

# Division of Drinking Water Response to “Expert Panel Preliminary Findings, Recommendations, and Comments on Draft DPR Criteria (dated August 17, 2021)” in the Memorandum of Findings submitted by NWRI dated March 14, 2022

## Contents

Introduction .....	2
Summary and Next Steps .....	2
Organization of the Document .....	3
General DDW Comments .....	4
DDW Clarification Questions for the Panel .....	7
Panel Comments in “Background” section .....	7
Panel comments on “Preliminary Task 1 Panel Finding” section .....	8
Comments on Recommendations 1 - 12 .....	9
<i>Recommendation 1. Include raw water augmentation in criteria and/or Statement of Reasons</i> .....	9
<i>Recommendation 2. Use scientific justification to support assumptions to develop log reduction values (LRVs) for pathogen criteria</i> .....	14
<i>Recommendation 3. Evaluate Pathogen LRV Criteria via Probabilistic Analysis</i> .....	23
<i>Recommendation 4. Expand engineering and operational topics</i> .....	26
<i>Recommendation 5. Redefine wastewater source control criteria</i> .....	28
<i>Recommendation 6. Address online wastewater collection system monitoring</i> .....	30
<i>Recommendation 7. Coordinate disease surveillance monitoring programs or community raw wastewater surveillance monitoring programs</i> .....	33
<i>Recommendation 8. Modify chemical criteria</i> .....	35
<i>Recommendation 9. Require Third-party review of the Technical, Managerial, and Financial Plan</i> .....	40
<i>Recommendation 10. Require third-party engineering review</i> .....	41
<i>Recommendation 11. Clarify communication and notification requirements</i> .....	43
<i>Recommendation 12. Other recommendations</i> .....	48
Miscellaneous DDW Comments to NWRI (Administrative Issues) .....	57

## Introduction

AB 574 (Water Code, Division 7, Chapter 7.3) requires the State Water Board to adopt uniform water recycling criteria for direct potable reuse (DPR) through raw water augmentation on or before December 31, 2023. Among other things, AB 574 requires that the State Water Board:

- Develop DPR criteria using information from the DPR research recommended in the State Water Board's Report to the Legislature, after soliciting stakeholder input.
- Establish and administer an expert review panel to review the proposed criteria and make a finding as to whether, in its expert opinion, the proposed criteria would adequately protect public health.

The State Water Board shall not adopt uniform water recycling criteria for raw water augmentation pursuant to this subdivision unless and until the expert review panel adopts a finding that the proposed criteria would adequately protect public health.

The State Water Board's Division of Drinking Water (DDW) is tasked with developing uniform water recycling criteria for DPR that is protective of public health.

## Summary and Next Steps

DDW has reviewed the "Expert Panel Preliminary Findings, Recommendations, and Comments on Draft DPR Criteria (dated August 17, 2021)" in the Memorandum of Findings from NWRI dated March 14, 2022 (hereinafter "draft memo").

The Panel's preliminary finding language was not clear as to whether the Panel was indeed finding the proposed criteria (the version reviewed by the Panel) to be protective of public health. Additionally, statements made in the memo and the extent of the Panel comments and recommendations indicate that it is not fully satisfied and is not ready to conclude its discussion of the proposed criteria with DDW. DDW finds that these discussions should not be deferred, and that feedback to the Panel on the items addressed in the Panel draft memo is appropriate before moving forward with the regulation development process and preparation of the regulation package.

Please note that DDW anticipates that revisions may be made to the proposed criteria reviewed by the Panel during the regulation development and adoption process after the Panel makes its preliminary finding. Any revisions to the proposed criteria that may

impact public health protection (and Panel finding) will be summarized and submitted to the Panel for review, and DDW will provide a final draft of the proposed criteria before regulation adoption for Panel review, in the same manner as was done for the 2016 expert panel that carried out the same charge for the proposed surface water augmentation criteria under SB 918 (Water Code, Division 7, Chapter 7.3).

Although the Panel comments and recommendations appear to be outside the Panel charge of determining whether the criteria are protective of public health, they provided information useful to DDW but also raised additional questions.

This document summarizes DDW's responses after fully considering the Panel's draft memo, for Panel review. The document contains revised and new regulatory language made in response to the Panel's comments and recommendations. DDW believes the proposed regulatory language revisions/additions maintain protection of public health. A 5<sup>th</sup> meeting of the expert panel will be scheduled to discuss the Panel's draft memo and the proposed changes to the draft.

Please note that DDW intends to post the March 14, 2022 draft memo, this DDW response document, and the revised draft memo on the State Water Board website for the public record as interim products of the expert panel review.

### Organization of the Document

The document is organized as follows:

- DDW provides general comments on three topics that address comments and recommendations in various parts of the Panel's draft memo;
- DDW provides clarifying questions on the Panel's evaluation of log removal values;
- DDW addresses Panel comments and findings; and
- DDW addresses the individual Panel recommendations 1 - 12. The DDW responses to Panel recommendations 1- 12 are addressed in the same order as presented in the Panel's draft memo. We have included text excerpted from the Panel's draft memo for reference, and these are presented in italics. Following each excerpt is the DDW response to the excerpted text, under the heading "DDW Response". In a few cases DDW has drafted revisions to the proposed draft criteria as part of the response. The revised proposed criteria are shown inside a text box for clarity. Additions are denoted as underlined text highlighted in yellow, deletions are denoted in strike-out highlighted in yellow).

## General DDW Comments

### Climate Change

DDW's authority is limited to public health protection through drinking water quality requirements.

The Expert Panel's concern about energy consumption, carbon footprint and global climate change is acknowledged. This concern appears to be the basis for the Panel's views that the assumptions used in the proposed regulations are too conservative (that is, too health protective) and that they will result in treatment that may be potentially over-engineered. That is, it appears the Panel believes that the proposed regulations will result in treatment requirements that are excessive (with no additional public health benefit), and that will result in an expanded carbon footprint of the treatment system that will contribute to global climate change.

Reducing the level of treatment of wastewater in the production of drinking water to address global climate change is an ill-advised trade-off. The LRVs that the Panel finds excessive are those needed to control for viral pathogen loads found in wastewater. The State Water Board has determined that the virus LRVs necessary to provide adequate public health protection are not excessive and that simple adjustment of chlorination processes can easily satisfy those requirements. The draft criteria will have either no impact or at worst a de minimis impact on carbon footprint / climate change.

DDW addresses in detail the LRV assumptions and public health protection in our response to Panel recommendations 2 and 3 below.

The issues of energy consumption and carbon footprint are appropriately addressed on a project-by-project basis in accordance with the California Environmental Quality Act (CEQA). DPR project sponsors are primarily public agencies, who will have the primary responsibility for carrying out or approving a project and act as the lead agency for CEQA evaluations. A DPR project's environmental impact related to greenhouse gas emissions and energy consumption will be evaluated on a project specific basis. The lead agency is also required to perform an evaluation of alternatives, which include a summary comparison of significant effects of the project and project alternatives.

Dealing with climate change is an important societal issue, and one that will not be solved by reducing water treatment requirements for public health protection in DPR

projects. The State Water Board, along with other state agencies, is already working to address climate change in its various programs (see <https://www.waterboards.ca.gov/climate/>). To use the Expert Panel's terminology, the State Water Board believes that a "holistic" approach should be applied to addressing climate change, and that this can be done on a wider range of projects and activities by government agencies, far beyond DPR projects and the proposed regulations.

Nonetheless, we have considered the Expert Panel's concern about global climate change and have added a requirement in new section 64669.135 (Additional Reporting), for an annual climate change-related report to the public to discuss the impacts climate change might impose on the quantity and quality of drinking water that the DiPRRA and its partner agency(ies) are able to provide.

- DDW is revising the August 2021 proposed draft criteria as follows (additions to regulation text are denoted as underlined text highlighted in yellow):

§ 64669.135 Additional Reporting

(a) To demonstrate that the design, operation and maintenance of a DPR project will provide a reliable and adequate supply of pure, wholesome, potable and healthy water for human consumption, a DiPRRA and its partner agency(ies) shall prepare and make publicly available an annual report for consumers that addresses the DPR project's response to climate change.

(b) The report shall identify threats from climate change to the DPR project's ability to provide drinking water, and include steps taken or planned relative to the DPR project's resilience, adaptation, and mitigation, as they relate to climate change. For purposes of this report,

(1) Resilience is the capacity to prepare for, recover from, and grow from disruptions in water quantity or quality;

(2) Adaptation refers to actions taken or planned to build resilience and to adjust to the impacts of climate change; and

(3) Mitigation refers to actions taken or planned to reduce the contribution to the concentration of greenhouse gases in the atmosphere.

### Use of the initial statement of reasons (ISOR)

The Expert Panel, on several topics, recommends including guidance or additional information about the regulations in the initial statement of reasons (ISOR). The State Water Board is limited in what it can include in the initial statement of reasons.

The Office of Administrative Law, which ensures that the process of adopting regulations complies with the Administrative Procedure Act, describes the ISOR as follows:

*“The initial statement of reasons is a document that explains the reasons why the agency is making the proposed regulatory changes. This includes an explanation of the problem being addressed, the purpose of and necessity for, and benefits of the proposed changes. The initial statement of reasons also identifies the factual material upon which the agency relies in proposing the regulations. The initial statement of reasons includes a number of the required determinations, findings and analyses....”* ([https://oal.ca.gov/rulemaking\\_participation](https://oal.ca.gov/rulemaking_participation))

Thus, there are limitations about what can be included in the ISOR. The State Water Board cannot use the initial statement of reasons as a way to provide extensive “clarification” of the proposed regulations, other than explaining the basis for the proposed changes. It cannot be used to provide alternate approaches to comply with the proposed regulations. Further, it cannot be used to introduce topics unrelated to the proposed regulatory changes.

### Use of the Engineering Report

Existing statute mandates that public water systems (PWS) submit technical reports to the State Water Board as required (Health and Safety Code § 116530). Existing water recycling criteria requires that the engineering report contain a description of the design of the treatment system (California Code of Regulations, Title 22, § 60323). Further, it requires the report to clearly indicate the means for compliance with the regulations and any other features specified by DDW. These technical reports contain detailed project-specific information used by regulators to determine whether a proposed project conforms to regulations. While engineering reports describe a project in the level of detail required by the State Water Board, engineering reports are not permits or regulations. DDW is reviewing the Panel recommendations for clarity to ensure that they

align with the purpose/role of the engineering report. For example, in recommendation 4 the Panel has indicated that the proposed criteria require engineering reports address optimization “to result in producing a stable and high-quality nitrified water (0 to 2 mg/L NH<sub>4</sub> residual), prior to introduction into the AWTF”, which suggests an inappropriate use of an engineering report to establish a uniform criterion (that the optimization must result in producing a stable and high quality nitrified water, defined as having 0 to 2 mg/L NH<sub>4</sub> residual), rather than stating the uniform criterion directly within the regulation itself. Therefore, DDW cannot incorporate this criterion as the Panel envisions, but provides clarity in the DDW response to Panel recommendation 4 on how engineering reports are used to describe project-specific optimization.

Because the criterion above suggested by the Panel through recommendation 4 was not included on page 3 of the Panel’s draft memo regarding protection of public health, DDW interprets this as a criterion not necessary for the Panel to make a finding whether the proposed criteria would be protective of public health. The Panel should clarify its thinking regarding this criterion, and its expectation for DDW to incorporate it as a requirement in order for the Panel to make a determination whether the criteria would be protective of public health.

### DDW Clarification Questions for the Panel

1. DDW would like to clarify the Panel’s recommendation 3 (page 9) regarding the minimum redundancy needed to address undetected failures. Does the Panel believe that DDW should use the same failure assumption that the Panel used (a 24-hour 6 log reduction failure once per year), which would result in a minimum 5-log redundancy to address undetected failures?
2. On the LRV criteria (Figure 6, page 12), does the Panel believe that for the criteria to be protective of public health there must be a requirement that mandates operation to be discontinued if the LRV falls between 20/14/15 and 16/10/11 for a specific length of time?

### Panel Comments in “Background” section

*The Panel’s review is based on both an individual and holistic review of the draft criteria dated August 17, 2021. While the focus of the review is to determine if the proposed regulations provide adequate*

*public health protection relative to the risk posed by the water being produced, the Panel has significant concerns about unintended consequences, particularly related to excessive energy consumption and carbon footprint. A responsive, sustainable, and cost-effective approach to developing these regulations includes recognition by the State Water Board of potentially over-engineered treatment barriers (treatment steps) and requires an intentional effort by DDW to develop a reasonable number and combination of such barriers.*

*The Panel recommends that the State Water Board address the concerns about energy use, carbon footprint, and over-engineering through a holistic risk analysis. The Panel looks forward to reviewing the analysis as part of its review of the final draft DPR criteria.*

### DDW Response

On the Panel's opinions regarding energy use, carbon footprint, and over-engineered treatment barriers, please review the "General DDW Comments" section, under "Climate Change", for our analysis. We do not anticipate the proposed DPR criteria would be revised on the basis of the Panel's concerns for energy consumption and carbon footprint.

On the Panel's comment "...developing these regulations...requires an intentional effort by DDW to develop a reasonable number and combination of such barriers", please clarify whether the Panel believes that the number of barriers specified in the criteria for pathogens or chemicals is not protective of public health. The proposed criteria specify four separate treatment processes, which is one more treatment process than the "smallest" surface water augmentation scenario that qualifies as indirect potable reuse (IPR) (see section 60320.308(a)(2) of the existing surface water augmentation regulations). DDW believes this to be reasonable given the close proximity between wastewater and drinking water for DPR. The combination of barriers would be a project-by-project proposal; DDW does not make decisions for a project as to what combination of barriers a project can propose for pathogen control.

### Panel comments on "Preliminary Task 1 Panel Finding" section

***The Panel's Preliminary Task 1 Finding is that the Early Draft of Anticipated Criteria for Direct Potable Reuse dated August 17, 2021, adequately protects public health.*** *The Panel's preliminary finding is based on the assumption that the SWB/DDW will fully consider and address the Panel's recommendations and comments in developing a revised draft of the DPR criteria, including the holistic risk evaluation of all data and assumptions, along with an environmental review per the California Environmental Quality Act (CEQA).*

*The Panel review of the draft DPR criteria indicate that:*

- *The draft chemical control criteria for the ozone and biological activated carbon (BAC) processes do not adequately address public health concerns related to low molecular weight compounds.*
- *The draft pathogen control criteria are based on numerous conservative assumptions that result in an over-engineered treatment facility. Thus, the draft pathogen control criteria require additional treatment that does not contribute additional public health protection. The Panel expects that the revised draft will be shared with the Panel for final review and the Panel's Final Finding will be considered, prior to adoption by SWB.*

## DDW Response

The Preliminary Panel Finding that the August 17 draft criteria adequately protects public health is inconsistent with the later Panel statement that criteria "...do not adequately address public health concerns." The Panel must ensure statements are clear, consistent, and do not cause confusion or imply ambivalence in its findings. Further, the Panel provides a caveat that its preliminary finding is contingent on its assumption that further work must be done to "... [address] the holistic risk evaluation of all data and assumptions, along with an environmental review per the California Environmental Quality Act (CEQA)." We do not understand what the Panel means by "holistic risk evaluation of all data and assumptions" and would appreciate that the Panel elaborates or clarifies what it means by this phrase, so that we may consider it. Lastly, as previously discussed with the Panel, DDW plans to address CEQA in the same manner as DDW addressed CEQA for the Surface Water Augmentation regulations. A CEQA determination will be made during the Administrative Procedure Act process.

On the Panel's opinion that "additional treatment that does not contribute additional public health protection", please review DDW's responses to Panel recommendations 2 and 3.

## Comments on Recommendations 1 - 12

### ***Recommendation 1. Include raw water augmentation in criteria and/or Statement of Reasons***

*The Panel understands that DDW's intent is to keep the criteria broad enough to cover all forms of DPR, including raw water augmentation (RWA) and treated water augmentation (TWA). The Panel notes that there are clear features that distinguish RWA and TWA that warrant both separate and consistent specifications for treatment and monitoring within the DPR criteria. For example, inserting clear acknowledgement on how the draft criteria would apply to potential RWA projects relying on a*

*small reservoir with an existing surface water treatment plant (SWTP), projects with a large transmission line between an advanced water treatment facility (AWTF) and SWTP, or projects with a satellite AWTF that precedes an SWTP is necessary.*

### DDW Response to Recommendation 1:

The DPR criteria are intended to include all source control, treatment, monitoring, and other requirements necessary to supplement existing drinking water regulations and law to make safe drinking water from municipal wastewater.

Statutory definitions for the two forms of DPR are:

(1) “Raw water augmentation” (RWA), which means the planned placement of recycled water into a system of pipelines or aqueducts that deliver raw water to a drinking water treatment plant that provides water to a public water system ...

(2) “Treated drinking water augmentation” (TWA), which means the planned placement of recycled water into the water distribution system of a public water system ...

The statutory RWA definition does not assure a minimum amount of blending, transport time, or treatment to control the risk posed by pathogens or chemical contaminants, nor does it restrict the drinking water treatment plant to a surface water treatment plant. Nevertheless, some RWA projects may have features that provide significant risk management benefit.

In order to develop criteria that provide appropriate regulatory pathways for RWA and TWA, DDW considered three options:

1. The criteria could narrowly define RWA to mean projects with significant blending with a conventional water source prior to a drinking water treatment plant that is a surface water treatment plant (SWTP). This would narrow the scope of the statutory definition. The regulation development would have to identify a minimum blend that justifies the regulatory consideration granted. There is also the fact that not all SWTPs are equal in effectiveness and reliability. All projects not meeting the newly defined RWA would be classified as TWA.

2. A RWA section could be included in the criteria identifying the degree of beneficial blending, treatment, and transport time that a RWA might have and specify how that would satisfy or partially satisfy requirements. Most of these same features, however, could be part of a TWA project and that would have to be acknowledged in the regulation.

3. Develop a set of criteria that covers both RWA and TWA and the features of a RWA project (a project supplementing the raw water supply to an existing SWTP) to help meet the criteria. The regulation development followed this option.

All *quantifiable* risk management benefits of a RWA could be allowed toward compliance with specific requirements. This can be done for the following example projects suggested by the Panel:

- A project with a small reservoir (not meeting the minimums for SWA) preceding an existing SWTP - treated wastewater transport time through the reservoir can be used to help meet the flow path requirement in section 64669.85 (k) for treatment upstream of the reservoir. Attenuation of peak chemical contaminants due to mixing in the reservoir can meet or help meet the requirement in section 64669.50 (k). Other quantifiable risk management benefits of a RWA can also be considered.

The surface water treatment plant (SWTP) of a RWA project can be a significant benefit. For an existing SWTP, one obvious benefit of a RWA project is the virus credit from the chlorine disinfection treatment that is already required as part of existing surface water treatment regulations, which require at least 4-log inactivation of viruses. Free chlorine disinfection is extremely effective at inactivation of viruses. In addition to inactivation of viruses, some existing SWTPs are also achieving 0.5-log inactivation (or more) of giardia through chlorination. All chlorine treatment at SWTPs have been validated using protocols approved for surface water treatment by DDW, thus meeting the requirement in section 64669.45 (a)(3).

Existing SWTPs using alternative filtration technologies (e.g., microfiltration [membranes](#)) have also been validated using protocols approved for surface water treatment, as described in section 64669.45 (a)(3). Alternative filtration technologies that have been reviewed by DDW and conditionally approved for pathogen treatment credits pursuant to section 64653 of the surface water treatment rule are summarized in tables that are publicly available through the [DDW publications website](#). Most of these filtration technologies are credited for cryptosporidium, giardia, and virus reduction ranging from 1-log to 4-log when operated within the approved conditions.

- A project with a large transmission line between an advanced water treatment facility (AWTF) and SWTP - blending with other sources can be used to avoid or reduce the need to provide ozone/BAC treatment per section 64669.50 (b). Blending with other sources can be used to adjust the TOC limit in accordance with section 64669.50 (l). Treated wastewater transport time in the transmission line can be used to help meet the flow path requirement in section 64669.85 (k) for treatment upstream of the transmission line. Attenuation of peak chemical contaminants due to mixing in the transmission line can meet or help meet the requirement in section 64669.50 (k). There is also a possibility of virus log reduction through virus die-off or inactivation through a long transmission system (with significant retention time). Organism log removal credits for the SWTP processes can be validated using protocols approved for surface water treatment, or in the case of granular media filtration, pilot plant studies, as described in section 64669.45 (a)(3).
- A project with a satellite AWTF that precedes an SWTP – as with the two example projects above, the quantifiable benefits related to blending, mixing, and transport time can also be considered for this example.

The engineering community experienced in the design of potable reuse projects in California is sophisticated regarding the features of a project that can be exploited to satisfy the various proposed criterion as noted above, and knowledgeable on how the features can be demonstrated to quantify the benefits. It is expected that the engineering community would transfer expertise, methods, and tools used in IPR assessments as appropriate to assess, quantify, and demonstrate the benefits of various nuanced RWA (as well as TWA) scenarios. For SWTPs, US EPA has published many guidance documents on a variety of topics related to the Surface Water Treatment Rule.

The proposed criteria provide the necessary flexibility for projects, and DDW believes that including prescriptive “how to” requirements for specific RWA scenarios in the proposed criteria are not appropriate. DDW expects that projects would have the necessary TMF capacity to be able to read and comprehend the regulations and have the engineering expertise to propose to DDW how they intend to comply with the requirements.

*Further clarification is needed because TWA would require additional treatment processes including water stabilization, addition of chemicals to maintain a chlorine residual and, in some cases, temperature control.*

This comment seems to assume these are needed just for TWA because those projects would not include significant blending with another source or final treatment at a SWTP. The existing definition of RWA does not assure meaningful blending and a TWA project could have significant blending. When the statutory definitions were adopted, for example, a proposal was floated to build a water recycling AWTP and a SWTP to meet the definition of RWA. No blending was mentioned.

DDW believes all the requirements mentioned, with the exception of temperature control, are addressed in the draft criteria or other drinking water regulations. Water stabilization is addressed in section 64669.110 and can be dealt with under existing drinking water regulations as has been done for seawater desalination. Maintaining a disinfectant residual is required for all surface water supplies. Temperature control is a public acceptance matter that is not addressed by secondary standards. It is not a public health issue. It is up to the public water systems to satisfy their customers.

*Also, further clarification in the criteria and/or the Statement of Reasons on how DDW will determine what DPR project facilities will be covered by a Safe Drinking Water Act (SDWA) permit versus a National Pollutant Discharge Elimination System (NPDES) permit is absolutely necessary.*

All the requirements for DPR are contained in the drinking water regulations, and the DiPRRA (a PWS) is responsible for making sure that the DPR project water is distributed as drinking water only when all regulations and PWS permit requirements are met. *That said, the facilities needed to meet the requirements need not be owned or operated by the DiPRRA.* The DiPRRA must monitor the performance of all required facilities and operations with their SCADA system (perhaps by links to partner agency SCADA systems), including any CCP failure responses.

This means all facilities used to meet the DPR requirements are covered by the DiPRRA PWS (SDWA) permit. These facilities may be owned and operated by a POTW that is responsible for compliance with a NPDES permit, including the collection system and primary or secondary treatment or other wastewater treatment that both satisfies

discharge requirements and may have DPR log reduction credits or meet other DPR requirements.

DDW plans to review the proposed criteria to determine those statements in the draft that may be causing confusion. We recommend that the Panel provide information to DDW regarding the specific criteria that are causing confusion for the Panel. Please note that DDW does not have the authority to determine whether and where NPDES requirements apply; the Regional Boards would appropriately be responsible for making an independent determination based on CWA governing statutes and NPDES requirements regarding NPDES permits. DDW coordinates with the Regional Boards on IPR projects and will to continue to coordinate with the Regional Boards on matters relating to DPR.

***Recommendation 2. Use scientific justification to support assumptions to develop log reduction values (LRVs) for pathogen criteria***

*The Panel's analysis of the draft pathogen criteria is contained in Appendix 5 and Appendix 6. The following recommendations and comments are based on the results of the Panel's pathogen analysis. The Panel understands that the current draft criteria include a number of assumptions that were used to develop the overall pathogen LRVs. These assumptions are based on variables, which include:*

- a. *Selected a daily risk goal of  $2.7 \times 10^{-7}$  infections per person per day (PPPD) versus the Safe Drinking Water Act annual risk goal of  $10^{-4}$  infections per person per year (PPPY).*
- b. *Selected a single virus, norovirus (NoV), to represent human virus.*
- c. *Selected concentration of single maximum point from literature versus use of distribution.*
- d. *Assumed a fixed ratio between gene copies (GC) and infectious units (IU) of 1:1.*
- e. *Selected conservative dose-response functions (several for selected pathogens are available).*
- f. *Selected volume of drinking water consumed as single daily value versus a distribution.*
- g. *Selected representative LRVs based on maximum point estimate versus statistical characterization from LRV distribution.*

*When the Panel reviewed the variables above, it appeared that DDW chose the most conservative assumptions to protect public health. However, layering the most conservative assumptions upon each other results in unrealistic and impracticable processes that offer no additional significant positive effects on public health.*

*The Panel recommends using the Water Research Foundation (WRF) DPR-2 report (B. Pecson, E. Darby, et al. 2021) dataset rather than the literature-based static maximum point estimate approach used in 2c, above, to develop LRVs...*

*Using these conservative variables to attain the daily risk goal of  $2.7 \times 10^{-7}$  PPPD and operating at the 16 LRV based on a NoV point estimate concentration results in a risk goal of  $10^{-14}$  PPPD. This value is 7 logs more conservative than the DPR daily risk goal. Specifically, this result occurs when using a GC:IU ratio of 1:1, a conservative hypergeometric dose response- function, and a literature-based maximum value of  $10^9$  GC/L to represent the untreated wastewater concentration instead of using the DPR-2 (B. Pecson, E. Darby, et al. 2021) distribution dataset...*

*Modifying the concentration of NoV from a distribution based on DPR-2 (B. Pecson, E. Darby, et al. 2021) data to a point estimate makes the risk distribution even more conservative, adding approximately another 3 LRVs. Adding an additional 4-log reduction to compensate for a treatment failure assumption, on top of the 16-log reduction raises concerns about the compounding effects of numerous conservative assumptions.*

*The Panel notes that the science supporting GC:IU ratios in partially treated or fully treated recycled water is not settled. Also, the Panel notes that:*

- a. *More data are needed on this subject.*
- b. *It is appropriate and reasonable to consider GC:IU as a risk assessment reference given that the doses have almost all, with the exception of NoV, been determined by cell culture.*
- c. *A GC:IU range of 1 as lower bound and 10,000 as an upper bound, based in part on the DPR-2 dataset (B. Pecson, E. Darby, et al. 2021) and the National Research Council Report on water reuse (National Research Council 2012), is appropriate to illustrate the impact of compounding conservative assumptions on the risk assessment results.*

## DDW Response to Recommendation 2:

*The draft pathogen control criteria are based on numerous conservative assumptions that result in an over-engineered treatment facility. Thus, the draft pathogen control criteria require additional treatment that does not contribute additional public health protection.... [Page 3]*

*...[I]t appeared that DDW chose the most conservative assumptions to protect public health. However, layering the most conservative assumptions upon each other results in unrealistic and impracticable processes that offer no additional significant positive effects on public health. [Page 5]*

DDW agrees that the assumptions used are conservative and the approach to calculating LRV is health protective. By making the series of health protective assumptions, we are reducing the chance that we've underestimated the risk. The end result is that the treatment necessary to address the risk is not unreasonable.

## Approach for calculating the LRV

DDW's approach in the draft criteria to calculating the LRV is consistent with the approach used to develop LRVs for the indirect potable reuse regulations. The benefit of the draft criteria approach is to reduce the impact of an outbreak and reduce uncertainty about the adequacy of the risk assessment. Regarding the list of assumptions listed in the Panel comment (a) through (g), the rationale for the assumptions used are as follows:

- a. Selected a daily risk goal of  $2.7 \times 10^{-7}$  infections per person per day (PPPD) versus the Safe Drinking Water Act annual risk goal of  $10^{-4}$  infections per person per year.

A bad day or two can drive the annual risk, perhaps due to a spike in pathogen density or a glitch in treatment (Soller et al., 2017). If we regulate to meet an annual risk, what is the consequence of having one of more events that cause the risk to reach the annual risk goal in less than a year? Is the DPR project allowed to continue operation? DDW decided that, for DPR, a project must produce consistently safe water and we published in our Framework the decision to hold the daily risk to just one 365<sup>th</sup> of the acceptable  $10^{-4}$  annual risk of infection ( $2.7 \times 10^{-7}$  daily risk).

## **Reference**

Soller, J.A., Eftim, S.E., Warren, I., Nappier, S.P. (2017). Evaluation of microbial risks associated with direct potable reuse. *Microbial Risk Analysis*, 5, 3–14.  
<https://doi.org/10.1016/J.MRAN.2016.08.003>

- b. Selected a single virus, norovirus (NoV), to represent human virus.

To avoid underestimating virus risk norovirus was used to determine the required log reduction for enteric virus. norovirus 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  $2.7 \times 10^{-7}$  daily risk of infection (Teunis et al., 2020; CDPH, 2018; Eftim et al., 2017; Kirby et al., 2015). This approach 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).

## Reference

Teunis, P.F., Le Guyader, F.S., Liu, P., Ollivier, J., & 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>

CDPH, “Norovirus Fact Sheet”, March 2018.

<https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/NorovirusFactSheet.pdf>

Eftim, S.E., Hong, T., Soller, J., Boehm, A., Warren, I., Ichida, A. & 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>

Kirby, A.E., Teunis, P.F. & 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>

Regli, S., Rose, J.B., Haas, C.N. & 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>

Gerba, C.P., Betancourt, W.Q. & 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>

Gerba, C.P., Betancourt, W.Q., Kitajima M. & 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>

Soller, J.A., Eftim, S.E. & 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>

c. Selected concentration of single maximum point from literature versus use of distribution.

The Expert Panel's approach for dealing with microbial risks is to utilize probabilistic modeling in each of the various steps used to evaluate the health risks to drinking water consumers from pathogens. Such modeling results in distributions of data that move toward a centralized value (e.g., median), considering the data distribution of the various parameters of interest. Thus, the concentrations microorganisms in wastewater, their numbers in treated drinking water, the quantity of drinking water, and the resulting risk of disease are all evaluated in terms of the best fit of the available data, with statistical analyses then identifying upper and lower bounds within which the actual values might exist. However, it is reasonable to make health-protective assumptions that limit the likelihood of disease. This is why the State Water Board used maximum observed concentrations of pathogens in wastewater, versus the predictably lower values determined by use of statistical analyses of wastewater measurements.

Consistent with IPR, DDW is using the high values for pathogen density in raw wastewater to determine the LRTs, rather than a probabilistic approach (Eftim et al., 2017, for norovirus, Metcalf and Eddy, 2007, for giardia, and Robertson et al., 2006 and Tetra Tech, 2011, for cryptosporidium). This is done in part because future sampling may encounter higher densities and recoveries may improve. For DPR this is consistent with the effort to limit daily risk.

## **Reference**

Eftim, S.E., Hong, T., Soller, J., Boehm, A., Warren, I., Ichida, A. & 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>

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

Robertson, L.J., Hermansen, L. & 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>

“Observed and Predicted Oocyst Concentration Distributions as the Starting Point for Quantitative Microbial Risk Analysis of Tertiary Treatment”, prepared by Tetra Tech, Inc. for Melbourne Water, 28 June 2011.

d. Assumed a fixed ratio between gene copies (GC) and infectious units (IU) of 1:1

Norovirus GC data are used to determine the raw wastewater virus density for the reasons described in the response to b. It is understood that there is considerable uncertainty regarding the relationship between GC and IU although recent studies provide some direction. Gerba et al. (2017) concluded that the ratio of infective virus to virions (as detected by qPCR) should be considered to be less than 1:10 unless proven otherwise. Teunis et al. (2020) concluded that their analysis confirms the high infectivity of norovirus, with an estimated mean infection risk of 0.28 when exposed to 1 GC (qPCR unit) of GI norovirus, and 0.076 for 1 GC of GII virus in susceptible subjects, corresponding to infectivity ratios of 1:3.4 and 1:13, respectively. Teunis et al. (2020) also found variability in the susceptibility of infection among experimental subjects, reflecting genetic differences. The authors stated, “...it should be expected that there is variation in the probability of infection, due to factors associated with pathogen properties on one hand, and due to host factors on the other hand,”

Given variability in both viruses and humans and the potentially high infection risk from exposure to one gene copy, to avoid the possibility of underestimating the risk, it is appropriate to conservatively assume a fixed ratio between GC and IU of 1:1.

### Reference

Gerba, C.P., Betancourt, W.Q. & 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>

Teunis, P.F., Le Guyader, F.S., Liu, P., Ollivier, J., & 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>

*e. Selected conservative dose-response functions (several for selected pathogens are available).*

The Panel is correct that we have selected conservative dose-response functions upon which to base the log reduction values for pathogen criteria. However, the Panel has not provided any scientific justification as to why the conservative dose-response should not be used other than, in the Panel's opinion, such an approach contributes to unrealistic and impracticable processes that offer no additional significant positive effects on public health. The Panel uses as an example norovirus to argue its point.

However, with regard to norovirus, recent research (Teunis et al., 2020) has confirmed that norovirus is highly infective at low doses. In addition, it is clear from this work that host susceptibility plays an important role in who gets infected and becomes ill.

Protecting vulnerable subjects requires a conservative approach be taken. Therefore, given norovirus high infectivity and potentially significant population vulnerability, the use of the Hypergeometric dose-response function is appropriate.

It must be kept in mind that the public that needs protecting is not a population that consists of average people. While protecting the average consumer is important, it is even more important to protect the more vulnerable members of the population that are more susceptible to illness from ingested pathogenic organisms.

The vulnerable groups represent significant portions of the total population. They include pregnant women, infants and children, the elderly and the malnourished. They also include people with immune systems that have been compromised, for example, as the result of poor health or disease, or as the result of medical treatment, such as radiation or chemical therapy.

## **Reference**

Teunis, P.F., Le Guyader, F.S., Liu, P., Ollivier, J., & 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>

*f. Selected volume of drinking water consumed as single daily value versus a distribution.*

The State Water Board used drinking water consumption rate of 2 L per day for the typical water consumer, commonly used in risk and exposure assessments for drinking water regulations. This is consistent with the consumption values used in IPR regulations. Drinking water consumption among the population is not likely to vary more than several fold from this assumed value. For example, 2 L/day (about eight 8-oz glasses) ingested by the standard 70-kg person is 28.6 mL/kg. If someone ingested the unlikely volume of 4 L/day (about 16 8-oz glasses), would be 57.2 mL/kg. By comparison, a 10-kg child ingesting 1 L/day would take in about 100 mL/kg, about 3.5 times the adult rate. We do not believe the use of a single value contributes greatly to a difference in LRVs.

*g. Selected representative LRVs based on maximum point estimate versus statistical characterization from LRV distribution.*

See response to c.

LRVs and pathogen treatment processes

Free chlorine disinfection is extremely effective for inactivation of viruses. In fact, most surface water treatment plants indicate in their monthly reports a level of inactivation far in exceedance of 6-log virus. By requiring 20 LRV for viruses compared to 18 does not necessitate "unrealistic and impracticable" processes. Inactivation of viruses is very easy via free chlorine. There are two ways to achieve this in the CT product (chlorine residual times the contact time). One is a slight increase in chlorine residual and the other is a slight increase in the contact time (e.g., by improving hydraulics through a chlorine contact basin). The typical design includes a length of pipeline as the last process. Therefore, it would be a rare occurrence to add another treatment process to achieve the virus LRV.

By accepting up to 6-log virus credit via chlorination, the draft criteria will have little impact on a project's design and operation.

## Use of DPR-2 dataset

Regarding the Panel's recommendation to use the DPR-2 dataset and disregard the datasets the State Water Board selected (Eftim et al., 2017, for norovirus, Metcalf and Eddy, 2007, for giardia, and Robertson et al., 2006, and Tetra Tech, 2011, for cryptosporidium), DDW offers the following related to the Covid-19 pandemic:

The sole use of the DPR-2 pathogen data in determining DPR risks and required LRVs is problematic due to the potential effect the Covid-19 pandemic had on pathogen levels in wastewater. The Covid-19 pandemic occurred during much of the DPR-2 monitoring period. As indicated in the DPR-2 report, the COVID-19 stay-at-home order began in March 2020 and restrictions lasted through the end of this study (January 2021). The restrictions meant that there was the potential for significantly less public interaction and a commensurate reduction in communicable disease transmission. The pathogen disease occurrence data provided by the California Department of Public Health (CDPH) and the Centers for Disease Control (CDC) indicate this reduction in disease occurrence likely happened. Specifically, the incidence of cryptosporidiosis, giardiasis and norovirus outbreaks/illnesses were significantly reduced during 2020. For example, the 2019 CDPH reported cases of cryptosporidiosis in California were 747, while in 2020 the number of reported cases was 383. A similar reduction was also evident in Los Angeles, San Diego, Orange and San Francisco Counties where DPR-2 monitoring took place. A reduction in reported cases of giardiasis was also seen with statewide cases in 2019 at 2630 and in 2020 at 1262. And a similar reduction was also seen in all the four aforementioned counties.

<https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Monthly-Summary-Reports-of-Selected-General-Communicable-Diseases-in-CA.aspx>

Norovirus disease/illnesses reporting by the CDC also demonstrated the same trend. CDC reported that in 2019 the number of outbreaks in California were 51 with 741 reported illnesses. However, in 2020 CDC reported that there were just two outbreaks with 10 reported illnesses. <https://wwwn.cdc.gov/norsdashboard/>

The DPR-2 report indicated that no clear seasonal trends were observed in the concentrations of cryptosporidium and giardia. Yet, as observed in the DPR-3 report, based on CDPH case reporting for cryptosporidiosis from 2001 to 2018, the highest average case rates in Los Angeles, Orange and San Diego counties occur in late summer. The case rate for San Francisco does not show a clear seasonal difference. Thus, we would expect the levels of cryptosporidia in wastewater would increase in late

summer in Los Angeles, Orange County, and San Diego. However, this was not the case based on the DPR-2 results.

Taken as a whole, the epidemiologic data appear to indicate that there was less disease than would normally be expected circulating throughout the state and, more important, in those areas in which the pathogen monitoring took place. As a result, one would expect a smaller number of individuals shedding these pathogens and a commensurate lower concentration in wastewater than would be expected in a normal year. Thus, we have to conclude that there is a strong possibility that the DPR-2 data do not reflect pathogen levels that would normally be expected in wastewater. Relying solely on the DPR-2 data and disregarding previous pathogen studies could underestimate the risk from cryptosporidia, giardia and norovirus resulting in lower LRV requirements than necessary to adequately protect public health.

## Reference

Eftim, S.E., Hong, T., Soller, J., Boehm, A., Warren, I., Ichida, A. & 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>

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

Robertson, L.J., Hermansen, L. & 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>

“Observed and Predicted Oocyst Concentration Distributions as the Starting Point for Quantitative Microbial Risk Analysis of Tertiary Treatment”, prepared by Tetra Tech, Inc. for Melbourne Water, 28 June 2011.

### ***Recommendation 3. Evaluate Pathogen LRV Criteria via Probabilistic Analysis***

*The current DDW proposed LRV criteria are more conservative than needed to be protective of public health and the additional LRVs do not improve public health protection. Additional analysis is recommended to address potential over-engineering of treatment barriers and to conduct an intentional effort by SWB/DDW to require a reasonable number and combination of such barriers.*

*The Panel recommends a probabilistic analysis as previously recommended in the feasibility report (Olivieri, et al. 2016) using the DPR-2 (B. Pecson, E. Darby, et al. 2021) report dataset rather than the literature based static maximum point estimate approach to develop the LRVs...*

*Proposed compliance requirements for LRVs are shown below, but other alternatives described in Appendix 6 also meet the daily and annual risk goals. The Panel recommends that DDW evaluate other alternatives because variability in plant performance is inevitable...*

*The Panel notes that similar results can be demonstrated for human protozoa. The graphic on Figure 6 compares the draft criteria to the Panel's proposed criteria. The Panel also suggests an alternative approach to address compliance with the LRVs that greatly simplifies the response time-based approach currently in the draft criteria...*

*Finally, the Panel recommends clarifying the criteria on how alternative LRVs and compliance alternatives are addressed within the criteria so that there is no need to expand the draft criteria alternatives clause, as previously recommended by the Panel.*

*For example, to address LRV redundancy for an RWA project, options include clarifying the language in the criteria, expanding the alternatives clause, and/or including detailed clarification in the Statement of Reasons.*

### DDW Response to Recommendation 3:

A higher baseline LRV provides extra levels of public health protection against uncertainties around the assumptions, such as the wastewater pathogen densities and dose response models, in the derivation of the LRVs discussed under DDW Response 2, above.

DDW has reviewed Figure 6 and the Panel's proposed method of regulating the distribution of time that various LRV levels are met. It is unclear to us how the Panel proposal in Figure 6 can be implemented in regulation. The Panel should clarify what it means by "how alternative LRVs...are addressed within the criteria". The statewide uniform criteria that AB 574 mandates be adopted do not contain alternatives to the required LRVs. Regarding LRV redundancy that may be provided in some RWA projects, please see the DDW response to Panel recommendation 1.

DDW believes that the LRV requirements in the draft criteria provide enough flexibility for projects while being protective of public health but appreciates the Panel pointing out that the criteria are not clear regarding how often a treatment train can remain below 20/14/15.

- As a result, DDW is revising the August 2021 proposed draft criteria Pathogen Control section to add a new paragraph (2) as follows (additions to proposed

regulation text are denoted as underlined text highlighted in yellow, deletions of text are shown in strikeout):

#### § 64669.45 Pathogen Control

(b) The treatment shall be operated continuously to achieve the 20 log reduction for enteric virus, 14 log reduction for Giardia cysts, and 15 log reduction for Cryptosporidium oocysts while conforming to the Operations Plan prepared pursuant to section 64669.80.

(1) To determine compliance with the microorganism log reductions pursuant to subsection (a), treatment LRVs shall be tracked continuously with a SCADA system utilizing on-line monitoring for each process that was approved to receive credit for pathogen reduction based on the validation study report submitted pursuant to paragraph (a)(3).

(2) If the treatment train LRV falls below 20 log for enteric virus, 14 log for Giardia cysts, or 15 log for Cryptosporidium oocysts but not below 16 log for enteric virus, 10 log for Giardia cysts, or 11 log for Cryptosporidium oocysts for more than 10% of the time in a month, the DiPRRA shall investigate the cause(s) for the LRV deficiencies and report on the investigation within 90 days to the State Board with a plan to remedy the cause(s). The DiPRRA shall:

(A) Summarize the investigation in the monthly compliance report submitted pursuant to section 64669.95; and

(B) Provide public notification in the annual consumer confidence report describing the deficiencies and the corrective measures taken.

(3) If the treatment train LRV falls below 20 log for enteric virus, 14 log for Giardia cysts, or 15 log for Cryptosporidium oocysts but not below 16 log for enteric virus, 10 log for Giardia cysts, or 11 log for Cryptosporidium oocysts, the DiPRRA DPR project shall restore the 20 log for enteric virus, 14 log for Giardia cysts, and 15 log for Cryptosporidium oocysts within 24 hours or discontinue delivery of the finished water.

Rationale: The combination of (b)(2) and (b)(3) allows a project the flexibility to operate between the two LRVs, recognizing that there may be some potentially unforeseen chronic problems that the operator can address in a timely manner without being required to divert flow, and clarifies that diversion is necessary only if the 20/14/15 LRV is not restored within 24 hours. New paragraph (2) would allow operation below 20/14/15 to address the Panel's observation that there is variability in plant performance and uses the threshold suggested by the Panel for operating below the design conditions. Action is taken (initiate investigation and submit report) if the total amount of time operating below 20/14/15 exceeds 10% of the time in a month. DDW plans to consider what benefits of a RWA could be incorporated in this subsection.

#### **Recommendation 4. Expand engineering and operational topics**

*The Panel recommends expanding the engineering report section to require consideration and response to the following topics within the project engineering report. The operational topics cover a wide array of subjects within the draft criteria. Key recommendations are presented below.*

**Optimization of the secondary treatment process.** *Overall, the regulations are very prescriptive, but do not address how to optimize secondary treatment or alternatives to conventional secondary treatment for an advanced water treatment facility. Optimizing treatment is more valuable than requiring extra monitoring and over-engineering an AWTF. Municipal agencies have been optimizing to meet NPDES requirements and are now often optimizing for the AWTF. The wastewater agency and the direct potable reuse responsible agency (DiPRRA) will need to embrace the idea of spending more than what was necessary to meet NPDES requirements. This situation is true for both enhanced source control and optimized secondary treatment...*

*The specific Panel recommendations to include in the engineering report criteria section include:*

- *The requirement to define a chemical peak as part of monitoring and plant operation plans, including defining corrective actions. Include the DPR-4 (Debroux, Plumlee and Trussell 2021) report as a guidance document in the Statement of Reasons.*
- *A requirement to address optimizing the secondary treatment process. Criteria need to result in producing a stable and high-quality nitrified water (0 to 2 mg/L NH<sub>4</sub> residual), prior to introduction into the AWTF. The biological treatment process should have a sufficient mean cell residence time to nitrify in cold weather.*
- *A reference to technical, managerial, and financial capacity (TMF) documents that DDW will use to review and approve TMF plans. It could also be included in the Statement of Reasons.*

*Include a requirement to address other plant operation and performance issues such as:*

- *Changing wastewater characteristics (both initial design and long-term).*
- *Climate change.*
- *Influent flow and load equalization.*

- *WWTP optimization to reduce energy and chemical use at the AWTF.*
- *Equalization and treatment of return flows (e.g., separation/diversion of flows).*
- *Temperature effects on treatment and distribution system chemistry.*
- *A requirement to develop a project-specific ozone/TOC dosage as part of the engineering report clause.*
- *A requirement to assess the project's cybersecurity plans or to develop a plan.*

#### DDW Response to Recommendation 4:

DDW thanks the Panel for these recommendations and agrees that these are excellent ideas.

Existing Water Recycling Criteria states the following:

#### Article 7. Engineering Report and Operational Requirements.

##### “§ 60323. Engineering report.

(a) No person shall produce or supply recycled water for reuse from a water reclamation plant without a Department-approved engineering report.

(b) The report shall be prepared by a qualified engineer licensed in California and experienced in the field of wastewater treatment, and shall contain a description of the design of the proposed reclamation system. The report shall clearly indicate the means for compliance with these regulations and any other features specified by the regulatory agency.

(c) The report shall contain a contingency plan which will assure that no untreated or inadequately treated wastewater will be delivered to the use area.”

Existing criteria requires the engineering report to contain a description of the design of the treatment system. Further, it requires the report to clearly indicate the means for compliance with the regulations and any other features specified by DDW. DDW has reviewed and commented on hundreds of these engineering reports. Each is different, as is each plant/project. General guidance has been provided to the regulated community as to what is expected. DDW staff spend considerable effort on the review of these engineering reports. They meet with potential project proponents, starting typically in the conceptual phase of design, and continue to provide advice through the review of draft engineering reports submitted by project proponents. The process typically

involves several meetings to discuss pertinent concerns that are specific to each project.

Rather than an exhaustive list of topics to cover in the engineering report, each project is analyzed for its features. Regarding optimization of secondary processes, DDW intends to encourage this with a realization that some projects may be limited in their ability to address each of the topics that the Panel has recommended above. In fact, some of the topics may lead to “unintended consequences” to carbon footprint/climate change. Projects may argue that some options may be considered not feasible due to cost/space limitations. Therefore, DDW believes that each engineering report should propose how to optimize each process to address the project as a whole.

DDW agrees that optimization of nitrogen is important, and the ozone/BAC process may not be effective without addressing this issue. The requirement to demonstrate the ozone/BAC process with four indicator chemicals will encourage each project to design with knowledge of the influent water quality.

#### ***Recommendation 5. Redefine wastewater source control criteria***

*The Panel recommends redefining wastewater source control as enhanced source control and provide additional clarification criteria regarding expectations and reporting.*

*The term enhanced source control is used in the draft criteria but is not explicitly defined. The Panel understands that this term may be deleted. The Panel recommends that the wastewater source control criteria be redefined as “enhanced wastewater source control.” In addition, the authority to request the enhanced program on behalf of the SWB needs to be clarified.*

*Authority within the new DiPRRA to define and implement the new criteria (e.g., expansion/enhancement of the Clean Water Act pretreatment programs) needs to be explicit, and the expected enforcement program expectations, including penalties, needs to be defined within the criteria. The authority for the DiPRRA to collect data including criteria for managing (formatting and storage) and submission to the SWB needs to be defined.*

#### **DDW Response to Recommendation 5:**

The criteria were written to include the findings of a particular expert panel assembled because of their specific knowledge and extensive experience (both regulatory and operationally) with source control. The language in the draft criteria attempts to incorporate the findings and recommendations of this expert review panel. The report is titled, *Enhanced Source Control Recommendations for Direct Potable Reuse in California*, dated March 31, 2020.

The panel members were (Chair) Jeff Neemann, Black & Veatch, James Colston, Irvine Ranch Water District (formerly Orange County Sanitation District), Stuart Krasner, Independent Consultant (formerly Metropolitan Water District), Ian Law, IBL Solutions and University of Queensland, (with extensive international experience in Africa and Australia), Amelia Whitson, US EPA Region 9 (pretreatment expert).

This expert panel evaluated the existing federal National Pretreatment Program (NPP) requirements to determine whether California needs to make changes to its program to support DPR, and made the following comment regarding authority, “LEGAL AUTHORITY 40 CFR 403.8(F)(1). No enhancement needed.” (Table 2, Summary of NPP Requirements and Recommended Enhancements for DPR, page 15)

In Table 1, Key Elements of an Enhanced Source Control Program, the report states, “Federal National Pretreatment Program (NPP) - The NPP is a solid foundation for enhanced source control for a DPR program. Use Waste Discharge Requirements (WDR) and NPDES permits to require pretreatment programs for all potable reuse systems with significant industrial users, regardless of size.”

The Panel concerns regarding authority are unclear, and DDW would like to clarify the requirements contained in section 64669.40, and the DiPRRA responsibilities. The criteria specify a DiPRRA’s responsibilities in ensuring that municipal wastewater used to supply a DPR project is from a wastewater management agency that meet the criteria for wastewater source control, including the requirement that the wastewater management agency “has the legal authority to implement an industrial pretreatment and pollutant source control program, ...” (section 64669.40 (a)(2)). The criteria do not extend the responsibility of the wastewater management agency to implement an industrial pretreatment and pollutant source control program, nor does it grant the DiPRRA the authority to implement a wastewater management agency’s industrial pretreatment and pollutant source control program. The DiPRRA and the wastewater management agency may choose to have a legal/contractual arrangement for implementation of an industrial and pollutant source control program, but such arrangement can take place regardless of any statutory authority delegation or assignment.

DDW envisions that agreement(s) would be made between the DiPRRA and the wastewater management agency(ies) that would have direct authority over implementing the applicable requirements in this section. If a DiPRRA does not have cooperation with a wastewater management agency to implement the requirements in

the DPR regulations, then the safety of the DPR project cannot be ensured, and therefore the DPR project cannot be implemented.

***Recommendation 6. Address online wastewater collection system monitoring***

*While the concept is interesting and the Panel applauds the forward thinking on the topic, the technology to develop and implement such programs effectively is not currently feasible and/or practicable. The Panel recommends online wastewater collection monitoring as a permit modification when the technology is feasible and practicable. The Panel recommends including language to encourage pilot programs in the DPR criteria.*

*The Panel recommends that DDW include criteria that encourage DiPRRAs to continue to investigate future development and application of this concept through pilot programs. The Panel notes that DDW and/or the SWB can update regulatory permits to include online collection system monitoring as such programs become feasible and practicable.*

**DDW Response to Recommendation 6:**

The State Water Board contracted with NWRI to convene an independent expert advisory panel (panel) to examine existing research and case studies on enhanced source control programs designed for potable reuse projects. The result of NWRI's work is this panel consensus report (report), which is meant to inform the State Water Board during the process of writing regulations for DPR.

The report is titled, Enhanced Source Control Recommendations for Direct Potable Reuse in California, dated March 31, 2020

The panel members are:

- Chair: Jeff Neemann, Black & Veatch
- James Colston, Irvine Ranch Water District
- Stuart Krasner, Independent Consultant
- Ian Law, IBL Solutions and University of Queensland
- Amelia Whitson, US EPA Region 9

Invited Experts

The panel also invited additional experts to presenting case studies of existing source control programs, describing new research and pilot studies on state-of-the-art monitoring systems, and providing peer review of this report.

- Ari Goldfarb, Kando
- Linda Schadler, Los Angeles County Sanitation Districts

- Eva Steinle-Darling, Carollo Engineers
- Shane Trussell, Trussell Technologies
- James Crook, Environmental Engineering Consultant
- Adam Olivieri, EOA, Inc.

The 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 made recommendations on sewer collection system monitoring options for DPR, including a framework for sewer collection system monitoring program (strategy for selecting monitoring locations, example monitoring plans, sampling protocols, sample collection methods, a cost estimate for example programs, and identifying wastewater agency partnerships to pilot such programs.

These experts stated,

“Monitoring an enhanced source control program is critical to verify that the program is working and to help plan future efforts. Monitoring for industrial user permit compliance can include routine and non-routine sampling to verify that a discharger is meeting the permit requirements. However, one of the most significant risks in source control programs for DPR is caused by occasional noncompliant and illegal discharges.”

“Noncompliant discharges can be detected by enhancing monitoring at the industrial discharge point, while illegal discharges can be detected by installing monitoring systems at nodal points in the wastewater collection system and in the headworks at the WWTP. These two types of monitoring help to establish risk management procedures to safeguard the WWTP product water quality.”

“Enhanced monitoring also provides data for continuous program improvement. Dischargers and the nature of discharges can vary over time, and there will be known and unknown events that could cause chemical peaks. Enhanced monitoring continuously refines the program to decrease the mass loading and number of chemical peaks in the wastewater collection system.”

The report sites case studies,

“Nodal monitoring can occur in the wastewater collection system at nodal points in the system and in the headworks at the WWTP. Headworks monitoring is more standard for constituents such as pH, conductivity, flow, and ORP because the analyzers are located

at the WWTP where staff can check and maintain them. Data from headworks monitors can also be compared to daily grab or composite samples that are part of regulatory or process monitoring for the WWTP utility. Monitoring at the headworks does not, however, give the utility much time to react to problems. Monitoring at nodal points is gaining traction as companies develop new sensors that are adapted to the challenges of the wastewater collection system; two key challenges are the corrosive environment and remote nature of monitoring locations.”

“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.”

“Technology developed in Israel monitors conductivity, ORP, temperature, pH, and H<sub>2</sub>S, and was tested over nine months (July 2018 through March 2019) by Unity Water, a Utility in Queensland, Australia. The technology was tested for:

- Sulfide monitoring for optimized network odor management.
- Peak pollution sampling to facilitate compliance with commercial waste admission limits.
- Pollution monitoring to better inform WWTPs of incoming volumes and constituents.
- Inflow and infiltration monitoring to identify seawater intrusion.”

“Results were very encouraging. Similar technology is being tested in Ventura, California, as part of The Water Research Foundation Project 17-30 on Real-Time Collection System Monitoring for Enhanced Source Control.”

“One advantage of real-time monitoring is that the resulting data can be used to refine the wastewater collection system sampling program and manage costs.”

“Singapore Public Utilities Board (PUB) is committed to protecting the operation of its WWTPs and NEWater Plants and has successfully installed 40 VOC analyzers at nodal points in its wastewater collection system to track and deter illegal discharges. It has recently added 42 microbial electrochemical sensors (MES)—a form of microbial fuel cell—which provide real-time monitoring for heavy metals and cyanide and, when used with sensors for pH, temperature, chemical oxygen demand, ORP, nitrate, and sulfate, contribute significantly to the value of real-time monitoring. These MES units are installed at selected dischargers along with pH meters. Autosamplers are installed when a noncompliant discharge is detected.”

“Parameters that are monitored with real-time monitoring equipment at the WWTP headworks are similar to those listed for on-premises discharger monitoring with the possible addition of total organic carbon and ammonia.”

The Enhanced Source Control Expert Panel has found that online wastewater collection system monitoring is feasible and should be implemented with current technologies. As a result, the State Water Board has determined that it is appropriate to include the requirement in section 64669.40 (d)(1) in the criteria. A DiPRRA, through a Joint Plan, would implement a sewershed surveillance program that includes on-line monitoring instrumentation that measure surrogate(s) that may indicate a chemical peak resulting from illicit discharge. 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.

***Recommendation 7. Coordinate disease surveillance monitoring programs or community raw wastewater surveillance monitoring programs***

*The Panel recommends close communication with local and state public health agencies and recommends not requiring implementation of raw wastewater surveillance monitoring. The Panel assumes that the draft criteria to monitor disease surveillance programs is aimed at having the DiPRRA develop a program of close communication and coordination with local and state public health agencies as well as hospitals within the DiPRRA service area. The Panel agrees with a communication and coordination type of program. If that is the case, further clarification of the criteria is needed to define the goals and reporting for the DiPRRA to design a program for DDW review.*

*The concept of community raw wastewater surveillance monitoring to locate disease outbreaks within the served community may be practical as an early indicator of outbreaks but is not a practicable and/or feasible approach for assessing the adequacy of water treatment. Therefore, the Panel believes that raw wastewater surveillance monitoring should not be a requirement within the DPR criteria.*

*Further, the DPR-3 research report titled “Feasibility of Collecting Pathogens in Wastewater During Outbreaks,” (Wiggington, et al. 2021) investigated the feasibility of linking the concentration of pathogens in wastewater with infections in a community through building a model for three human pathogens. Given infection prevalence in a community and shedding rates, the model predicts wastewater concentrations. However, it is clear that available community prevalence and fecal shedding data are the weak links in the model and significant community data are required to improve the predictions and, thus, reduce uncertainty. DDW staff should continue to stay informed on raw waster surveillance advances and, if appropriate, can modify surveillance monitoring program language in the future.*

### DDW Response to Recommendation 7:

The Panel's assumption is correct. The intent of subsection 64669.40 (d)(3) is to establish a communication and coordination program with public health agencies. A requirement for the DiPRRA to perform wastewater surveillance is not intended by the draft regulation. We believe the word "monitoring" was misconstrued, so we have replaced it with the word "tracking." We appreciate identifying the need for clarification.

- DDW is revising the August 2021 proposed draft criteria as follows (additions to proposed regulation text are denoted as underlined text highlighted in yellow, deletions of text are shown in strikeout):

#### § 64669.40 Wastewater Source Control

(d) A DiPRRA, through the Joint Plan, shall implement a sewershed surveillance program to receive early warning of a potential occurrence that could adversely affect the DPR treatment and that contains the following:

- (1) On-line monitoring instrumentation that measures surrogate(s) that may indicate a chemical peak resulting from illicit discharge;
- (2) Notification by the pretreatment program to the DiPRRA of any discharge that results in the release of contaminants above allowable limits;
- (3) ~~Monitoring of~~ 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; and
- (4) Other aspects of a surveillance program determined by the State Board on a project-specific basis.

#### Rationale:

Subsection (d)(3) identifies an important part of a sewershed surveillance program, namely, keeping track of the results of various disease surveillance programs that are in existence. At the federal level, the Centers for Disease Control (CDC) keeps track of reports of infectious disease outbreaks and their origins that come from the network of state public health departments. The California Department of Public Health (CDPH) collects data from local health departments on the occurrence of certain infectious

diseases including cryptosporidiosis and giardiasis. In addition, CDPH and local health departments conduct investigations and report on the origin of disease outbreaks.

For DPR projects, tracking the results of local, state, and federal disease outbreak investigations can provide important information that can provide the DiPRRA with insights into the prevalence of infectious diseases and their origin.

In a similar manner, there are data being collected by the CDC from local programs that are collecting samples of wastewater and analyzing them, in order to determine the level of SARS-CoV-2 virus in local communities. While such surveillance has been primarily associated with the COVID-19 pandemic, it appears likely that researchers as well as state and local agencies will continue to use wastewater monitoring as a tool for gauging community health. To the extent that such data are available in the DiPRRA's service area, the DiPRRA can track them as well.

#### **Recommendation 8. Modify chemical criteria**

*A number of comments and recommendations for chemicals are presented below:*

- *Recommend that ozone and biological activated carbon (BAC) processes be located appropriately before the reverse osmosis (RO) process to manage low molecular weight compounds as well as other chemicals of emerging concern (CECs). As currently drafted, the criteria imply that ozonation and BAC are one process. Biological treatment is a powerful barrier, and it should count as a separate barrier. The criteria should recognize these treatment processes as two separate barriers and the criteria should include a clear definition of expected functions of each process.*
- *The Expert Panel feasibility report (Olivieri, et al. 2016) pointed to the need to address low molecular weight compounds passing through RO. The current draft criteria imply that the use of ozone/BAC on RO permeate is acceptable. The approach will not be effective on RO permeate because there's not enough carbon left in the system to support the biological function of the BAC filter. Also, ozonation works better at elevated pH, while the RO permeate due to control of scaling has a pH of less than 7 (in the range of 6.2 to 6.5). The criteria document should clearly recognize ozonation and BAC as processes that precede RO. Also note that the ozonation and BAC barriers are synergistic—the sum of the effectiveness of ozonation alone or BAC alone is not as effective as the two combined. The potential use of ozonation and/or BAC after RO can be considered, if appropriate, as part of the alternative language.*
- *Recommend carbamazepine and sulfamethoxazole as ozone performance indicators.*
- *Recommend using acetone and formaldehyde as BAC performance indicators.*

DDW Response to Recommendation 8 (bullets 1-4, above):

To address the Panel's recommendation on order of treatment, DDW is revising the August 2021 proposed draft criteria by inserting a new subsection after existing subsection (a) as follows (additions to proposed regulation text are denoted as underlined text highlighted in yellow):

§ 64669.50 Chemical Control

(b) The treatment train must treat wastewater with an ozone/biological activated carbon (ozone/BAC) process followed by a reverse osmosis membrane process followed by an oxidation process, in that order.

To address the Panel's concern that the ozone/BAC process are actually two processes, DDW has clarified that the ozone process would be demonstrated independently from the demonstration of the BAC process, and that there are two sets of indicators (two for ozone, and two for BAC).

DDW is revising the August 2021 proposed draft criteria as follows (additions to proposed regulation text are denoted as underlined text highlighted in yellow, deletions of text shown in strikethrough):

§ 64669.50 Chemical Control

(c) To demonstrate that a sufficient ozone/BAC treatment processes es haves been individually designed for implementation, a DiPRRA shall conduct testing demonstrating that ~~demonstrates~~ an ozone/BAC process will provide no less than 1.0 log (90 percent) reduction for each of the following indicators: formaldehyde, acetone, and n-nitrosodimethylamine (NDMA).

(1) an ozone process will provide no less than 1.0 log (90 percent) reduction measured across the ozone process for each of the following indicators: carbamazepine, and sulfamethoxazole; and

(2) a BAC process will provide no less than 1.0 log (90 percent) reduction measured across the BAC process for each of the following indicators: formaldehyde, acetone.

(13) A DiPRRA shall submit a testing protocol, as well as the subsequent testing results, to the State Board for review and written approval. The testing protocol shall include challenge or spiking tests, using formaldehyde, acetone, and NDMA, carbamazepine, and sulfamethoxazole, to demonstrate the proposed ozone/BAC treatment processes will achieve the minimum 1.0 log reduction for each indicator under the proposed ozone/BAC treatment processes' normal full-scale operating conditions.

(24) A DiPRRA shall establish and submit to the State Board for review and written approval, surrogate and/or operational parameters that indicate whether: the minimum 1.0 log formaldehyde, acetone, and NDMA reduction design criteria is being met. At least one surrogate or operational parameter shall be capable of being monitored continuously, shall be continuously recorded, and shall have associated alarms that indicate when the process is not operating as designed.

(A) The ratio of the applied ozone dose to the design feed water total organic carbon (TOC) concentration shall be greater than 1.

(B) The empty-bed contact time of the BAC contactor shall be at minimum 15 minutes.

(A) For the ozone process, the minimum 1.0 log carbamazepine and sulfamethoxazole reduction design criteria are being met. At least one surrogate or operational parameter shall be capable of being monitored continuously, shall be continuously recorded, and shall have associated alarms that indicate when the process is not operating as designed.

(B) For the BAC process, the minimum 1.0 log formaldehyde and acetone reduction design criteria are being met. At least one surrogate or operational parameter shall be capable of being monitored continuously, shall be continuously recorded, and shall have associated alarms that indicate when the process is not operating as designed.

- Delete the applied ozone/total organic carbon (ozone/TOC) dosage language and include a requirement to develop a project-specific dosage as part of the engineering report. [As] stated during a public hearing, the value of 1 mg ozone/mg TOC is not justified. The Panel understands that the DDW Project Team relied on a study titled "Persistent contaminants of emerging concern

*in ozone biofiltration systems: Analysis from multiple studies,” to support the draft criteria (Sari, et al. 2020). Sari, et al. 2020 is a literature review of studies that target CEC and pathogen removal. To achieve LRVs for pathogens, higher specific dosages were applied.*

*The focus of the draft DPR criteria should solely be CEC removal, specifically low molecular weight compounds. As stated in the paper, much lower specific dosages are sufficient. Because the treatment process is specified (ozone/BAC) and log removal values for several indicator chemicals are defined, there is no need to specify a specific ozone dose. Therefore, the ozone/TOC requirement can and should be deleted. Further, treatment should be optimized for the feedwater to maximize biotransformation and minimize ozone byproducts, such as bromate.*

DDW Response to Recommendation 8 (bullet 5, above):

A new subsection (d) has been added to clarify the design requirements for the ozone/BAC processes, to replace existing paragraphs 64669.50 (c)(2)(A) and (c)(2)(B). DDW kept the design requirement to allow some projects to design at an ozone TOC ratio without doing the piloting work.

DDW is revising the August 2021 proposed draft criteria as follows (additions to regulation text are denoted as underlined text highlighted in yellow):

§ 64669.50 Chemical Control

(d) The ozone/BAC processes must be designed to provide no less than 1.0 log (90 percent) reduction for each of the following indicators: formaldehyde, acetone, carbamazepine, and sulfamethoxazole.

(1) The ozone process shall be designed to provide a ratio of the applied ozone dose to the design feed water total organic carbon (TOC) concentration greater than 1.0, or a ratio demonstrated to achieve the reductions at a pilot scale as part of the design of the ozone process, and

(2) The BAC process shall be designed with an empty-bed contact time of at least 15 minutes.

- *Recommend online nitrite monitoring for ozone feedwater.*

DDW Response to Recommendation 8 (bullet 6, above):

DDW is revising the August 2021 proposed draft criteria as follows (additions to regulation text are denoted as underlined text highlighted in yellow):

§ 64669.50 Chemical Control

(d) During full-scale operation of the ozone/BAC treatment process designed pursuant to subsection (c), a DiPRRA shall continuously monitor the surrogate and/or operational parameters established pursuant to paragraph (c)(2), and the DiPRRA shall continuously monitor the ozone feedwater for nitrite. The DiPRRA shall implement, in full-scale operation, the ozone/BAC process as designed pursuant to subsection (c).

- *Address alternatives to ozone/BAC as part of the alternatives clause. As alternatives are approved by DDW, it is important to recognize the need to consider extension of the approvals, as appropriate, to other projects. Any extension of such approvals to other projects should be based on the alternative(s) having addressed a wide variety of wastewater characteristics and operating conditions, including key chemical and microbial process performance indicators and surrogates. In particular, the startup and adaptation time of the BAC filter should be addressed.*

DDW Response to Recommendation 8 (bullet 7, above):

DDW thanks the Panel for the comment. DDW has been approving alternatives for many years for IPR using considerations described by the Panel. We also have been reviewing and approving alternative technologies for surface water treatment for many years. DDW maintains lists of previously-approved technologies that are available to projects, such as the [alternative filtration technology list](#) for surface water treatment and the [recycled water alternative technologies list](#).

- *Define chemical peak to differentiate normal facility variation in water quality from true chemical peaks. In this study, chemical peaks are defined as resulting from intentional or unintentional illicit discharges of chemicals to the wastewater collection system (Debroux, Plumlee and Trussell 2021).*
- *Online TOC monitoring [see Chapters 4 and 6 in (Debroux, Plumlee and Trussell 2021)] is recommended as a feasible option for capturing chemical peaks. TOC is already used as a compliance critical control point monitoring device for RO systems.*

- *Experimental results suggest that commercially available TOC analyzers have the ability to detect chemical peaks originating from volatile organic compounds. Among the TOC meters that were tested, at least two models demonstrated acceptable performance and are recommended for DPR projects.*
- *Recommend no more frequent than 15-minute minimum sampling intervals for online TOC analyzers, given that chemical peaks last on the order of hours to days.*

DDW Response to Recommendation 8 (bullets 8-11, above):

Panel comment/recommendation noted.

***Recommendation 9. Require Third-party review of the Technical, Managerial, and Financial Plan***

*The criteria appropriately require development of a technical, managerial, and financial (TMF) plan. The Panel recommends the criteria include an independent third-party review of the TMF plan. The Panel also recommends that DDW include the following in the criteria or Statement of Reasons:*

*Information (example if available) on what is expected to be included in the TMF documentation.*

*Information identifying the key factors DDW staff will use to review the plan and determine acceptability.*

DDW Response to Recommendation 9:

The proposed DPR criteria include requirements to demonstrate TMF and specifies the capacity that must be demonstrated. The criteria do not require a “TMF plan” to be submitted, but in order to demonstrate capacity, a DiPRRA would have to submit documents that will demonstrate that it (and other partner agencies in the Joint Plan) possesses the capacity to satisfy a requirement. DDW has considered the Panel recommendation that the criteria include an independent third-party review of the TMF plan. It is necessary to be specific regarding what components of TMF requires independent review.

DDW believes that adequate information is available to DDW to assess the technical capacity of a project, based on the ability of a proposed DPR project to comply with the technical requirements contained in the proposed criteria. Hence, no additional requirement would be added for an independent third-party review of technical capacity.

DDW concurs that an independent third-party review of the information submitted to demonstrate financial capacity would be a benefit. A requirement for a DiPRRA to

submit financial documents that it proposes to demonstrate financial capacity to an independent third-party reviewer can be added, but more information on the kinds of independent financial reviews and the qualification of the financial auditor is needed.

Regarding the Panel's recommendation for an independent third-party review of managerial capacity, it is unclear what the role of an independent auditor would be. Existing proposed DPR criteria require a DiPRRA to utilize an independent advisory panel to conduct tasks including reviewing continuous improvement plans to support treatment optimization, enhance a culture of public health protection within the DiPRRA and DPR project, or development of TMF capacity, as required by the State Water Board (64669.120(a)(3)). An independent advisory panel reviewing TMF capacity could advise a DiPRRA to consult with an independent management auditor as needed to address a problem, once a DPR project has been approved for operation.

The clarification proposed by the Panel is most suited in the initial statement of reasons, and DDW will include the rationale for requiring a demonstration of TMF, the types of TMF guidance that exist, and what factors can be considered in evaluating TMF capacity.

***Recommendation 10. Require third-party engineering review***

*The Panel recommends that the DPR criteria include a requirement for third-party peer review to:*

*Review designs, including instrumentation, controls, and the SCADA system prior to preparation of project bid documents.*

*Review project plans at commissioning.*

*Review operational projects to identify engineering best practices that can be incorporated into future engineering designs.*

*These reviews, because they lead to improved practices, will also inherently benefit the public health, safety, and welfare (National Society of Professional Engineers 2022).*

**DDW Response to Recommendation 10:**

DDW agrees that a third-party review is beneficial in situations where the subject is specialized or when an independent evaluation is needed. The draft regulation includes requirements for independent review of several specific components, namely:

- (1) audit of the source control program every 5 years by an independent party to assess effectiveness of the program in controlling the discharge of contaminants (sections 64669.40 (c) and 64669.120 (a)(2));
- (2) review of the Water Safety Plan every 5 years by an independent party to ascertain whether all hazards have been considered by the DiPRRA (section 64669.55 (a) and 64669.120 (a)(4));
- (3) review of alternatives (section 64669.120 (a)(1) which is project-specific);
- (4) review of continuous improvement plans to support treatment optimization, enhance a culture of public health protection within the DiPRRA and DPR project, or development of TMF capacity (section 64669.120 (a)(3) which is project-specific);
- (5) review of water quality data and provide recommendations for water quality investigations (section 64669.120 (a)(5) which is project-specific);

The aforementioned are mostly independent reviews that are applicable to, and would be conducted over the life of a DPR project/permit, although items (2) and (3) would also be conducted prior to project approval to operate. DDW agrees that a review of the engineering design proposal by an independent peer reviewer not involved in the development of said design would be appropriate as an additional safeguard to ensure protection of public health. However, more information is needed regarding selection criteria for the independent peer reviewer (e.g., what should be the specifications for the independent reviewer, who develops the specifications, and what questions must the peer reviewer address), accountability (e.g., what would be the end result of the independent peer review?, what would the evaluation entail?), liability, and other matters not fully addressed in the Panel's recommendation. Without these details, a peer reviewer might end up doing value engineering, which is not a public health benefit, and probably not what the Panel envisions should be achieved with this recommendation.

DDW believes the Panel's recommendation for review of operations to identify engineering best practices that can be incorporated into future engineering designs may be a benefit to the potable reuse industry as a whole, but DDW has not identified a public health need for it because it is not focused on the project under review. However, a review of operations to identify operational best practices that can be incorporated into future operations plans is addressed as treatment optimization under section 64669.80 (Operations Plan) and continuous improvement under section 64669.120 (a)(3) (Independent Advisory Panel).

- DDW is revising the August 2021 proposed draft criteria as follows (additions to regulation text are denoted as underlined text highlighted in yellow):

§ 64669.75 Engineering Report

(a) ...

(1) The Engineering Report shall include an evaluation report from an independent engineering peer reviewer of the treatment plant design proposal, on the following components of the design:

(A) instrumentation,

(B) process controls,

(C) SCADA system, and

(D) cybersecurity.

(2) The Engineering Report shall include an independent evaluation report from an engineering peer reviewer on the review of the treatment plant commissioning plan and observation of the treatment plant commissioning, as an addendum.

**Recommendation 11. Clarify communication and notification requirements**

*All notifications to the public and public agencies need to be consistent with those currently required as part of the California potable water regulations and the SDWA. References to existing potable water notification regulations should be included in the DPR criteria.*

DDW Response to Recommendation 11:

As public water systems, the DiPRRA and its partner agency(ies) are subject to all the existing regulations and statutes that pertain to public notification. These include the regulations in the California Code of Regulations, Title 22 (22 CCR) § 64463 et seq., which deal with Tier 1, Tier 2, and Tier 3 notifications (which have differing timelines associated with the need to provide notification, and 22 CCR § 64480 et seq., which deals with annual consumer confidence reports.

In addition, there are statutory requirements that address notification levels and response levels for certain drinking water contaminants that do not have maximum contaminant levels (MCLs), but have otherwise been considered by the State Water Board to be of concern to drinking water systems and their consumers.

Health and Safety Code § 116455 sets forth the general requirements for providing notice to the governing body of the community served by the public water system (e.g., city council or county board of supervisors) when drinking water served to consumers contains a contaminant at a concentration that exceeds its notification level. It also provides recommendations for removing sources from service when the contaminant's response level is exceeded.

Another law, Health and Safety Code § 116378 (AB756, Garcia, Chapter 162, Statutes of 2019), addresses per- and polyfluoroalkyl substances (PFAS) and identifies actions that are required to be taken when notification and response levels are exceeded for those contaminants in drinking water served to consumers. These requirements extend beyond those set forth for other chemicals (that is, not PFAS) with notification levels, in that when a contaminant exceeds its response level, the source must be taken out of service or else public notice is required. This enhanced notification requirement reflects the widespread nature of PFAS, and the likelihood of consumer exposure in inadequately treated drinking water supplies.

Pathogenic microorganisms are ubiquitous in wastewater, and the likelihood of consumer exposure in inadequately treated drinking water that has as its origin wastewater is of great concern in the regulation of DPR projects.

By way of background, all public water systems must provide public notification for certain violations, occurrences, or situations. For example, Tier 1 notifications must be given promptly, as seen below:

This is existing regulation for public water systems.

#### 22 CCR § 64463.1 -Tier 1 Public Notification

(a) A water system shall give public notice pursuant to this section and section 64465 if any of the following occurs:

- (1) Violation of the *E. coli* MCL (as specified in section 64426.1(b));
- (2) Violation of the MCL for nitrate, nitrite, or total nitrate and nitrite, or when the water system fails to take a confirmation sample within 24 hours of the system's receipt of the first sample showing an exceedance of the nitrate or nitrite MCL;
- (3) Violation of a Chapter 17 treatment technique requirement resulting from a single exceedance of a maximum allowable turbidity level if:

(A) The State Board determines after consultation with the water system and a review of the data that a Tier 1 public notice is required; or

(B) The consultation between the State Board and the water system does not take place within 24 hours after the water system learns of the violation;

(4) Occurrence of a waterborne microbial disease outbreak, as defined in section 64651.91, or other waterborne emergency, a failure or significant interruption in water treatment processes, a natural disaster that disrupts the water supply or distribution system, or a chemical spill or unexpected loading of possible pathogens into the source water that has the potential for adverse effects on human health as a result of short-term exposure;

(5) Other violation or occurrence that has the potential for adverse effects on human health as a result of short-term exposure, as determined by the State Board based on a review of all available toxicological and analytical data;

(6) Violation of the MCL for perchlorate or when a system is unable to resample within 48 hours of the system's receipt of the first sample showing an exceedance of the perchlorate MCL as specified in section 64432.3(d)(3);

(7) For chlorite:

(A) Violation of the MCL for chlorite;

(B) When a system fails to take the required sample(s) within the distribution system, on the day following an exceedance of the MCL at the entrance to the distribution system; or

(C) When a system fails to take a confirmation sample pursuant to section 64534.2(b)(4); or

(8) Violation of the MRDL for chlorine dioxide; or when a system fails to take the required sample(s) within the distribution system, on the day following an exceedance of the MRDL at the entrance to the distribution system.

Although existing regulations are quite broad in addressing problematic areas that may require public notice, the State Water Board has determined that in order for DPR projects to understand when public notification is required (and when it is not), for example, in 22 CCR § 64463.1(a)(4), further clarifications in the proposed DPR regulations are needed.

As shown below, the additional public notification requirements for DPR projects in the proposed regulation focus on failures in treatment or monitoring that might result in water served to the public that is unsafe.

## § 64669.125 Public Notification

- (a) A DiPRRA shall provide an initial public notice to persons served by the DPR project that describes the project and when the DPR project water is scheduled to be delivered.
- (b) A DiPRRA shall provide public notice to persons served by the DPR project pursuant to Title 22, Division 4, [Chapter 15, Article 18](#).
- (c) A DiPRRA shall provide public notice pursuant to section 64463.1 for the following:
- (1) A failure to meet the minimum 16 log for enteric virus, 10 log for Giardia cysts, or 11 log for Cryptosporidium oocysts reduction requirement pursuant to section 64669.45;
  - (2) A failure to comply with an MCL associated with an acute health effect;
  - (3) A failure to meet the 0.5 mg/L TOC limit set forth in section 64669.50(I).
  - (4) A failure to discontinue delivery of water pursuant to sections 64669.45, 64669.50, 64669.60, or 64669.65; and
  - (5) A failure to monitor the pathogen or chemical control points pursuant to section 64669.85.
- (d) A DiPRRA shall provide public notice pursuant to section 64463.4 for the following:
- (1) A failure to comply with an MCL associated with a chronic health effect;
  - (2) A failure to monitor pursuant to sections 64669.60 and 64669.65;

### Rationale:

Because they are public water systems, the DiPRRA and its partner agency(ies) are subject to notification requirements that pertain to all public water systems.

Generally, the proposed notification requirements for DPR projects are consistent with other regulatory notification requirements. They address public health concerns and reflect the state's long appreciation for community right-to-know approaches to providing information about actual or potential risks to public health and the environment.

The State Water Board has determined that in order for DPR projects to understand when public notification is required further clarifications in the proposed DPR regulations are needed.

For example, subsection (a) of the proposed regulation requires initial notification of the DPR project and when DPR project is scheduled to be delivered. This regulation obviously can only apply to DPR projects. Providing the public information about the project and when DPR water is to be introduced into their water supply is reasonable.

Subsection (b) reminds us that the DPR project is subject to existing notification requirements.

Subsections (c)(1) and (c)(3) - (c)(5) address a need to alert the public about the failure(s) to the DPR project to adequately protect consumers from pathogens and chemical contaminants. These requirements are not required for other public water systems not using recycled wastewater as their water supply. For water systems that do not use DPR, there is little opportunity for direct exposure to untreated or inadequately treated wastewater. For water systems that use indirect potable reuse (IPR) to supplement their drinking water supplies, there is built-in public health protection, in terms of the presence of environmental buffers associated with ground water aquifers or surface waterbodies, along with a longer response time, for operators to address perturbations in the treatment processes. For DPR, the lack of environmental buffers and adequate response time necessitate a need to inform the public about potential or actual exposures to inadequately treated wastewater.

Subsection (c)(2) refers to chemicals that are considered to pose acute health effect. These chemicals, currently limited to nitrite/nitrate and perchlorate, are regulated similarly for all public water systems in order to protect against acute health effects.

Subsection (d)(1) refers to chemicals that are considered to pose chronic health effects. These chemicals are regulated similarly for certain public water systems in order to protect against chronic health effects.

Subsection (d)(2) refers to a need to alert the public for failure to monitor for regulated chemicals and radionuclides, contaminants with notification levels and other potential chemical contaminants whose presence may pose a health concern.

**Recommendation 12. Other recommendations**

1. *Include a criterion that requires 24/7 operation for at least 12 months before considering a request for reducing the number of operators and/or unstaffed operations.*

DDW Response 12-1:

DDW is revising the August 2021 proposed draft criteria as follows (additions to regulation text are denoted as underlined text highlighted in yellow):

§ 64669.35 Operator Certification

(e) After 12 months of operation pursuant to subsection (d), if an operations plan, submitted to the State Water Board for review and approval pursuant to section 64669.80(g), demonstrates an equivalent degree of operational oversight and reliability with either unmanned operation or operation under reduced operator oversight, the chief operator or shift operator is not required to be on-site at all times, but shall be able to monitor operations and exert physical control over the treatment facility within the period specified in the operations plan, or one hour, whichever is shorter.

2. *Include a clear linkage in the DPR criteria for monitoring and/or source control and/or in the Statement of Reasons to the SWB Recycled Water Policy for chemicals of emerging concern. Criteria should include constituents to be monitored, the monitoring trigger levels, and the response action plan.*

DDW Response 12-2:

DDW recognizes the need for monitoring for chemicals of emerging concern. Section 64669.65 (Additional Monitoring) requires monitoring for chemicals of emerging concern including chemicals that are identified in wastewater as part of the source control program. In addition, DDW is planning to add the following to section 64669.65, DDW believes that the proposed addition would address the need to keep up with the state of the science of CECs occurrences and monitoring and take full

advantage of the expertise from both State Water Board science advisory panels on CECs in recycled water and aquatic ecosystems.

- DDW is revising the August 2021 proposed draft criteria as follows (additions to proposed regulation text are denoted as underlined text highlighted in yellow, deletions of text shown in strikeout):

§ 64669.65 Additional Monitoring

(h) Each year, a DiPRRA shall also identify chemicals that may be within the wastewater collection area(s) that are not otherwise required to be monitored and are:

(1) Known to the State pursuant to the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health and Safety Code, division 20, chapter 6.6, section 25249.5) to cause cancer or reproductive toxicity, as listed in California Code of Regulations, Title 27, Division 4, Chapter 1, Article 9, sections 27001(b) or 27001(c); ~~or~~

(2) Considered to be chemicals of emerging concern (CECs), based on information presented in reports from the State Board or its scientific advisory bodies; or

(3) Likely to be present in wastewater used in the DPR project, based on reviews of possible contaminating activities identified in drinking water source assessments performed by or for the DiPRRA or the partner water agency(ies) in the Joint Plan; reviews of CECs in wastewater, including endocrine disrupting chemicals, in reports from ~~State Water Board advisory bodies~~; the scientific literature; and lists of the most prescribed pharmaceuticals.

Clear linkage in the DPR criteria and/or in the Statement of Reasons to the SWB Recycled Water Policy is not essential to protection of public health, impractical and infeasible for the following reasons:

1. The Recycled Water Policy CEC monitoring requirements are investigatory and do not require any public health protective compliance action (unlike drinking water maximum contaminant levels, action levels, and notification levels). [The Recycled Water Policy's Staff Report](#) stated the following

“Currently, CEC monitoring is intended to be investigatory and not for regulatory compliance with a specific limit such as a maximum contaminant level or water quality objective. For both targeted chemistry and bioanalytical screening tools, the response actions for exceeding the monitoring trigger levels are to further investigate the exceedance if the magnitude of the exceedance is greater than a factor of 10 higher than the monitoring trigger level.”

2. Subjecting DPR project proponents (DiPRRA or its partners) to Recycled Water Policy CEC monitoring requirements is not supported by State Water Board statutory authority. Implementation of the state water quality control policies are mandated for “carrying out activities which affect water quality” ([Water Code § 13146](#)). In absence of a discharge to the environment, the regulatory basis for incorporating this requirement into the DPR criteria is questionable.
3. Recycled Water Policy CEC monitoring requirements that overlap with drinking water regulatory limits cause inevitable regulatory implementation confusion. DDW staff has experienced a couple of indirect potable reuse project proponents who refused to acknowledge that drinking water notification levels require DDW specified methods and accredited laboratories, asserting that the analysis performed based on the Recycled Water Policy is acceptable for meeting Title 22 requirements. It is impractical to perpetuate this confusion for DPR where DDW staff has no control over the implementation of Recycled Water Policy. In addition, the Recycled Water Policy CEC monitoring requirements are less stringent than the proposed monitoring requirements set forth in section 64669.65, both with regard to frequency and chemicals to be monitored. Thus, linkage to the Recycled Water Policy would result in a regulatory dilemma as to which of the requirements would apply.
4. The statement of reasons is not enforceable. The statement of reasons is a document that explains the reasons why the agency is making the proposed regulatory changes. The statement of reasons may provide an explanation of the problem being addressed, the purpose and necessity for, and benefits of the proposed changes. Only requirements included in the DPR criteria proposed regulation text are enforceable.

5. Incorporating Recycled Water Policy CEC monitoring requirements into the DPR criteria pose rulemaking procedural hurdles unless a specific statutory exemption exists. The CEC monitoring requirements in the Recycled Water Policy are driven by the recommendations of the science advisory panel, which the State Water Board convenes every five years. The DPR criteria adoption is subject to the rulemaking procedures and standards set forth in California's Administrative Procedure Act (APA) ([Government Code § 11340, et seq.](#)). State regulations must also be adopted in compliance with regulations adopted by the Office of Administrative Law ([California Code of Regulations, Title 1, § 1-280](#)). [1 CCR § 20](#) contains the requirements for incorporation by reference. Unless specifically authorized by statute, prospective incorporation by reference (incorporation of a future version of an external document) is not permitted because it allows changes to the DPR regulations without going through the APA.
  
3. *Include TOC monitoring criteria in several locations. The use of the 0.5 mg/L TOC, as written, could imply that TOC is a health-based criterion. The Panel recommends that the criteria and the Statement of Reasons should clarify that TOC is not a health-based criterion.*

DDW Response 12-3:

The clarification is most suited in the initial statement of reasons, and DDW will include an explanation of how TOC is used in the ISOR. DDW can reflect the Panel's concern in the writeup in the ISOR, and that TOC is used as a measurable parameter that is useful in making operational decisions.

4. *The criteria should include specific time frames and digital formats for submitting monitoring data to the SWB/DDW.*

DDW Response 12-4:

The digital format and time frames for submittal of monitoring data are included in existing drinking water regulations (section 64469, Reporting Requirements, excerpt below). Additionally, the proposed draft criteria clarify the requirement for the submittal of monitoring data conducted pursuant to Article 10 (DPR regulations) in

Section 64669.95 Compliance Monitoring, which references existing regulatory requirements for submittal time frames and digital formats:

Section 64669.95 Compliance Monitoring

(c) Analytical results of water quality monitoring conducted pursuant to sections 64669.60 and 64669.65 shall be reported to the State Board electronically by the 10th day of the month following the end of the monitoring period pursuant to *Chapter 15 section 64469*.

Excerpt of 22 CCR § 64469:

“§ 64469. Reporting Requirements.

(a) Analytical results of all sample analyses completed in a calendar month shall be reported to the State Board no later than the tenth day of the following month.

(b) Analytical results of all sample analyses completed by water wholesalers in a calendar month shall be reported to retail customers and the State Board no later than the tenth day of the following month.

(c) Analytical results shall be reported to the State Board electronically using the Electronic Deliverable Format as defined in The Electronic Deliverable Format [EDF] Version 1.2i Guidelines & Restrictions dated April 2001 and Data Dictionary dated April 2001.

(d) Within 10 days of giving initial or repeat public notice pursuant to Article 18 of this Chapter, except for notice given under section 64463.7(d), each water system shall submit a certification to the State Board that it has done so, along with a representative copy of each type of public notice given.”

5. *Include a 20-year life cycle planning horizon for the DiPRRA Joint Plan and a limited life-cycle cost analysis (LCCA) update every five years.*

DDW Response 12-5:

The proposed draft criteria include a requirement for the costs of a DPR project to be estimated based on the proposed DPR project described in the Engineering Report.

“Costs shall include operation and maintenance costs, 20-year life-cycle costs of equipment, capital replacement costs, energy costs, personnel costs, and other elements specified by the State Water Board on a project-specific basis.” The DiPRRA and partner agencies in the Joint Plan would then use this information in

part to demonstrate TMF. (Section 64669.30 Technical, Managerial, Financial Capacity).

DDW would like more information from the Panel on the rationale for the “20-year life cycle planning horizon for the DiPRRA Joint Plan” to explain how a “life-cycle planning horizon” would be used in the Joint Plan.

DDW would also like more information from the Panel on a “limited life-cycle cost analysis update every five years”, specifically what does “limited” entail (what elements of a LCCA), and what is the purpose of submitting the updates (e.g., what is the problem and what are the key piece(s) of information or objective from a LCCA that are key to addressing the problem). The proposed draft criteria include a requirement for an updated Engineering Report to be submitted every 5 years that includes among other things an “update of the 5-year capital replacement cost and budget forecast”. DDW has revised the draft to clarify that TMF shall be demonstrated every 5 years, in alignment with the frequency at which the updated Engineering Reports are to be submitted.

- DDW is revising the August 2021 proposed draft criteria as follows, pending a rationale from the Panel (additions to regulation text are denoted as underlined text highlighted in yellow):

§ 64669.30 Technical, Managerial, Financial Capacity

(b) A DiPRRA shall demonstrate to the State Board that the agencies in the Joint Plan possess adequate technical, managerial, and financial capability pursuant to subsection (a), with the submittal of an Engineering Report pursuant to section 64669.15 or 64669.75.

6. *The Panel agrees with the DDW draft criteria that existing drinking water treatment plant treatment processes that have been validated for LRVs and approved by DDW do not need to be revalidated.*

DDW Response 12-6:

DDW appreciates that the Panel highlighted this topic, which is addressed by the August 2021 proposed criteria submitted to the Panel. Section 64669.45 (a)(3) states in part:

“The validation study protocol and study report may rely on validation study protocols and *reports previously approved by the State Board* [emphasis added]. These include protocols approved by the State Board pursuant to the US EPA Membrane Filtration Guidance Manual and the US EPA UV Disinfection Guidance Manual. Validation of granular media filters can be conducted using a pilot plant with verification based on turbidity and periodic particle count monitoring. LRVs are limited to what is demonstrated with ongoing monitoring.”

7. *The source control section criteria requires quantitative risk assessment (QRA) which is confusing, probably not productive for each utility to conduct, and duplicative of SWB-CEC risk-based efforts and should be deleted. The Panel suggests adding a specific reference to the Statement of Reasons regarding enhanced source control qualitative risk-assessment background information and to the SWB-CEC risk-based documents to eliminate confusion with other risk assessment approaches.*

DDW Response 12-7:

Recommendations for quantitative risk assessment for contaminants in wastewater intended for potable reuse are present throughout the report of the Expert Panel on Enhanced Source Control’s report to the State Water Board (Neemann et al., 2020). This panel believes such risk assessments are fundamental to evaluating the impact of water-borne contaminants on receiving water treatment processes and ultimately on public health.

The source control panel identified technical support documents for public health goals established by the Office of Environmental Health Hazard Assessment as examples of comprehensive health risk assessments for water quality constituents. There are other health risk assessments available from government agencies,

scientific advisory bodies, that can provide information to water reuse projects to enable improvements to be made in the quality of their wastewater.

- DDW is revising the August 2021 proposed draft criteria as follows (additions to proposed regulation text are denoted as underlined text highlighted in yellow, deletions of text shown in strikeout):

§ 64669.40 Wastewater Source Control

(a) A DiPRRA shall ensure that the municipal wastewater used to supply a DPR project is from a wastewater management agency that:

...

(5) Evaluates the concentration of ~~Conducts a quantitative risk assessment for each~~ contaminants in wastewater documented in paragraph (3) by comparing them with human health protective concentrations for drinking water (i.e., public health goals or the results of other human health risk assessments by the state Office of Environmental Health Hazard Assessment, or similar levels derived from health risk assessments performed or compiled by other state agencies, the US EPA, or State Board scientific advisory bodies, or otherwise determined using generally accepted health risk assessment principles).

(A) The evaluations, along with the cited documents that provide the health protective concentrations of the contaminants in drinking water, shall be presented in tables with supplemental text if necessary.

(B) The evaluations will be used by the DiPRRA to identify contaminants that may have to ensure no contaminant will have a deleterious effect on the DPR project treatment facility; that may or contribute to exceedance of MCLs or Notification Levels by the facility; that otherwise may result in a public health concern; or that lack available human health risk assessments.

Rationale:

The expert panel for enhanced source control (Neemann et al., 2020) recommended quantitative health risk assessments for source control programs associated with evaluations of wastewater used for potable reuse (focusing on DPR but recognizing that this is important for indirect potable reuse as well). This expert panel mentioned

as examples of risk assessments those performed by OEHHA in its development of public health goals (PHGs). PHGs are used by the State Water Board's Division of Drinking Water in the development of maximum contaminant levels (MCLs). Thus, they have a drinking water connection.

OEHHA also performs other human health risk assessments, such as those for the state's Air Resources Board and establishment of safe harbor levels for the Safe Drinking Water and Toxic Enforcement Act of 1986. These other risk assessments can be used by the DiPRRA and its partner agency(ies) to develop PHG-like values for purposes of risk assessment evaluations. For example, the safe harbor level for a carcinogen under the Safe Drinking Water and Toxic Enforcement Act of 1986 (Health and Safety Code § 25249.5, *et seq.*) is set at a  $10^{-5}$  lifetime cancer risk level, based on an exposure expressed in micrograms per day (27 CCR § 25705). This can be converted to a  $10^{-6}$  lifetime cancer risk (that is, that risk level used by OEHHA for PHGs) by dividing the safe harbor level by 10, and then by dividing that value by 2 liters per day consumption rate the drinking water consumer. There are similar assessments done for chemicals with non-cancer toxicological endpoints/effects.

There are other entities, such as the state Department of Pesticide Regulation and the US EPA, that also evaluate chemicals for various environmental and public health protection programs. When human health risk assessments are used in these programs, they, too, when converted to drinking water exposures and risk levels similar to those used for development of PHGs, would be suitable for use in this section.

Finally, advisory committees and panels also provide valuable information that can contribute to satisfying this requirement. For example, the State Water Board's advisory panels for contaminants of emerging concern have provided compilations of risk assessment levels for water contaminants. Information in those compilations that can be used in satisfying this requirement for risk-based evaluations of wastewater destined for use in water reuse projects for the production of drinking water.

## **Reference**

Neemann, J, J Colston, S Krasner, I Law, and A Whitson (2020), Enhanced Source Control Recommendations for Direct Potable Reuse in California, National Water Research Institute, NWRI-2020-07, March.

### Miscellaneous DDW Comments to NWRI (Administrative Issues)

1. On page 1 of the draft memo, please note that bullets 2 and 3 are not relevant to the Panel work presented in the memo. Bullet 2 says “Assemble technical workgroup(s) from among selected Panel members and invited experts to provide consultation on technical and scientific questions related to the update of uniform statewide criteria for potable and non-potable recycled water.” The subject of the Panel work is not related to the update of uniform statewide criteria for potable and non-potable recycled water. The “update” refers to existing regulations. The proposed DPR criteria that the Panel is reviewing would be a new regulation and is not an update.
2. On page 2 of the draft memo, please note that the description of “Task 2 of the Agreement” (contract) is not correct. Task 2 of the contract does not refer to technical workgroups. It is unclear the purpose for referring to the contract between State Water Board and NWRI, but the description must be accurate if NWRI chooses to reference the contract. Organizing the draft memo by “Task 1” and “Task 2” referencing the contract between the State Water Board and NWRI is confusing, because the tasks described in the draft memo do not reflect the tasks in the contract, and because there is only the single charge of the Panel, which is to make a finding whether the proposed criteria would be protective of public health.
3. DDW reviewed the contract with NWRI before it was executed in 2021. If NWRI has any questions about the contract, please consult with DDW.