

Subsection (b)(3) requires that the proposed analytical methods be selected in the order of priority set forth in subsection (b)(3). The analytical methods for unregulated chemicals range from those that are accepted and commonly used by regulators and public water systems for unregulated chemicals being monitored in drinking water to those that are relatively new and used by research laboratories and the scientific community for chemicals only recently observed as being present in or problematic for drinking water. Subsection (b)(3) ensures that the DiPRRA and its partner agencies address the analytical methods used to assess the presence and the concentration of those chemicals. It establishes a priority of methods, further explained below, to be used for analyses performed for unregulated chemicals. Using an order of priority is necessary to provide clarity regarding methods to use when there are multiple known methods.

Subsection (b)(3)(A) establishes as the first priority a method that is approved for use in compliance with the Safe Drinking Water Act as prescribed in 40 Code of Regulations part 141 or part 143, and that can be used for additional chemicals beyond those already included in such methods. The restriction for this selection is that there can be no modification of methods unless the method allows such modification (U.S. EPA, 1996). This regulation is necessary because it makes available to the DiPRRA an approach that allows a chemical to be analyzed using an existing method that ensures the quality of the data generated.

Subsection (b)(3)(B) establishes as the second priority a method that has been published by a state or federal government agency or a non-governmental scientific body that establishes analytical methods for laboratory analyses. The restriction for this selection, similar to that for subsection (b)(3)(A), is that no modification to the of methods unless the method allows for such modification (U.S. EPA, 1996), which is necessary to ensure the method is used within approved validated conditions to generate data of known and documented quality. This regulation is necessary because it expands the methods available for monitoring unregulated chemicals. The U.S. EPA and the US Geological Survey are examples of government agencies that may establish such methods. Non-governmental bodies such as the Standard Methods Committee or ASTM International are examples of entities that develop and publish methods. These methods are largely developed to meet the needs of industry, researchers and regulators to have standard methods for measuring the quality of drinking water, wastewater, and environmental water. It is necessary to specify these methods to ensure that the data collected for compliance are of known and documented quality and can be used for analyses for a DPR project.

Subsection (b)(3)(C) establishes as the third priority methods that are developed or modified by an analytical laboratory for chemicals that lack available methods. It sets forth the procedure by which such a method can be developed or modified from another

method, such as those described in preceding subsections. To use a method developed under subsection (b)(3)(C), the proposed method must include the laboratory's standard operating procedure and a method validation study package. The method validation package follows submittal of a method validation plan to the State Board, where the plan is to conform to the alternative test protocols of the U.S. EPA, namely the Protocol for the Evaluation of Alternative Test Procedures for Organic and Inorganic Analytes in Drinking Water (EPA 815-R-15-007, February 2015, https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100MERX.txt) or Protocol for the Evaluation of Alternate Test Procedures for Analyzing Radioactive Contaminants in Drinking Water (EPA 815-R-15-008, February 2015, (https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100MESN.txt). A proposed method that is in conformance with one of the U.S. EPA's protocols for an alternative text procedure is acceptable to the State Board for use in analysis of water in a DPR project. The requirements in this subsection are necessary to clarify the analytical capability that is available when needed, given the lack of alternatives that may exist with respect to any given chemical. The information required to be submitted is necessary to demonstrate that a proposed method can produce data of known and documented quality.

Subsection (c) references existing drinking water regulations for the performance of sample collection and field tests, such as the requirement for trained water sample collection personnel. The requirements of section 64415(b), which apply to public water systems in general, ensure a level of technical competence by personnel so that samples and other related activities are done appropriately. Even though the requirements exist in other regulations, it is necessary to include the requirements here, so that the DiPRRA is reminded that it is responsible for those activities throughout the DPR project.

Section 64669.75. Engineering Report.

The engineering report includes all the information necessary to describe how a DiPRRA will comply with the requirements of this Article. Subsection (a) requires the DiPRRA to submit the engineering report to the State Board with the permit application. This requirement is necessary, since the DiPRRA is responsible for the DPR project. The engineering report must be submitted with the permit application so that the State Board can ensure the engineering report contains the information required to issue a permit.

Subsection (b) addresses who is responsible for preparation of the engineering report. A clearly written engineering report that addresses how a DPR project would comply with all regulatory requirements will allow the State Board to efficiently review a proposed DPR project in consideration of a permit application. To this end, the report is required to be prepared by a qualified engineer licensed in California and experienced

in the field of wastewater treatment and drinking water treatment. Five years is a reasonable length of time to demonstrate experience.

Subsection (c) describes the information that must be included in the engineering report.

Subsection (c)(1) requires that the engineering report describe the means by which the DPR project will meet each and every requirement set forth in this Article, as well as other requirements that apply to the DPR project as set forth in Chapter 17. The description is required to include information about the project's facilities, the personnel involved in the projects and other resources that will enable the DPR project to operate pursuant to the regulations. This requirement clarifies that a DPR project is subject to the surface water treatment rule as well as the additional requirements of this Article, and that a DiPRRA is obligated to review the surface water treatment rule and address the requirements in the surface water treatment rule in its engineering report.

Subsection (c)(2) requires that the engineering report include a characterization of the chemical quality of the municipal wastewater proposed to be used as feed water for a DPR project to produce drinking water. The characterization, which includes the identification of chemicals in the municipal wastewater and the concentrations at which they are found, is necessary to assess the adequacy of treatment proposed, the initial monitoring requirements, and identify focus areas appropriate for industrial source control. In addition, the characterization provides information necessary for the evaluation of the health risks associated exposure to those chemicals.

Subsection (c)(2)(A) provides the requirements for the data used in the characterization. Samples of the municipal wastewater that will feed the DPR project are to be collected for chemical analysis on a monthly basis, for at least a period of 24 consecutive months. This frequency of sampling is necessary to provide an adequate initial dataset of wastewater quality to take into account fluctuations in chemicals over time, as might occur seasonally or through industrial or personal use patterns, for example. The monitoring locations from which samples are to be taken are required to adequately represent the waters that will be feeding into the DPR project. The analytical data must include information on the detection limits used in the laboratory analyses, with particular detection limit requirements for chemicals with drinking water standards. This is necessary to ensure that the data meet acceptable quality standards. All data that are used in characterizing the chemical quality of the municipal wastewater are required to be included in the engineering report to ensure accurate documentation of information submittal for consideration in the permit review.

The characterization is to include chemicals set forth in subsections (c)(2)(A)1 through (c)(2)(A)8. The chemicals include:

- chemicals with drinking water maximum contaminant levels (MCLs) and regulatory action levels;

- priority pollutants listed in the Code of Federal Regulations section 131.38 that pertain specifically to California;
- chemicals with California drinking water notification levels (NLs);
- several specific solvents that, based on their low molecular weight and experience related to their presence or potential presence in recycled water projects, may pose a particular concern to DPR projects;
- substances that, as a result of treatment within the DPR project, may result in the production of chemicals such as disinfection byproducts;
- chemicals specified by the State Board based on a review of the industrial source control program;
- chemicals that are associated with non-industrial sources of hazardous substances, such as those used in businesses and household, and other household-related chemicals such as pharmaceuticals and personal care products, particularly those that have been found in studies performed near the project, or reported in pertinent publications; and
- other chemicals specified by the State Board that may pose a health risk, which could include chemicals of interest that may have been found in other DPR projects, or in other drinking water sources, so that occurrence can be determined for the wastewater characterization.

The extent of required monitoring in subsection (c)(2)(A) for the DPR project is necessary to enable identification of chemicals in wastewater that is to be used to provide the source for a DPR project as well as the concentration of those chemicals in wastewater. This approach is consistent with existing requirements for a public water system to characterize a drinking water source on a project-by-project basis; the identification of chemicals and their concentrations in wastewater is necessary to ensure the protection of public health. For municipal wastewater for a DPR project, the chemical characterization is necessarily required to be more extensive than a characterization for conventional drinking water sources that are from more pristine groundwater or from protected surface water environments, given the presence of industrial and non-industrial (e.g., household) chemicals.

Subsection (c)(2)(B) requires the DiPRRA to review the results of monitoring under subsection (c)(2)(A) and evaluate the health risks from detected chemicals by comparing the chemical concentrations in wastewater with drinking water standards and other health protective levels (HPLs). This comparison is necessary to determine whether the detected chemicals pose a health risk if treatment provided by the DPR project is inadequate. The evaluation is described in subsection (c)(2)(B)1 through subsection (c)(2)(B)4. It is necessary for the protection of public health for the DiPRRA to review the results of the monitoring conducted in subsection (c)(2)(A) to ensure detected chemicals that exceed HPLs are known and addressed in the engineering report.

Subsection (c)(2)(B)1 requires a comparison of the maximum detected concentrations of chemicals with primary MCLs, regulatory action levels and NLs. This requirement is

necessary to determine the concentration of these chemicals in municipal wastewater that feeds the DPR project, in order to ensure that treatment processes are capable of reducing the concentrations of these chemicals to their applicable required levels.

Subsection (c)(2)(B)2 requires a comparison of the maximum detected concentration of chemicals for which there are no primary MCLs, action levels or NLs with available HPLs. HPLs represent levels that pose no significant health risk, using the same methods and toxicological endpoints used in the establishment of public health goals (PHGs), which contribute to the establishment of MCLs. Those endpoints are a lifetime cancer risk of no more than 10^{-6}, and for non-cancer effects a level derived from the no observable adverse effects level and applicable uncertainty factors. This comparison is necessary to ensure that treatment processes are capable of reducing the concentrations of detected unregulated chemicals to levels that would not pose a health risk. The comparison of chemicals concentrations is necessary to identify chemicals without MCLs or NLs that pose the greatest health risk in the case of inadequate treatment.

Subsection (c)(2)(B)2 requires the use of state, federal and other sources of HPLs in the comparison of chemical concentrations in wastewater. It is necessary because those HPLs follow risk assessment procedures similar to those that contribute to the establishment of MCLs and NLs. The sources of HPLs include:

- **The Office of Environmental Health Hazard Assessment (OEHHA):** OEHHA addresses cancer and non-cancer risks of chemicals when it establishes PHGs, which are the HPLs resulting from health risk assessments that contribute to the development of MCLs by the State Board. Besides its PHGs, OEHHA has other sources of appropriate HPLs available on its website (www.oehha.ca.gov). For chemicals that pose a cancer risk, for example, PHG-like values (that is, established at a lifetime cancer risk of 10^{-6}) can be derived from the list of chemicals with daily risk assessment levels (Title 27 California Code of Regulations, section 25705) established by OEHHA for California's Safe Drinking Water and Toxic Enforcement Act of 1986.
- **Other California State Agencies:** The activities of other CalEPA agencies may provide additional sources of HPLs for chemicals that do not have MCLs, action levels, or NLs, from human health risk assessments for air contaminants, toxic substances, and pesticides. The State Board's DDW's evaluations for the use of extremely impaired sources, and health-based components of the State Board's Compilation of Water Quality Goals (https://www.waterboards.ca.gov/water_issues/programs/water_quality_goals/), also may provide HPLs.
- **US Environmental Protection Agency (U.S. EPA):** Similar HPLs are available from the U.S. EPA, as from its Integrated Risk Information System (https://www.epa.gov/iris), and from its Regional Screening Levels for Resident Tap Water (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables).

- **State Board Advisory Panels:** State Board advisory committees and panels also provide valuable information that can contribute to satisfying the HPL need. For example, the CEC Monitoring Panel (Drewes et al., 2018) compiles risk assessment-derived levels (in Table D.3) for water contaminants for indirect potable reuse projects that may be used by a DPR project.
- **State Board:** The evaluation of subsection (c)(2)(B)2 also includes other similar HPLs required by the State Board. This is necessary to enable the Board to direct additional HPLs to be included when the State Board is aware of HPLs that the DiPRRA may be unaware of, such as HPLs that have been utilized in the permitting process associated with an extremely impaired source.

Subsection (c)(2)(B)3 requires that the DiPRRA include the comparisons for the chemical risk evaluation in the engineering report along with citations to the references that provided the information for the HPLs used in the evaluation. This is necessary to allow readers to identify the sources of scientific information used in the document, a common practice in scientific and technical writing.

For ease of presentation and subsequent use of the documentation, the regulations require that the information about the comparisons of concentrations of chemicals in wastewater with MCLs, action levels, and NLs, as well as with HPLs for other chemicals for the chemical risk evaluation be presented in tables, with accompanying narrative discussion on chemicals that are found at greater concentrations than MCLs or NLs, or that exceed the HPLs. The discussion can take the form of additional text, footnotes, or other means of narration. The requirement for the use of tables is necessary because the use of tables result in a more concise, easy to read presentation of information.

Additionally, the presentation is to include whether the presence of such chemicals can be addressed by the wastewater treatment entity, through the use of local limits or other methods of discharge control. This is necessary because providing feedback to the wastewater provider when a chemical is identified as needing additional attention upstream of the DPR project is beneficial to the project.

Subsection (c)(2)(B)4 requires the DiPRRA to identify chemicals that lack risk assessment-derived HPLs, and that therefore cannot be included in the comparative risk evaluation. This is necessary to bring attention to chemicals that are present in wastewater, but that cannot be evaluated in terms of their potential health risks.

The regulation also requires the DiPRRA to identify chemicals with analytical methods that are lacking adequate sensitivity to reach the HPLs used in the risk evaluation, that is, where the HPL is lower than the level of detection used by the method. This requirement is necessary so that the DiPRRA and its partner agencies can identify analytical needs associated with chemicals in wastewater.

The identification of data gaps associated with analytical method sensitivity and with human health risk assessments from this subsection will serve to encourage

laboratories to develop more sensitive analytical methods and will also highlight the need for future human health risk research, investigations, and literature searches that pertain to the chemicals in wastewater being supplied to the DPR project, to be used in future updates of the engineering report.

Subsection (c)(3) requires that the engineering report include information about the characteristics of the wastewater feed to a DPR project that may be anticipated to occur in the future including the effects on water quality resulting from climate change. This requirement is necessary because a changing climate could result in prolonged droughts and reduced sewage flows. Reduced sewage flows could in turn result in a commensurate increase in the concentrations of pathogens and toxic chemicals. Including this information in the engineering report provides the State Board information about whether a DPR project is adequately addressing feed water quality changes that may affect a DPR project's continued ability to comply with DPR regulations and protect public health. The subsection also requires that the engineering report include information on existing or planned activities to optimize wastewater treatment operations. This is necessary because optimization of the wastewater treatment facilities and their operation has been shown to improve the efficiency of operation and the consistency in the quality of water that serves as the water source for the DPR project, resulting in a higher level of public health protection. The 2022 Panel recommended that wastewater treatment optimization be reviewed in the engineering report. (Recommendation 4, State Board, 2022)

Subsection (d) requires the DiPRRA to update its engineering report no less often than every five years and to submit the updated report to the State Board. The updates are intended to present information on all DPR project activities including the joint plan and water safety plan, wastewater source control program, treatment optimization and efficiency, operations, operator training and improvements, forecast of capital replacement and budget and other project specific information that the State Boards finds necessary to assess the operation of the DPR project. The five-year updates of the engineering report are necessary to provide a comprehensive review of recent operations (since the last update) and current activities related to the DPR project, as well as a forward-looking prospectus for future activities.

Section 64669.80. Operations Plan.

The DPR project's operations plan describes how the DiPRRA and partner agencies will operate, maintain, and monitor the project facilities to comply with the requirements of Article 10 and permit requirements. A comprehensive operations plan is necessary to allow the State Board to evaluate the sufficiency of a proposed DPR project and establishes documentation of the known and approved operations of the DPR project. An operations plan will also provide guidance to project management, operators, ancillary programs, and support staff on the approved operations of the DPR project

and allow these entities to understand when operations deviate from the written operations plan and take the appropriate corrective actions.

Subsection (a) requires that the operations plan must be submitted to the State Board to enable State Board review and approval of the plan and subsequent project operation in conformance with an approved plan. A draft operations plan must be submitted with the permit application, so that adequate time is available to review the operations plan prior to operation of a DPR project. Prior to operation of a project means before the project begins to distribute water for use by a public water system's drinking water treatment plant or water distribution system.

Subsection (b) requires that the DiPRRA operate the DPR project as described in the operations plan that has been approved by the State Board.

Subsection (c) establishes the basic requirements of the operations plan.

Subsection (c)(1) requires a description of how each treatment process and reliability feature will be operated to meet the requirements of the Article. This requires identification of the decisions and adjustments an operator may have to make to keep each process, operation, or feature meeting the critical limit. Many requirements specified in this Article enable a DPR project to operate reliability to produce water that is protective of public health. Additionally, projects may voluntarily design additional reliability into a DPR projects for other reasons (such as to improve ease of operation or to address another project-specific need). It is necessary to describe how these reliability features will be implemented to provide the State Board with the full picture of the reliability of a DPR project to provide safe drinking water and the operational features and constraints. The information in subsection (c)(1) is also necessary for the State Board to determine whether a DPR project has addressed all the operations of the project.

Subsection (c)(2) requires information on the monitoring used to demonstrate that each control point is functioning as necessary. Treatment process monitoring tells an operator when a process is not functioning as designed. It is critical that a DPR project has evaluated the full scope of the process monitoring requirements to ensure reliable and effective treatment for the protection of public health. It is necessary for the information to be described in the operations plan so that the State Board can determine if a DPR project will be able to comply with the regulations and for the State Board to assess technical capacity of a DPR project.

Subsection (c)(2)(A) requires that each surrogate and operational monitoring parameter for each pathogen and chemical control point be identified, and a description of the online monitoring equipment and sampling be provided in the operations plan. This is necessary for the State Board to determine if the project has accounted for all the monitoring at the control points to protect public health.

Subsection (c)(2)(B) requires that the monitoring location for each surrogate and operational parameter be identified. This is necessary for the State Board to verify that the monitoring location is effective and would be representative of the water being monitored.

Subsection (c)(2)(C) requires that the critical limits associated with each surrogate and operational parameter be identified. This is necessary for the State Board to determine whether limits have been established and whether the limits established are those justified in the validation study reports.

Subsection (c)(3) requires information demonstrating that the DPR project operators and managers are properly trained. Subsections (c)(3)(A) through (D) require training in several specific areas, namely, in how to properly operate the necessary treatment processes used in the DPR project, the statutes and regulations relevant to drinking water and DPR, the public health concerns associated with water that does not meet drinking water standards and that therefore justify the regulations, and the implementation and associated operation of a wastewater source control program. These are all knowledge areas critical to the informed operation and oversight of a DPR project.

Subsection (c)(4) requires that the plan identify the appropriate type of operator certification and number of operators at each level of certification for each treatment plant. Existing regulations govern the appropriate type of operator certification required at a water treatment plant. Operation of a DPR project would require operators certified at specific levels for chief and shift operators. Treatment plants require a sufficient number of operators to carry out scheduled tasks for each shift and to deal with contingencies. The plan must consider all these factors and identify the necessary staffing for each treatment plant. Subsection (c)(4) also requires a description of new staff training and ongoing education and training be included. This is necessary to ensure that operators are up to date on the required knowledge and skills needed to operate the plant. The trained and knowledgeable operators are integral to ensuring that public health protection when operating a DPR treatment train, and the information is necessary for the State Board to determine whether adequate resources are being provided to support operations staff.

Treatment plants can often be operated to perform better than the minimum objective of the design. This might be done by adjusting a treatment chemical dose, minimizing flow fluctuations, or other operational adjustments, referred to as optimization, depending on the nature of the process. Subsection (c)(5) requires that the plan identify how it will go about optimizing treatment to maximize reduction of pathogens, regulated contaminants, other chemicals addressed by this regulation, and disinfection byproduct precursors and disinfection byproducts. Under existing section 64661 (“Operation Plan”) of Chapter 17, a PWS operating a surface water treatment plant must develop and operate the surface water treatment plant in a manner “designed to produce the optimal water quality from the treatment process.” Consistent with existing regulations for

surface water treatment, proposed subsection (c)(5) requires a DiPRRA to develop an operations plan to optimize the treatment processes.

Subsection (c)(6) requires that the plan describe how the operations will provide for additional validation for pathogen control treatment when conditions change such that the original validated LRV or critical limit may no longer be correct. The steps in the validation procedure that must be revisited depend on the conditions that have changed.

The Supervisory Control and Data Acquisition (SCADA) system for a DPR project facility will include equipment and programing to measure water quality parameters at pathogen and chemical control points, evaluate the data to determine compliance, and take action that depends on compliance status, including keeping the operator informed and halting flow to the distribution system, if halting the flow is appropriate. Subsection (c)(7) requires that the operations plan describe the system and how it uses SCADA system data to determine compliance. The plan must describe how the system carries out specific functions, including how the SCADA system collects and uses monitoring data, how it detects and responds when a control point does not meet a critical limit, how it communicates among the partner agency treatment plant(s). In addition, the operations plan must describe the method the SCADA system uses to continuously evaluate treatment train LRVs, to determine the LRV performance status of a process, and to identify a failure to meet pathogen LRVs. The plan must also address and describe how the SCADA functions and capabilities specified in section 64669.85(d) are implemented in operations.

The SCADA system is critical if compliance with pathogen and chemical controls are to be known in real time. Subsection (c)(8) requires a protocol to test the ability of SCADA to perform as necessary.

Subsection (c)(9) requires that a process be in place to investigate and respond to failures to enable a rapid reaction. This is necessary for protection of public health as operators need to have the necessary tools and know what procedures need to be followed to avoid confusion when an incident occurs. Having a plan in place enables follow-up actions to be taken more quickly to protect public health. The information must be included in the operations plan so that the operators, managements, and the State Board can easily find it.

Subsection (c)(10) requires that the plan describe the protocol for halting flow to the distribution system and recommencement of flow to allow for a thorough review of this critical exercise. This is necessary to ensure that, should the DPR project not produce water safe for public consumption, that there is a process (or processes) that eliminates project water from being distributed for potable use. In addition, to minimize any consumer hardships that may occur during a possible reduction in drinking water supply, it is important to have a process for the expeditious return of the project to

normal operation once the activity that caused the diversion or shutoff to occur has been resolved.

Subsection (c)(11) requires a description of project facility inspection, maintenance, and calibration necessary to keep the facilities operating as intended. A description of the process of calibration and verification of continuous online monitoring equipment associated with pathogen or chemical control points and field test kits in the operations plan will help ensure the quality of data that the SCADA uses to carry out its functions. Online monitoring equipment must undergo periodic calibration and validation to ensure control limits are being met and the project water meets quality requirements. Field kits require periodic calibration and verification to ensure the quality of the results meet requirements.

Subsection (c)(12) requires a description of the form of record keeping used to document the project operations to make sure it will be satisfactory. This is necessary so the State Board understands what kinds of records are being maintained, determine if the appropriate records are being maintained, and facilitates the verification of records during sanitary surveys and inspections.

Subsection (c)(13) requires the form of compliance reporting to make sure it will be satisfactory. This is necessary so that the State Board can verify whether the minimum required compliance information will be submitted to demonstrate compliance with the requirements of this Article and with permit requirements.

Section 64669.85. Pathogen and Chemical Control Point Monitoring and Response Plan.

Critical control points are the points within a treatment system or its operation of which a disruption or a failure would result in a greater public health risk compared to other points.

Pathogen control points and chemical control points are necessary to demonstrate control of acute and chronic exposure threats. Subsection (a) requires that a DPR project utilize critical control points for pathogens and chemicals, called pathogen control points and chemical control points, to control acute and chronic exposure threats. Subsection (a) requires that the DiPRRA use a SCADA system to manage the information generated at the pathogen and chemical control points to determine compliance with this Article. The SCADA system serves as a critical tool in a DPR project to rapidly evaluate large amounts of data and draw operator attention to certain situations that may result in a failure and increased public health risk. The SCADA system must meet the requirements described in subsection (d).

Subsection (a)(1) requires that pathogen and chemical control points be identified, and that a critical limit be identified for each control point. A critical limit must be identified for

each control point so that the system and operators know the objective minimum standard of treatment performance.

Subsection (a)(2) requires that each control point be equipped with online monitoring sufficient to determine whether the critical limit is being met. The online monitoring is needed to generate information sufficient to determine compliance with this Article.

Subsection (a)(3) states that, if the online monitoring is unable to demonstrate compliance with this Article, regardless of the cause, the associated critical limit(s) shall be deemed to not have been met. Should the online monitoring fail to confirm that a critical limit is being met, including when an instrument fails to take or record a reading or there is a communication failure with the instrument such that the instrument defaults to a static reading, or for any reason, failure must be assumed to have occurred and appropriate actions must be taken. For pathogen control, this means that for example, a treatment process LRV cannot be used toward complying with the treatment train pathogen log removal requirements unless the online monitoring demonstrates that the treatment process is complying with the critical limits established to monitor its treatment efficacy. This is necessary to track these types of failures because wastewater is being treated and if critical information from treatment process monitoring is not available, it is protective of public health to assume that the process is not operating within the approved operating envelope during this time.

Subsection (b) requires that water posing an acute exposure threat shall be prevented from being distributed as drinking water. This is necessary because brief exposure to pathogens and certain chemical contaminants can cause illness.

Subsection (b)(1) identifies those situations that constitute an acute exposure threat to the public. Those situations include the possibility of excessive pathogen densities, excessive concentrations of chemicals known to pose an acute hazard, and concentrations of organic material that may indicate an immediate threat. These conditions result from failures to meet specific critical limits at control points.

Subsection (b)(2) requires sufficient time for an acute exposure hazard critical limit failure to be remedied by stopping or diverting the flow before any inadequately treated water gets to the distribution system. The time is achieved by providing a flow path between each failed control point and the point where flow is halted that is sufficiently long at design flow rates. The subsection identifies components of the flow time available in a DPR project. The entire time interval between online measurements taken at a pathogen or chemical control point must be included because the worst-case situation is that the treatment fault occurs immediately after the previous measurement. Including the increment of time it takes for online measurements to be accessed by the SCADA system, and an assessment made as to whether the critical limit is being met, although probably short, encourages rapid action on available data. The time it takes the SCADA system to perform and fully implement its control functions is addressed, including identification of the acute health threats identified in subsection (b)(1) and

termination of the flow. Large valves can require a significant time to close. There may be additional periods of time that must be included for individual projects.

A standard for how to measure the time it takes water to flow through a system of pipes and vessels is provided in subsection (b)(3). All water molecules will not travel at the same speed through plumbing due to friction at the pipe walls and turbulence. It is not practical to base a requirement on the first arrival of a batch of water because that is difficult to identify. The time when 10% of the flow representing a batch of water makes it through a section of plumbing has been used in other drinking water regulations and is sufficient for this purpose. The requirement ensures that at least 90 percent of the flow to the distribution system will still be water meeting all requirements at the point of diversion or shutoff. The assessment in subsection (b)(2) and calculation in subsection (b)(3) are necessary to ensure that unsafe water is not distributed to the public once the SCADA system determines that an acute exposure threat listed in subsection (b)(1) has occurred.

Subsection (c) identifies those situations that constitute a chronic exposure threat to the public. A chronic exposure threat is identified as a failure to operate the chemical control treatment train to comply with the treatment technique requirement in section 64669.50(o) for more than two consecutive months. Water posing a chronic exposure threat shall be prevented from being distributed as drinking water on a frequent basis or for prolonged periods as a means to reduce the chronic exposure threat.

A DPR project must use a SCADA system to monitor critical control points for pathogens and chemicals that are used to control acute and chronic hazards to provide all the functionality required and enable communication across partner agencies.

The online monitoring used to track the status for each control point must be described to allow comparison with the requirements in the pathogen and chemical control sections of the regulations. There must be clear and continuous evidence of sufficient treatment during drinking water production. The SCADA system must be able to alert operators to water quality concerns and failures, as well as interrupt the flow when necessary, to avert water quality threats. The system must record and report these events to allow for quality control and compliance reviews.

Subsection (d) requires the SCADA system to be designed and operated with certain features and capabilities described in subsections (d)(1) through (d)(5). For projects that utilize multiple water treatment plants, the SCADA system of each water treatment plant must be designed and operated with the features and capabilities described in this subsection. This is necessary to ensure there are no gaps in the treatment control and monitoring under a unified SCADA system for a DPR project, in order to ensure protection of public health.

Subsection (d)(1) requires the SCADA system to provide alarms that alert the operator when a control point is not operating as designed and to halt the flow of water if

necessary. It is necessary for the SCADA system to have these capabilities to ensure that inadequately treated water is not distributed and to protect public health. It is necessary to alert the operator of the status of the treatment so that the operator can take corrective action.

Subsection (d)(2) requires the SCADA system to identify trending degradation and significant excursions of water quality or surrogate and/or operational parameters that indicate a need for treatment adjustment, maintenance, or other operator intervention. The SCADA system shall alert the operator and generate a record of the trending degradation or significant excursion incident. It is up to the DiPRRA to propose in the plan how the trends and excursions are to be determined by the SCADA system for the specific DPR project. The SCADA system must alert the operator to the water quality situations of concern and document the event to enable operator response and review of the treatment performance history. This is necessary so that the operator has the information on treatment process performance necessary to identify potential problems with a treatment process and take appropriate corrective measures before a critical alarm is triggered. It is necessary to record the information so that operators can review the information when responding to a critical alarm to troubleshoot the problem and determine the course of action to take to correct the problem.

Subsection (d)(3) requires that all project critical pathogen and chemical treatment point SCADA systems communicate as necessary for overall project operation and control. If a partner agency is responsible for providing a portion of the treatment in a DPR treatment train, the operations plan must describe operator and SCADA control system communications between the partner agency treatment plant and the DiPRRA. A DiPRRA must have current knowledge of the status of treatment for the entire DPR project if it is to be held responsible. Knowledge that the SCADA system will perform as designed is critical to the regulators and project management in order to ensure protection of public health.

The SCADA system and related systems must be secure from unauthorized access and cyberattack. Subsection (d)(4) requires a cybersecurity plan component. Compliance with this subsection allows for sensitive information that could jeopardize the system to be submitted in a secure manner. It is necessary for the SCADA system to be secured and hardened against malicious attacks and for a DPR project to perform as designed under such threats to ensure protection of public health.

Subsection (d)(5) requires a test protocol be developed that is capable of testing the SCADA system to ensure that it provides the functions identified in the section. The intention is that a test protocol would be run before plant operations and subsequently on a routine (typically monthly or quarterly) basis to continue to verify the SCADA is operating as designed. When a change is operations is made, the SCADA must also be tested. These types of actions in a protocol reflect some of the components of a quality test of the SCADA system to ensure the reliability of this critical part of DPR project

operations. It is necessary to ensure protection of public health for the SCADA system to be tested for the DPR project to demonstrate capability to perform as designed.

Section 64669.90. Monitoring Plan.

A comprehensive monitoring plan is required to address all the specific chemical monitoring requirements contained in the Article. As the entity responsible for oversight and operation of the DPR project, the DiPRRA is required to prepare the monitoring plan and work with the respective agency partners and laboratories that provide analyses to ensure that the plan is effectively implemented. The requirement for a monitoring plan is consistent with existing regulations that mandate such plans for larger public water systems that use conventional water supplies and is necessary to ensure the protection of public health.

The monitoring plan must cover the monitoring requirements for regulated chemicals. In addition, the plan is to describe additional monitoring to address specific unregulated chemicals, as well as chemicals that have the potential to be present in the wastewater being treated, and for chemicals that the State Board may determine are important to monitor based on an assessment of an individual project.

Subsection (a) requires that the DiPRRA as the responsible entity for the DPR project submit the monitoring plan for State Board before the DPR project is put into operation. This is necessary to allow for the review of the plan to ensure that it meets the requirements of the Article. The DiPRRA has the option to include the monitoring plan as part of the operations plan or submit it as a separate document to provide flexibility for projects in how they submit information to the State Board while complying with the requirements in the section.

Subsection (b) requires that all monitoring be conducted in accordance with an approved monitoring plan. It allows for monitoring to be conducted by the DiPRRA, partner agencies under the joint plan, or a regional monitoring consortium. This approach is necessary to provide for flexibility in carrying out the monitoring and possible cost savings through the use of a regional consortium involving multiple DPR projects that could combine resources to achieve the required monitoring. Should a regional consortium be used, samples are required to be analyzed individually to ensure samples are not commingled causing the results to be compromised.

Subsection (c)(1) requires that the plan include a description of the entities involved in monitoring and their roles and responsibilities and contact information to ensure that it is clear how the plan will be implemented, and by whom. This requirement is necessary to ensure that all entities involved in monitoring are identified and the roles and responsibilities are clear.

Subsection (c)(2) requires that the plan include the monitoring locations and monitoring schedules and describe the procedures for tracking monitoring status and reviewing the analytical results. Maintaining appropriate monitoring schedules and timely review of analytical results is necessary to ensure that project water quality requirements are being met.

Subsection (c)(3) requires that the plan list the laboratories that will be conducting the analyses and the anticipated time to complete the analyses and report the results. This requirement is necessary to ensure that accredited laboratories are used and that the results are provided within an acceptable timeframe.

Subsection (c)(4) requires that the plan describes the analytical methods to be used consistent with section 64669.70 for each constituent monitored, and the sample collection, handling, and processing procedures, which are specific for different chemicals and chemical groups and, which must be strictly followed to ensure the quality of the results.

Subsection(c)(5) requires that the plan include the anticipated detection limits and reporting levels for each constituent monitored. This information is necessary to ensure the monitoring results meet acceptable quality standards.

Subsection (c)(6) requires a description of training and instruction provided for sample collectors, sample schedulers, sample handlers, water quality data reviewers, water quality data submitters, and other personnel associated with sampling and data quality assurance. These measures are necessary to ensure staff are properly trained to carry out sampling and other procedures consistent with established requirements.

Subsection (c)(7) requires a description of how recordkeeping and maintenance of records will be carried out to ensure accuracy of records and ensure that the necessary historical records are secured and maintained.

Subsection (c)(8) requires a description of the procedures for communication and coordination between sample collector personnel, treatment operations personnel, water quality data reviewers, and laboratory personnel. Maintaining proper communication and coordination among personnel responsible for all aspects of the sampling, analysis, review of monitoring results and treatment operation is necessary for ensuring project water meets quality requirements.

Subsection (c)(9) requires a description of the follow-up actions that will be taken when a laboratory analysis finds that a chemical or contaminant exceeds a MCL, action level, or notification level. The plan should address actions consistent with existing regulatory requirements for notification under such circumstances and include information on the timeframe for notification by a laboratory to a DiPRRA when a sample is found to exceed an MCL, action level or notification level. Timely notification of a laboratory result is necessary to allow follow-up actions to be taken in a timely manner.

Section 64669.95. Compliance Reporting.

Compliance reporting is an integral element of all drinking water regulations. The information that is provided is necessary to ensure that drinking water quality standards are being met and the operation of the treatment facility is being effectively monitored and operated in accordance with the parameters defined in the DiPRRA's operations plan for the DPR project. Monthly reporting provides an assessment of trends in the operation that is important in determining operational and performance consistency. As the entity responsible for oversight and operation of the DPR project, the DiPRRA is responsible for meeting the requirements of this section.

Subsection (a) requires that the DiPRRA provide a monthly report submitted no later than the tenth day of the following month that includes a summary and the results of the compliance monitoring that has been carried out during the previous month according to the DiPRRA's monitoring plan, which includes monitoring to ensure compliance with chemical and pathogen requirements. The subsection also defines which individual is responsible for signing the report. The signatory is required to be a person responsible for the drinking water treatment train including the chief water treatment operator.

Subsection (a)(1) requires a summary of the overall treatment train pathogen LRV performance, which provides an overall indication of how well pathogen removal is being achieved compared with the minimum pathogen removal requirements.

Subsection (a)(2) requires a summary of the overall treatment train performance of the chemical control treatment, which provides an overall indication of how well the chemical barriers performed.

Subsection (a)(3) requires a summary of individual treatment process performance monitoring data. This data will provide an indication of how well each treatment process is performing in meeting the operational and treatment requirements for both chemicals and pathogens.

Subsection (a)(4) requires the report indicate each time the design requirements for the three regulated pathogens are not met including the date, duration, and cause of the occurrence. A treatment plant is required to meet the pathogen removal design requirements at least 90 percent of the time each month. Frequent noncompliance with this requirement is an indication of operational issues that require investigation and follow-up to address the cause.

Subsection (a)(5) requires reporting of control points that do not meet their critical limits. Meeting the critical limits for chemical and pathogen reduction is essential to the treatment plant performance and to ensure water quality requirements are met. The failure to meet control point critical limit provides an indication of the reliability of the

treatment plant processes and the overall operation of the treatment plant. Providing information on the duration, response and corrective action is important for an ongoing understanding of how reliably the treatment plant is performing and how responsive the DiPRRA is in addressing problems.

Subsection (a)(6) requires the reporting of excursions of operational parameters outside of approved operating envelope. Operational parameters are established to ensure that the treatment plant is producing water that is meeting quality requirements and is operated within the limits of validation. The monitoring parameters are tracked by the SCADA system, which provides a real time indication as to whether operational parameters are being met within the operating conditions under which the treatment plant has been designed and approved.

Subsection (a)(7) requires the reporting of information pursuant to section 64464. Section 64464 requires reporting under the Surface Water Treatment Rule (SWTR) including monthly reporting requirements for distribution system residual monitoring. Certain DPR projects particularly those involving raw water augmentation may include treatment processes that would be subject to the SWTR and its reporting requirements. Many DPR projects would be subject to distribution system monitoring. The requirement serves to clarify that the DiPRRA is subject to requirements in Chapter 17 that are applicable to the DPR project.

Subsection (a)(8) requires the reporting of any violation of performance standards that address the acute and chronic exposure threats. Reporting violations is necessary to understand how well the treatment plant is being operated and meeting performance requirements and to determine whether operational changes are needed.

Subsection (a)(9) requires the calibration records for instruments monitoring pathogen or chemical control points. Ongoing calibration of these instruments is necessary to ensure accurate readings are made at the control points to ensure that the pathogen and chemical critical limits are being met. Inaccurate readings could result in inadequately treated water being delivered to consumers.

Subsection (a)(10) requires the reporting of dates and descriptions of major equipment and process failures and corrective actions taken. Failures of major equipment and processes can result in the delivery of drinking water that does not meet quality requirements. Monthly reporting of these occurrences provides an indication of how well these systems are performing, their reliability and how responsive the DiPRRA has been in addressing the failures.

Subsection (a)(11) requires the reporting of dates and summary of testing of the treatment control and alarm system consistent with the protocols in the operations plan. The operation plan sets forth the protocols for testing treatment control and alarm system, which are necessary for the proper operation of the treatment plant. Monthly

reporting of this information provides an assurance that treatment control and alarms systems are operating according to design and operational specifications.

Subsection (a)(12) requires providing the investigation or incident reports required to be prepared pursuant to subsection 64669.45(b)(3) (for instances where the treatment train achieves the pathogen LRV for virus, Giardia lamblia, and Cryptosporidium of 20, 14, and 15, respectively, less than 90 percent of the time in a month), subsection 64669.50(j)(1) and (j)(2) (for instances where the TOC performance exceeds 0.15 mg/L or 0.1 mg/L), and sections 64669.60 and 64669.65 (for instances where results of chemical monitoring trigger follow-up action as described in these sections).

Subsection (a)(13) requires providing a summary of activities of the wastewater source control program.

Subsection (a)(14) requires providing a summary of chemicals detected as a result of monitoring conducted pursuant to sections 64669.60 and 64669.65.

Subsection (a)(15) requires providing any investigation or incident report resulting from a cross-connection.

Subsection (a)(16) requires a summary of water quality complaints and reports of gastrointestinal illness received from customers. This reporting requirement extends to DPR projects the same reporting requirement under the existing SWTR, section 64664(f).

Subsection (c) requires reporting of analytical results of water quality monitoring conducted pursuant to sections 64669.60 and 64669.65 to the State Board electronically by the 10th day of the month following the month when the analysis is completed pursuant to subsections 64469(a), 64469(b), and 64469(c). This reporting requirement addresses reporting of chemical monitoring results and extends to DPR projects the same reporting requirement already mandated for drinking water systems.

While analytical results are to be submitted electronically to the State Board’s drinking water quality data intake portal by the analytical laboratory pursuant to 64469(c), it may be difficult for certain analytical results to always be submitted electronically to and received by the State Board. For example, the results may represent findings of novel or unusual chemicals or contaminants, or there may be special water matrices or sampling locations for which the portal is not yet set up to receive the results electronically. Subsection(c) is intended to address such instances by requiring that the laboratory’s analytical results be submitted directly to the State Board by alternative means, for example, by email or by delivery of a paper copy.

Section 64669.100. Annual Report.

The annual report provides an annual summary of the operations and compliance status of a DPR project. The report is intended to provide a synopsis of the relevant information associated with the treatment plant operations. The information provided will allow the State Board to assess the overall operations and identify any ongoing issues with the operation that could be problematic in the future. It will also allow the public and DPR project water customers to be informed of and evaluate the performance of the project.

Subsection (a) requires that a DiPRRA submit the report to the State Board within six months after the end of the calendar year. The DiPRRA must also provide a copy of the report to all public water systems that receive water from the DPR project. These requirements are necessary to ensure that the report is timely and that the public water systems who receive the DPR project water are informed about the treatment operation.

Subsection(a)(1) requires that the report provide a summary of the project's compliance status for the prior year associated with the monitoring requirements and requirements in the regulations as well as requirements contained in the water supply permit, including a summary of violations and the corrective actions taken as a result of those violations.

Subsection(a)(2) requires that the report summarize any plant shutdowns or diversions that occurred during the prior year and the corrective actions taken as a result of a plant shutdown or diversion.

Subsection(a)(3) requires that the report provide a description of the treatment performance, any problems or difficulties encountered with the operations during the prior year and any proposed revisions to the operations plan.

Subsection(a)(4) requires that the report provide a description of the wastewater source control program performance and any problems or difficulties encountered during the prior year and any proposed program changes.

Subsection (a)(5) requires that the report provide a description of any assessment of chemicals in the treatment system or any investigation of sources of chemicals that was performed during the prior year pursuant to section 64669.40(a) and the results of the assessments and investigations. A summary of the local limits and other methods to control the discharge of chemicals must also be included.

Subsection(a)(6) requires that the report provide a description of any anticipated treatment changes, along with an evaluation of the expected impact of the changes on subsequent unit process(es).

Subsection(a)(7) requires that the report provide an indication of any expected change in quantity and quality of the municipal wastewater.

Subsection(b) requires that the DiPRRA post the Annual Report on the DiPRRA's internet website. Posting on the DiPRRA's internet website is necessary to facilitate access to the report by consumers who are served water by the DiPRRA or by a public water system delivering DPR project water as well as interested members of the public at large.

The information required under subsections (a)(1) through (a)(5) are necessary to obtain an accurate and comprehensive picture of the operation of the DPR project for the previous year including important information on the ability of the project to comply with relevant requirements and to operate in a manner that ensures the delivered water is safe.

Subsections (a)(6) and (a)(7) are necessary to provide information about treatment changes being contemplated by a DiPRRA that would inform the State Board and a public water system receiving the DPR project water about potential changes in the project's operations that may affect the quality of the DPR project water.

Section 64669.105. Cross-Connection Control.

DPR project facilities, pipelines, and equipment process, store, carry, or transport different fluids of various qualities. The complexity of a DPR project and the treatment plant and works creates significant risks of cross-connection, which could result in wastewater or contaminants entering a drinking water distribution system.

Oversight of a cross-connection control program, including cross-connection evaluation of the DPR treatment plant and infrastructure during design, construction, and operation of the facilities, are critical in ensuring that inadequately treated or unapproved sources of water are not distributed to the public as potable water. Existing regulations require public water systems to administer a cross-connection control program. Section 64669.105 clarifies certain requirements for cross-connection control for DPR projects.

Given potential public health risks associated with wastewater exposure or other contaminants through unprotected cross-connections, subsection (a) requires that a cross-connection control survey and hazard assessment be regularly conducted of the DPR project's treatment plant(s) and works. The initial cross-connection control survey and hazard assessment must be completed during the first year of full-scale operations, and subsequent surveys and hazard assessments must be conducted annually thereafter. Subsection (a) is necessary to protect public health from contaminants that may be introduced through cross-connections.

As a public water system, a DiPRRA is subject to existing backflow protection and cross-connection control requirements. Subsection (b) requires the DiPRRA to be responsible for compiling the cross-connection surveys and hazard assessments and making the results of the surveys and assessments available to the State Board upon request. Subsection (b) is necessary to confirm that the surveys are being done. The State Board may include report submittal due dates in the operating permit for the DPR project or may request a copy of the report prior to an inspection. No due date is specified in the regulations to provide flexibility for a DiPRRA to schedule the completion of the surveys among the partner agencies that own or operate a facility that requires a survey (such as facilities that treat, store, convey, or distribute DPR project water). The procedures for carrying out the cross-connection control requirements are included in the joint plan pursuant to section 64669.20.

Section 64669.110. Corrosion Control and Stabilization.

Existing regulations require public water systems to demonstrate optimized corrosion control to minimize lead and copper in the water served to customers, and to monitor the distribution system for total coliform bacteria as an indicator of microbial quality, adequacy of treatment, and integrity of the distribution system from contamination. In order to comply with these and other drinking water regulations related to distribution system water quality, public water systems use a number of strategies to ensure stability of the water in the distribution system, with special attention directed towards for example the planning for seasonal changes in water sources and the introduction of new sources or new quality of water. The 2016 Panel stated: “Although it is common practice to blend waters from different sources and of different qualities in conventional drinking water supplies, it is important to anticipate any changes that might be stimulated by DPR-treated water.” (page 149, Olivieri et al., 2016).

The stability of water in the distribution system is managed through distribution system operations as well as at the water treatment plant. The DiPRRA must conduct the activities under existing regulations to demonstrate optimized corrosion control for the water that is distributed. Concerns related to the introduction of advanced treated water directly to a distribution system of a public water system or through a public water system’s water treatment plant prior to distribution is addressed in this section.

The treatment of municipal wastewater to produce drinking water changes the chemical quality of the water which could increase the corrosivity of the water. Changes in chemical quality of the water may cause operational problems and water quality issues in downstream receiving facilities such as water treatment plants, reservoirs, and distribution system pipelines. A new water source to be introduced into a water distribution system must be evaluated to ensure that changes in source water quality can be managed by distribution system operations so that the water being delivered to customers continue to comply with drinking water standards. This section would require the DiPRRA to assess the potential water quality or operational impacts due to the

change in quality of water as DPR project water is introduced into a public water system's distribution system or water treatment plant. For a DiPRRA that delivers DPR project water to another public water system, this section requires the DiPRRA to take into consideration the water quality impacts to the other public water systems receiving DPR project water as it evaluates how to optimize corrosion control.

Subsection (a) requires the DiPRRA to provide water that is stabilized to the degree acceptable to the public water system(s) receiving water from the DPR project, as described in a corrosion control and stabilization plan prepared pursuant to subsection (b). This will ensure the protection of public health through appropriately treated and conditioned water.

Subsection (b) requires the DiPRRA and any public water systems (together, "entities") receiving the DPR project water to jointly develop and submit a plan for corrosion control and stabilization of the DPR project water to the State Board before operating a DPR project. The joint preparation of the plan ensures that the needs of each entity – the public water system producing the water and the public water system receiving the water come to an agreement on the water quality that would be delivered and the necessary operations to achieve the water quality and compliance with drinking water standards. State Board approval is needed to ensure that the plan contains the information necessary to sufficiently protect public health.

Subsection (b)(1) requires that the plan describe how the entities will maintain chemical and microbial stability in the drinking water distribution system as the drinking water quality changes with anticipated increases in the contribution of flow from a DPR project finished water into the distribution system. This is necessary to ensure that water quality in the distribution system continues to meet existing drinking water regulations when the new DPR project water source is introduced.

Water treatment plants are designed to treat a certain type of water and changes to the feed water quality may make treatment less effective or render the treatment monitoring scheme less effective at verifying the efficacy of treatment. Subsection (b)(2) requires that the plan describe how the entities will ensure that a drinking water treatment plant receiving DPR project water maintains treatment effectiveness as the source water quality changes with anticipated increases in the contribution of DPR project water. This is necessary to ensure that the drinking water treatment plant continues to treat water that meets regulatory requirements when the new DPR project water source is introduced.

Subsection (c) provides an option for a DiPRRA that delivers DPR project water to more than one public water system to develop individual corrosion control and stabilization plans with each public water system, or a single combined plan that includes the minimum required information for all public water systems. All public water systems involved in the corrosion control and stabilization plan would need to agree to develop a combined plan. This is necessary to provide flexibility to the DiPRRA and may reduce

the reporting burden when all public water systems receiving DPR project agree to participate in a joint corrosion control and stabilization plan.

Subsection (d) requires that the DiPRRA include the operations described in an approved corrosion control and stabilization plan in the operations plan. This is necessary so that any operations identified in the corrosion control and stabilization plan is implemented.

Section 64669.120. Independent Advisory Panel.

An independent advisory panel (IAP) is necessary in some circumstances to provide scientific and/or specialized technical expertise, or an independent assessment of risk, water quality, treatment, or operations. The specific use of IAPs is included in existing IPR regulations to do similar work. An independent scientific review of the specific tasks listed in subsections (a)(1) through (a)(8) provides an independent assessment of a key technical task or key element of a DPR project that may not otherwise be provided and is necessary to protect public health.

Subsection (a) would require a DiPRRA to convene an IAP to conduct the specific tasks listed in subsections (a)(1) through (a)(8). The IAP would be approved by the State Board to ensure the panel has the appropriate expertise for the specific project.

Alternatives to chemical control criteria pursuant to section 64669.50 must be reviewed by an IAP. AB 574 mandates that an expert panel must review the proposed DPR criteria and make a finding that the criteria would adequately protect public health. The prospective nature of the alternatives criteria in section 64669.50 anticipates that there may be alternatives to some of the criteria set forth in section 64669.50 after the 2022 Panel that considered the adequacy of public health protection has concluded its work. Subsections (a)(1) and (b) therefore require an IAP similar in composition to the expert panel to review a DiPRRA’s proposal for alternatives to chemical control set forth in section 64669.50.

A water safety plan must be reviewed by an IAP pursuant to section 64669.55. The IAP is tasked with providing the DiPRRA with recommendations on revisions to the water safety plan including measures to control site-specific hazards. Subsections (a)(2) and (b) would require an IAP, similar in composition to the 2022 Panel, to review a DiPRRA’s water safety plan. This is necessary to ensure the same level of expertise is provided for the review of a water safety plan as described in section 64669.55.

An IAP must review the hydrodynamic modeling and tracer study used to demonstrate the effectiveness of blending pursuant to subsection 64669.45(d)(1) if a reservoir is involved and/or mixing pursuant to subsection 64669.45(d)(2). These processes are complex and require that the modeling and its results be confirmed, which may be

beyond a regulatory agency's expertise and wherewithal. Subsections (a)(3) and (c) require an IAP with the necessary expertise as specified.

An IAP must review a recharge option pursuant to section 64669.45(d)(3) and review a proposed alternative virus reduction rate described in subsection 64669.45(f) if proposed by a DPR project. Such proposal would be complex and requires that modeling be confirmed with tracer testing, activities which may be beyond a regulatory agency's expertise and wherewithal. Subsections (a)(4) and (d) require an IAP with the necessary expertise as specified, similar to those specified for IPR groundwater recharge regulations. Proposals related to the virus decay rate in(d)(3) require a microbiologist with knowledge of the factors that affect the fate of virus in groundwater.

Subsection (a)(5) requires a DiPRRA to use an IAP possessing the expertise described in subsection (e) to review the effectiveness of a wastewater source control program, including the use of local limits and outreach efforts to include the expertise as specified. An independent review by an IAP is necessary to provide insight and strategies from the broader wastewater source control community to improve the effectiveness of a local wastewater source control program.

Subsection (a)(6) requires a DiPRRA to use an IAP possessing the expertise described in subsection (f) to review and provide recommendations on the assessment and maintenance of managerial and financial capacity. Managerial and financial capacity must be maintained in order for the DPR project to operate reliably to meet the standards as well as optimize operations. An IAP is necessary to provide an independent opinion on a DiPRRA's proposed managerial and financial capacity demonstration, and any development and maintenance strategies submitted as part of the demonstration.

Subsection (a)(7) requires a DiPRRA to use an IAP possessing the expertise described in subsection (g) to review specific water quality data and results of water quality investigations for the purposes of providing recommendations for monitoring for additional chemicals that may pose risks to consumers or that may be used as indicator compound or compounds, pursuant to section 64669.65. An IAP is necessary to provide an independent opinion of a DiPRRA's monitoring and control of chemicals.

To ensure the State Board has available all the information necessary from the IAP regarding a required IAP review and to make well-informed decisions regarding a DiPRRA's demonstration of compliance with specific requirements described above, subsection (h) requires a DiPRRA to allow State Board representatives to observe all required IAP meetings and discussions. The DiPRRA must provide the results of all IAP reviews to the State Board. This requirement is necessary so that the State Board can assess the IAP recommendations and determine if those recommendations could improve operational reliability and compliance with specific requirements.

Section 64669.125. Public Notification.

All public water systems are responsible for advising their customers regarding the quality of the drinking water that they deliver. It is necessary that to ensure transparency and protect public health, persons served by a DPR project must be notified when water distributed fails to meet a standard or requirement set forth to protect public health. The required public notification, notification content, timing and distribution of public notices are described in this section to ensure that the public receives notification in a timely manner and each consumer has the necessary information about the drinking water and, if necessary, what actions the consumer can take to obtain safe drinking water.

Subsection (a) requires public notification as defined by section 64463.1 for situations where the delivered water may pose an acute health risk to consumers.

Subsection (a)(1) requires public notification when the delivered water fails to meet the pathogen reduction requirements as defined in Section 64669.45 that are necessary to protect public health.

Subsection (a)(2) requires public notification when the delivered water fails to meet an MCL for a chemical that poses an acute health risk as listed.

Subsection (a)(3) requires public notification when the TOC limit as defined in section 64669.50(n) is not met. The TOC limit is intended to address the total organic content of wastewater origin that may pose an acute health risk; when the critical limit is not met, there is uncertainty about the quality of the water being served.

Subsection (b) requires public notification as defined by section 64463.4 for situations where the delivered water may pose a chronic health risk to consumers.

Subsection (b)(1) requires public notification when an MCL or action level for a chemical that poses a chronic health risk is not met in the delivered water.

Subsection (b)(2) requires public notification when a treatment train fails to meet the requirement of section 64669.85(c). This notification requirement reflects a need for the DiPRRA to inform consumers that the water being served is not consistently meeting quality requirements as set forth in section 64669.50(o).

Subsection (b)(3) requires public notification when monitoring requirements set forth in sections 64669.60 or 64669.65 that are designed to track chemicals that pose a potential chronic health risk are not met and the DPR project water is continued to be delivered to customers.

Subsection (c) identifies the specific health effects language that is required by regulation to be included in the public notification, citing specific language for pathogen-related and acute chemical exposure-related notices in (c)(1) and (c)(2), respectively.

Subsection (c)(3) refers to existing regulatory language for the notice for TOC and adds new language to the notice that explains the reason for the TOC notice.

Subsection (c)(4) identifies the sections that contain specific health effects language required in public notice for chemicals identified in subsection (b)(1) that fail to meet MCLs related to potential chronic health risk in the delivered water.

Subsection (c)(5) specifies the language that is required in a public notice when a treatment train fails to meet the treatment technique requirement of section 64669.50(o) for more than two consecutive months. The language is intended to advise consumers of the potential chronic health effects resulting from long-term exposure to chemicals compounds in the delivered water.

No specific health effects language is required for conditions described in subsection (b)(3) as these are monitoring violations for which other required language is specified in the existing public notification regulations.

Section 64669.130. Consumer Confidence Report.

Under existing law, public water systems are required by Health and Safety Code § 116470, and California Code of Regulations, title 22, Article 20, section 64480, *et seq*., to provide on an annual basis a consumer confidence report (CCR). The CCR is required to provide certain types of information to the consumer about the source(s) and quality of their drinking water. The CCR must also include information on the drinking water source assessment and protection and possible contaminating activities, water quality standards, and public health information related to drinking water, among other information. Section 64669.130 describes the information that must be included in a CCR for a DPR project.

Subsection (a) requires the DiPRRA to provide information about the DPR project in its CCR. The information is necessary to provide consumers with a complete picture of the DPR project on an annual basis. This information is critical to ensuring that the public is knowledgeable about the DPR project and is confident that the drinking water being served is safe to drink.

Existing law and regulations require a public water system to identify the drinking water source in the CCR. For the DPR project, the source is municipal wastewater. Subsection (a)(1) requires the inclusion of the identification of municipal wastewater as being the type of water being delivered, as well as information on the wastewater treatment plant and its associated sewershed, which serve as the name and location of the source of water required by existing regulations. This is necessary because existing regulations require the information so that consumers have minimum information about where their drinking water comes from.

Subsection (a)(2) requires the CCR to provide information about activities to control chemicals released into the sewershed and into the wastewater used in the DPR project. This includes a description of commercial and industrial sources, including the types of industries that contribute chemicals to the wastewater, along with a description of source control program. Because households and other non-industrial sources also contribute chemicals to the wastewater, a description of such chemicals and of any outreach programs established pursuant to section 64669.40 is necessary to be included in the CCR as a means to educate consumers about the importance of source control and to make the public aware of personal products they may use that contribute to the chemical makeup of the wastewater.

Subsection (a)(3) requires a general description of the treatment provided by the DPR project. A municipal wastewater source cannot be used without treatment provided by a DPR project in compliance with the regulations, so it is important to provide a simple description of the treatment provided by the DPR project for the public to understand the level of treatment that is required to make the water safe to drink as well as instill public confidence that the water is safe to drink.

Subsection (a)(4) requires a table of detected chemicals in finished water to be included in the CCR. The detected chemicals are those that resulted from sampling and analyses from the previous calendar year. The table is required to include specific information about the detected chemicals so that consumers have minimum information about the quality of the drinking water they are receiving.

Subsection (a)(4)(A) requires the inclusion of the average concentration and range of concentrations of the detected chemical, consistent with existing requirements for the reporting of summary water quality data in the CCR, so that information about chemicals is presented in a consistent manner to avoid confusion for the reader.

Subsection (a)(4)(B) requires the inclusion of chemical-specific information required by existing drinking water regulations, in subsection 64481(d)(2)(C), as well as any notification level established for the detected chemical, so that consumers are able to determine what the chemical concentration numbers mean as compared to established drinking water standards or goals.

Subsection (a)(4)(C) requires that the likely source or sources of the detected chemical be identified. This requirement enables the consumer to know whether the chemical’s presence is likely to be associated with industrial releases, or whether it results from activities associated with non-industrial businesses or households.

Subsection (a)(5) requires that a summary of violations incurred over the previous calendar year be reported in the CCR, to inform customers of any compliance issues, pursuant to Section 64669,45. Other requirements related to the reporting of violations in a CCR are in existing regulations.

Subsection (a)(6) requires that the DiPRRA's CCR include a discussion of the effect of climate change on the ability of the DPR project to provide drinking water, in terms of both quality and quantity.

The issue of climate change and a DPR project's "carbon footprint," which applies to fossil fuel-related energy use and the associated release of greenhouse gases to the atmosphere, was raised by the 2022 Panel in its consideration of whether the proposed regulations for DPR are protective of public health. The 2022 Panel was concerned that water treatment beyond that needed for the protection of public health would increase the carbon footprint of the DPR project, thereby contributing to climate change.

Climate change and the activities associated with businesses' carbon footprints are important issues that pose potential threats to the quantity and quality of California's water supply. Hence, there is a need for a DPR project to pay attention to the challenges of climate change. In this regard, then, the regulations require that the DiPRRA address the ways the DPR project is responding to those challenges.

The discussion required by subsection (a)(6) is to describe actions taken or planned by the DPR project to address climate change and its potential to alter the chemical and pathogen load of wastewater, as well as the quantity of available treated wastewater. An example might be the DPR project's response to a decrease in wastewater that is to be used in a DPR project, if the associated community reduces its overall water consumption by a significant amount, as it seeks to conserve water. The discussion could cover what the volume of reduction might be, and how this might affect the concentration of industrial chemicals and pathogens in wastewater destined for use in the DPR project.

The discussion could describe actions of DPR project to continue to provide safe drinking water in the quantity needed by consumers. Such actions, as examples, could include the DPR project's water systems' ability to respond to interruptions in the quantity of available water and in the quality thereof. Other examples could include the use of increased monitoring in times of drought to address chemical and pathogen changes, or steps to minimize water loss through leaks or evaporation, or how the DPR project is addressing or plans to address extreme climate events such as flooding that might affect the project's ability to treat water adequately.

Finally, subsection (a)(6) requires the DiPRRA to include a description of how the DPR project's agencies are working to reduce their own contributions to the release of greenhouse gases that are associated with drinking water production via DPR. Given the challenge that climate change-related poses to the ability of public water systems to provide adequate drinking water, this is a necessary requirement to include in the CCR.

Subsection (a)(7) requires inclusion of the location of the DiPRRA website on the Internet so that the public can obtain access to the annual report for the DPR project

produced pursuant to section 64669.100. The annual report contains additional information beyond that provided in the CCR and is critical for ensuring that the public's right-to-know is met for the DPR project, its drinking water, and the municipal wastewater that serves as the source of drinking water.

Subsection (b) requires the DiPRRA to deliver information required in subsection (a) to public water systems that distribute DPR project water to consumers. Such information is to be provided to those public water systems by April 1 of each year, or on another agreed to date, pursuant to existing regulations in subsection 64480(c), so that the receiving public water systems have time to include the information in their CCRs. This is necessary in order for consumers to obtain the information in a timely manner.

Subsection (c) requires all public water systems that distribute DPR project water to consumers to include in their CCRs the DPR project-related information identified in subsection (a) provided by the DiPRRA. Providing information from the DiPRRA about the DPR project in the various public water systems' CCRs enables customers to receive consistent DPR project-specific information.

REASONABLE ALTERNATIVES DESCRIPTION

Government Code section 11346.2(b)(4) requires that the State Board consider reasonable alternatives to the regulation and the Board's reasons for rejecting those alternatives.

The State Board has determined that no reasonable alternative considered or otherwise identified and brought to its attention would be more effective in carrying out the purpose for which this action is proposed, would be as effective and less burdensome to the regulated water systems and affected private persons, or would be more cost-effective to the regulated water systems and affected private persons, yet equally effective in implementing statutory requirements or other provisions of law, than the proposed action.

There are no alternatives to adopting the proposed regulation because the adoption of direct potable reuse regulations is mandated by law. The adoption of the regulations is mandated by section 13561.2(a) of the Water Code.

The proposed regulations mandate the use of specific technologies and performance standards, while allowing for the use of alternative technologies. In the absence of regulations, the same technologies and performance standards would also be mandated, and the use of alternative technologies allowed.

EVALUATION REGARDING INCONSISTENCY OR INCOMPATIBILITY WITH EXISTING STATE REGULATIONS

The State Board evaluated this proposal as to whether the proposed regulations are inconsistent or incompatible with existing California state regulations. This evaluation included a review of California's existing regulations, including drinking water regulations adopted under the federal and state Safe Drinking Water Acts, and the State Board's regulations for indirect potable reuse (IPR). It was determined that no other state regulation addressed the same subject matter, and that this proposal was not inconsistent or incompatible with other state regulations. It should be noted that water present in direct potable reuse is considered a type of surface water, which is regulated under the surface water treatment rules (surface water treatment rule, interim enhanced surface water treatment rule, long term 1 and 2 enhanced surface water treatment rule). For those portions comparable with the surface water treatment rules, the proposed DPR regulations are substantially consistent with the existing regulations. It should also be noted that DPR is a type of potable reuse, which also includes indirect forms such as groundwater replenishment and surface water augmentation. For those portions comparable with the IPR regulations, the proposed DPR regulations are substantially consistent with the existing regulations. Therefore, the State Board has determined that this proposal, if adopted, would not be inconsistent or incompatible with existing state regulations.

ECONOMIC IMPACT ASSESSMENT

The adoption of the proposed regulations will serve two primary purposes: 1) to meet the legislative mandate to adopt DPR regulations that are protective of public health and 2) to help streamline the permitting process for public water systems choosing to engage in DPR. The State Board has prepared the following Economic Impact Assessment of the proposed regulations, pursuant to Gov. Code § 11346.3(b)(1)(A)-(D).

Currently, no member of the regulated community – which consists of public water systems (PWSs) and municipal wastewater agencies/water recycling agencies (WRAs) – is engaged in Direct Potable Reuse. In addition, no existing or future member of the regulated community will be required or compelled to engage in DPR as a result of the proposed regulations.

The proposed regulations would not impose or induce requirements beyond those that would be required through the existing drinking water permitting process under the California Safe Drinking Water Act (Health and Safety Code, division 104, part 12, chapter 4, commencing with section 116270). In other words, the requirements proposed in the regulation would occur in the absence of the regulation through permitting requirements for individual DPR projects. Thus, the proposed regulations would not impose any additional requirements (relative to existing ones) on members of the regulated community that may choose to engage in DPR. Accordingly, State Board

staff estimates that no PWS or WRA would incur cost impacts as a result of the proposed regulations.

The proposed regulations, however, would help streamline the permitting process through the adoption of uniform criteria, as mandated by Water Code section 13561.2. State Board staff estimates that the adoption of uniform criteria may preclude the need for four or five preliminary meetings between State Board personnel and members of the regulated community seeking to obtain a permit for their DPR project. This would result in potential benefits to the members of the regulated community, including, (a) cost savings associated with travel and personnel time to and from four or five preliminary meetings; and (b) cost savings associated with a PWS and WRA possibly having more fruitful initial discussions between their personnel involved in a DPR project and State Board personnel.

These potential cost savings would vary and depend on factors, such as: the number of representatives attending a meeting; distance and travel-time to a meeting (which could be could negligible if, for example, a conference call was utilized); the nature of the project (larger and/or more complex DPR projects would likely have higher cost savings); and the number of PWS seeking to engage in DPR – as mentioned before, to date, there are no DPR projects in the process of obtaining a permit for DPR (there are five projects that are doing early investigative work, such as, feasibility studies and pilot studies). Taking these factors into consideration, State Board staff estimates that the potential cost savings would likely be negligible.

State Board staff has made the additional determinations regarding the economic impact of the proposed regulations:

- The creation or elimination of jobs within the State of California: The requirements previously summarized should not have any effect on employment, because the requirements would not create or eliminate significant enough workload to support the creation or elimination of jobs in the regulated community, regulatory agency personnel, or any other industry in California.

- The creation of new businesses or the elimination of existing businesses within the State of California: The adoption of the proposed regulations will streamline the existing permitting process for DPR projects through the adoption of uniform criteria and will not impose any requirements beyond those that are already required. Thus, it will not result in the creation or elimination of businesses.

- The expansion of businesses currently doing business within the State of California: As explained above, the adoption of the proposed regulations will streamline the existing permitting process for DPR projects and would not impose any requirements beyond those that are already required. Therefore, it would not have any effect on the expansion of businesses within the State of California.

- The benefits of the regulation to the health and welfare of California residents, worker safety, and the state's environment: The proposed regulations would streamline the permitting process for DPR projects – which involve the use of municipal wastewater for treatment to produce drinking water – through the adoption of uniform criteria, thus it would further ensure the protection of the public's health and welfare, with no adverse impacts to worker safety or California's environment.

- Statewide adverse economic impact directly affecting business, including ability to compete: The proposed regulatory action would have no adverse economic impact on California business enterprises and individuals, including the ability of California businesses to compete with businesses in other states. The proposed regulations apply only to municipal wastewater agencies/water recycling agencies and public water systems choosing to engage in DPR and include no requirements that would not otherwise be required of the entities through existing statutory authority and mandates.

- Effect on small business: As discussed above, the proposed regulations would not affect businesses, including small businesses. Moreover, Government Code chapter 3.5, article 2, section 11342.610 excludes utilities from the definition of small business.

- Fiscal impact on local or state government: The proposed regulatory action would have no fiscal impact on members of the regulated community, which, as mentioned before, are public entities. Additionally, the proposed regulatory actions would not affect any other local entity or program or any State agency or program. Similar to the potential cost savings described above for PWS, state regulatory agency personnel may benefit from not having to attend four or five preliminary meetings during the permitting process for a DPR project. For the reasons noted above, this potential benefit is negligible. The proposed regulations would not affect any federally funded State agency or program.

STATE WATER POLICY CODE SECTION 106.3 CONSIDERATION

In establishing and adopting the proposed regulations, the State Board considered the statewide policy set forth in section 106.3 of the Water Code, that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes, and determined the proposed regulations will further the stated policy because they increase the possible supply of drinking water in the state and ensure that such water provided is safe to drink.

DUPLICATION OR CONFLICTS WITH FEDERAL REGULATIONS

The proposed regulations do not unnecessarily duplicate or conflict with federal regulations. A review of the Code of Federal Regulations did not indicate the existence of duplicative or conflicting law.

APPENDIX A – DOCUMENTS INCORPORATED BY REFERENCE

The following documents are incorporated by reference in the regulations as it would be too cumbersome, unduly expensive, or impractical to publish these documents into regulation.

1) ASTM Standard D4194-23 (2023), Standard Test Methods for Operating Characteristics of Reverse Osmosis and Nanofiltration Devices, ASTM International, West Conshohocken, PA, 2023.

2) U.S. EPA, Protocol for the Evaluation of Alternative Test Procedures for Organic and Inorganic Analytes in Drinking Water (EPA 815-R-15-007, February 2015).

3) U.S. EPA, Protocol for the Evaluation of Alternate Test Procedures for Analyzing Radioactive Contaminants in Drinking Water (EPA 815-R-15-008, February 2015).

APPENDIX B - DOCUMENTS RELIED UPON

Technical, theoretical, and empirical study, report, or similar document upon which the agency relies in proposing the adoption of the regulations. [Gov Code 11346.2(b)(3)

1. Advisory Group on the Feasibility of Developing Uniform Water Recycling Criteria for Direct Potable Reuse (2016). *Recommendations of the Advisory Group on the feasibility of developing uniform water recycling criteria for direct potable reuse*, National Water Research Institute, Fountain Valley, CA. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/rw_dpr_criteria/app_b_ag_rpt.pdf

2. Anderson, P., Denslow, N., Drewes, J. E., Olivieri, A., Schlenk, D. and Snyder, S. (2010). *Monitoring strategies for chemicals of emerging concern (CECs) in recycled water: Recommendations of a Science Advisory Panel*, Southern California Coastal Water Research Project, Costa Mesa, CA. https://ftp.sccwrp.org/pub/download/DOCUMENTS/CECpanel/CECMonitoringInCARecycledWater_FinalReport.pdf

3. Anderson, P. D., Denslow, N. D., Drewes, J. E., Olivieri, A. W., Schlenk, D., Scott, G. I., and Snyder, S. A. (2012). *Monitoring Strategies for Chemicals of Emerging Concern (CECs) in California's Aquatic Ecosystems: Recommendations of a Science Advisory Panel* (Technical Report 692 April 2012), Southern California Coastal Water Research Project, Costa Mesa, CA. https://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/692_CECEcosystemsPanelReport_Final.pdf

4. Asano, T., Burton, F., Leverenz, H., Tsuchihashi, R., and Tchobanoglous, G., Metcalf & Eddy, Inc. (2007). *Water reuse: Issues, technologies, and applications (1st ed.)*., McGraw-Hill, New York, NY (Table 3-7).

5. ASTM Standard D4194-23 (2023), Standard Test Methods for Operating Characteristics of Reverse Osmosis and Nanofiltration Devices, ASTM International, West Conshohocken. https://www.astm.org/d4194-23.html

6. Bukhari, Z., Dasgupta, S., Marfil-Vega, R., and Sundaram, V. (2022). *Optimization of Ozone-BAC Treatment Processes for Potable Reuse Applications* (Report 4776), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/optimization-ozone-bac-treatment-processes-potable-reuse-applications

7. CDPH, "Norovirus Fact Sheet", March 2018. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/NorovirusFactSheet.pdf

8. City of San Diego (2013). Advanced water purification facility study report: Indirect potable reuse /reservoir augmentation demonstration project, San Diego, 2013, Section 2 Demonstration Facility Description and Observations. https://www.sandiego.gov/water/purewater/pdf/projectreports/section2demonstration.pdf

9. Debroux, J., Plumlee, M. H., and Trussell, S. (2021). *Defining potential chemical peaks and management options* (Report 4991), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/defining-potential-chemical-peaks-and-management-options

10. Drewes, J. E., Anderson, P., Denslow, N., Jacubowski, W., Olivieri, A., Schlenk, D., and Snyder S. (2018). Monitoring strategies for constituents of emerging concern (CECs) in recycled water: Recommendations of a Science Advisory Panel (SCCWRP Technical Report 1032), Southern California Coastal Water Research Project, Costa Mesa, CA. https://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/1032_CECMonitoringInRecycledWater.pdf

11. Drewes, J. E., Anderson, P., Denslow, N., Muir, D. C. G., Olivieri, A., Schlenk, D., and Snyder S. (2023). *Monitoring Strategies for Constituents of Emerging Concern (CECs) in California's Aquatic Ecosystems: Recommendations of a Science Advisory Panel* (Technical Report 1302), Southern California Coastal Water Research Project, Costa Mesa, CA. https://ftp.sccwrp.org/pub/download/DOCUMENTS/TechnicalReports/1302_ConstituentsofEmergingConcern.pdf

12. Eftim, S. E., Hong, T., Soller, J., Boehm, A., Warren, I., Ichida, A. and Nappier, S. P. (2017). Occurrence of norovirus in raw sewage – A systematic literature review and meta-analysis. *Water Research 111*, 366-374. http://dx.doi.org/10.1016/j.watres.2017.01.017

13. Federal Register, Vol. 54, No. 124, 27486 - 27568, June 29, 1989, "National Primary Drinking Water Regulations; Filtration, Disinfection; Turbidity, Giardia lamblia, Viruses, Legionella, and Heterotrophic Bacteria", 40 CFR Parts 141 and 142. https://www.govinfo.gov/content/pkg/FR-1989-06-29/pdf/FR-1989-06-29.pdf

14. Federal Register, Vol. 63, No. 241, 69478 - 69521, December 16, 1998, "National Primary Drinking Water Regulations: Interim Enhanced Surface Water Treatment; Final Rule", 40 CFR Parts 9, 141, and 142. https://www.govinfo.gov/content/pkg/FR-1998-12-16/pdf/FR-1998-12-16.pdf

15. Federal Register, Vol. 71, No. 3, 654 – 4968, January 5, 2006, "National Primary Drinking Water Regulations: Long Term 2 Enhanced Surface Water Treatment Rule; Final Rule", 40 CFR Parts 9, 141, and 142. https://www.govinfo.gov/content/pkg/FR-2006-01-05/pdf/FR-2006-01-05.pdf

16. Gerba, C. P., Betancourt, W. Q. and Kitajima, M. (2017). How much reduction of virus is needed for recycled water: a continuous changing need for assessment? *Water Research, 108*, 25-31. https://doi.org/10.1016/j.watres.2016.11.020

17. Gerba, C. P., Betancourt, W. Q., Kitajima M. and Rock, C. M. (2018). Reducing uncertainty in estimating virus reduction by advanced water treatment processes. *Water Research, 133*, 282-288. https://doi.org/10.1016/j.watres.2018.01.044

18. Kirby, A. E., Teunis, P. F. and Moe, C. L. (2015). Two human challenge studies confirm high infectivity of Norwalk Virus. *The Journal of Infectious Diseases, 211* (1), 166–167. https://doi.org/10.1093/infdis/jiu385

19. Messner, M. J., and Berger, P. (2016). Cryptosporidium infection risk: Results of new dose-response modeling. *Risk Analysis 36*, 1969–1982. https://doi.org/10.1111/risa.12541

20. National Research Council (2012). *Water reuse: Potential for expanding the nation's water supply through reuse of municipal wastewater*, The National Academies Press, Washington, DC. https://nap.nationalacademies.org/catalog/13303/water-reuse-potential-for-expanding-the-nations-water-supply-through

21. Neemann, J., Colston, J., Krasner, S., Law, I. and Whitson, A. (2020). *Enhanced source control recommendations for direct potable reuse in California*, National Water Research Institute, Fountain Valley, CA. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/dpr-esc-2020.pdf.

22. Tetra Tech, Inc. (2011). *Observed and Predicted Oocyst Concentration Distributions as the Starting Point for Quantitative Microbial Risk Analysis of Tertiary Treatment*, prepared for Melbourne Water, Revision 2, 28 June 2011.

23. Olivieri, A. W., Crook, J., Anderson, M. A., Bull, R. J., Drewes, J. E., Haas, C. N., Jakubowski, W., McCarty, P. L., Nelson, K. L., Rose, J. B., Sedlak, D. L. and Wade, T. J. (2016). *Evaluation of the feasibility of developing uniform water recycling criteria for direct potable reuse for the State Water Resources Control Board*, National Water Research Institute, Fountain Valley, CA.

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/rw_dpr_criteria/app_a_ep_rpt.pdf

24. Pecson, B., Ashbolt, N., Haas, C., Slifko, T., Kaufmann, A., Gerrity, D., Seto, E., and Olivieri, A. (2021a). *Tools to evaluate quantitative microbial risk and plant performance/reliability* (Report 4951), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/resource/tools-evaluate-quantitative-microbial-risk-and-plant-performancereliability

25. Pecson, B., Darby, E., Di Giovanni, G., Leddy, M., Nelson, K., Rock, C., Slifco, T., Jakubowski, W., and Olivieri, A. (2021b). *Pathogen monitoring in untreated wastewater* (Report 4989), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/pathogen-monitoring-untreated-wastewater

26. Regli, S., Rose, J. B., Haas, C. N. and Gerba, C. P. (1991). Modeling the risk from Giardia and viruses in drinking water. *JAWWA, 83* (11), 76-84. https://doi.org/10.1002/j.1551-8833.1991.tb07252.x

27. Robertson, L. J., Hermansen, L. and Gjerde, B. K. (2006). Occurrence of Cryptosporidium oocysts and Giardia cysts in sewage in Norway. *Appl Environ Microbiol., 72* (8), 5297–5303. https://doi.org/10.1128/AEM.00464-06

28. Sari M. A., Oppenheimer, J., Robinson, K., Drewes, J. E., Pisarenko, A. N., Sundaram, V. and Jacangelo, J. G. (2020). Persistent contaminants of emerging concern in ozone-biofiltration systems: Analysis from multiple studies. AWWA Water Science, 2020;e1193. https://doi.org/10.1002/aws2.1193

29. Schimmoller, L., Lozier, J., Mitch, W. and Snyder, S. (2020). *Characterizing and controlling organics in direct potable reuse projects* (Report Reuse-15-05/4771), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/characterizing-and-controlling-organics-direct-potable-reuse-projects

30. Soller, J. A., Eftim, S. E. and Nappier, S. P. (2018). Direct potable reuse microbial risk assessment methodology: Sensitivity analysis and application to State log credit allocations. *Water Research, 128,* 286-292. https://doi.org/10.1016/j.watres.2017.10.034

31. State Water Resources Control Board (2016). *Investigation on the feasibility of developing uniform water recycling criteria for direct potable reuse*. https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/rw_dpr_criteria/final_report.pdf

32. State Water Resources Control Board (2019). *A framework for regulating direct potable reuse in California.*

https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/direct_potable_reuse/dprframewkseced.pdf

33. State Water Resources Control Board (2022). Memorandum of findings dated June 23, 2022: Expert panel preliminary findings, recommendations, and comments on draft DPR criteria (dated August 17, 2021). https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2022/nwri-ep-finalmemoprelimfind.pdf

34. Teunis, P. F., Le Guyader, F. S., Liu, P., Ollivier, J., and Moe, C. L. (2020). Noroviruses are highly infectious but there is strong variation in host susceptibility and virus pathogenicity. *Epidemics, 32* (2020), 100401. https://doi.org/10.1016/j.epidem.2020.100401

35. Teunis, P. F., Moe, C. L., Liu, P., Miller, S. E., Lindesmith, L., Baric, R. S., Le Pendu, J. and Calderon, R. L. (2008). Norwalk virus: How infectious is it? *Journal of Medical Virology, 80* (8), 1468-1476. https://doi.org/10.1002/jmv.21237

36. Trussell, S. R., Tackaert, R. A., Pisarenko, A. N., Idica, E. Y., Trussell, R. R. (March 2017). Realizing reverse osmosis potential for potable reuse: Demonstrating enhanced pathogen removal (DWPR Report No. 196), Bureau of Reclamation, U.S. Department of the Interior, Denver, CO. https://www.usbr.gov/research/dwpr/reportpdfs/report196.pdf

37. Trussell, S. R., Pecson, B. M., Pisarenko, A. N., Idica, E. Y., Howe, E. W. and Trussell, R. R. (2018). *Demonstrating redundancy and monitoring to achieve reliable potable reuse* (Report Reuse-14-12/4765), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/san-diego-dpr

38. U.S. EPA, (December 1996, draft). Guide to method flexibility and approval of EPA water methods, Office of Science and Technology, Office of Water, Washington, DC. https://www.epa.gov/sites/default/files/2015-09/documents/guide-method-flexibility-approval-epa-water-methods_draft-1996.pdf

39. U.S. EPA, (February 2015). *Protocol for the evaluation of alternate test procedures for organic and inorganic analytes in drinking water* (EPA 815-R-15-007), Office of Ground Water and Drinking Water, Standards and Risk Management Division, Cincinnati, OH. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100MERX.txt

40. U.S. EPA, (February 2015). *Protocol for the evaluation of alternate test procedures for analyzing radioactive contaminants in drinking water* (EPA 815-R-15-008), Office of Ground Water and Drinking Water, Standards and Risk

Management Division, Cincinnati, OH. https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100MESN.txt

41. U.S. EPA, (November 2005). *Membrane filtration guidance manual* (EPA 815-R-06-009), Office of Water, Washington, DC. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=901V0500.TXT

42. U.S. EPA, (November 2006). *Ultraviolet disinfection guidance manual for the final long term 2 enhanced surface water treatment rule* (EPA 815-R-06-007), Office of Water, Washington, DC. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=600006T3.TXT

43. U.S. EPA, (April 2020). *Innovative approaches for validation of ultraviolet disinfection reactors for drinking water systems* (EPA 600-R-20-094), Office of Research and Development, Washington, DC. https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=541258&Lab=CESER

44. Walker, T., Khan, S., Robillot, C., Snyder, S., Valerdi, R., Dwivedi, S. and Vickers, J. (2016). Critical control point assessment to quantify robustness and reliability of multiple treatment barriers of a DPR scheme (Reuse-13-03), Water Environment & Reuse Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/critical-control-point-assessment-quantify-robustness-and-reliability-multiple-0

45. Wigginton, K., Lahr, R., Bardha, A., and Rockey, N. (2021). *Feasibility of collecting pathogens in wastewater during outbreaks* (Report 4990), The Water Research Foundation, Alexandria, VA. https://www.waterrf.org/research/projects/feasibility-collecting-pathogens-wastewater-during-outbreaks

46. Yates, M. V., Gerba, C. P. and Kelley, L. M. (1985). Virus persistence in groundwater. *Applied and Environmental Microbiology, 49* (4), 778-781. https://doi.org/10.1128/aem.49.4.778-781.1985

APPENDIX C - COMMONLY USED ACRONYMS AND TERMS

2016 Panel	2016 Expert Panel on the feasibility of developing uniform water recycling criteria for direct potable reuse that would be protective of public health (SB 918)
2016 Advisory Group	2016 Advisory Group on the feasibility of developing uniform water recycling criteria for direct potable reuse (SB 918)
2022 Panel	2022 Expert Panel to review the proposed uniform water recycling criteria for direct potable reuse and make a finding whether the proposed criteria are protective of public health (AB 574)
Source Control Panel	Expert Panel on Source Control Recommendations for DPR
CalEPA	California Environmental Protection Agency
CEC Panel	Science Advisory Panel on Monitoring Strategies for Constituents of Emerging Concern (CECs) in Recycled Water
AOP	Advanced Oxidation Process
ASTM	American Society for Testing Materials
AWWA	American Water Works Association
CFR	Code of Federal Regulations
CCR	California Code of Regulations
CEC	Constituents or Chemicals of Emerging Concern
DBPs	Disinfection By-Products
DiPRRA	Direct Potable Reuse Responsible Agency
DPR	Direct Potable Reuse
ELAP	Environmental Laboratory Accreditation Program
HPLs	Human health protective levels
IPR	Indirect Potable Reuse
MCL	Maximum Contaminant Level
NL	Notification Level
NWRI	National Water Research Institute
Ozone/BAC	Ozone Biological Activated Carbon
PWS	Public Water System
RO	Reverse Osmosis
Regional Board	Regional Water Quality Control Board
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
SWA	Surface Water Augmentation
State Board	State Water Resources Control Board
SWTP	Surface Water Treatment Plant
U.S. EPA	United States Environmental Protection Agency
UV-AOP	Ultraviolet Advanced Oxidation Process
WRA	Water Recycling Agency

APPENDIX D - HEALTH AND SAFETY CODE SECTION 57004 SCIENTIFIC PEER REVIEW