

NATIONAL WATER RESEARCH INSTITUTE

FINAL Panel Report #2

Independent Advisory Panel for
Soquel Creek Water District's
Pure Water Soquel Groundwater Replenishment Project

Based on an Independent Advisory Panel Meeting Held
September 20, 2017 (Meeting #2)

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Independent Advisory Panel for
Pure Water Soquel Groundwater Replenishment Project

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ACRONYMS AND ABBREVIATIONS

AFY	Acre feet per year
AWTP	Advanced water treatment plant
CEC	Constituent of emerging concern
DBP	Disinfection byproducts
District	Soquel Creek Water District
DWR	Department of Water Resources (California)
FP	Formation potential
GRRP	Groundwater replenishment reuse project
GSA	Groundwater sustainability agency
GSP	Groundwater sustainability plan
LRV	Log removal value
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
MF	Microfiltration
MRL	Method reporting limit
ND	Non-detect
NWRI	National Water Research Institute
PFOA	Perfluorooctanoic acid
PFOS	Perfluorooctanesulfonic acid
RO	Reverse osmosis
SCCSD	Santa Cruz County Sanitation District
SCWWTF	Santa Cruz Wastewater Treatment Facility
SGMA	Sustainable Groundwater Management Act
SWA	Surface water augmentation
TDS	Total dissolved solids
TOC	Total organic carbon
UF	Ultrafiltration
USEPA	United States Environmental Protection Agency
USFDA	United States Food and Drug Administration
UV	Ultraviolet
WWTP	Wastewater treatment plant

1. BACKGROUND AND OVERVIEW OF THE PROJECT

The National Water Research Institute (NWRI) of Fountain Valley, California, a joint powers' authority (JPA) and 501c3 nonprofit, appointed academic researchers and other water industry experts to an Independent Advisory Panel (Panel) to provide scientific and technical review of the proposed Pure Water Soquel Groundwater Replenishment Project (Project) for Soquel Creek Water District (District) in mid-Santa Cruz County, California. For this effort, the District is evaluating the feasibility of implementing a groundwater replenishment reuse project^{1,2} to address groundwater overdraft of the Soquel-Aptos Groundwater Basin (Basin) and to sustainably manage the Basin in the long term. The goal of the Panel review is to help District staff and local policymakers make informed decisions about the proposed Project to ensure it would be protective of public health and the environment.

1.1 Project Background

Soquel Creek Water District relies entirely on groundwater to meet customer needs. The Basin, which provides 100 percent of the District's water supply, is designated as "critically overdrafted" by the California Department of Water Resources (DWR). The Basin became overdrafted after many years of withdrawals that significantly exceeded the estimated sustainable Basin yield of approximately 3,000 AFY³. In 2014, the District's Board of Directors declared a groundwater emergency based on the intrusion of seawater into the Basin's groundwater basin, causing seawater contamination at the coastline and reducing water security. In addition to this emergency declaration, the District also initiated a stage 3 withdrawals to 3,000 AFY by implementing a public water conservation program to ease demands on the Basin as development of a supplemental water supply is being pursued.

To ensure a reliable water supply, the District intends to provide one-third of its total water needs from an alternate water source, such as recycled water. Through its Recycled Water Policy, the State of California has adopted goals to increase the beneficial use of recycled water, including groundwater recharge, to supplement local community water supplies.⁴ Other water supply projects in California, such as the Groundwater Replenishment System in Orange County,⁵ use or are planning to use recycled water to replenish local groundwater basins. The District is taking this opportunity to evaluate the feasibility of undertaking a groundwater replenishment reuse project using recycled water as the source water supply.⁶

¹ As defined in the California Code of Regulations, Title 22, Division 4, Chapter 3, Article 1, §60301.390, "Groundwater Replenishment Reuse Project" or "GRRP" means a project involving the planned use of recycled municipal wastewater that is operated for the purpose of replenishing a groundwater basin designated in the Water Quality Control Plan [as defined in Water Code section 13050(j)] for use as a source of municipal and domestic water supply.

² Regulatory information regarding recycled water in California is available at https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/RecycledWater.shtml

³ Soquel Creek Water District 2015 Urban Water Management Plan, prepared by Water Systems Consulting, Inc., 24 June 2016.

⁴ Refer to http://www.swrcb.ca.gov/water_issues/programs/water_recycling_policy/ for the Recycled Water Policy.

⁵ Refer to <https://www.ocwd.com/gwrs/> for more information about the OCWD Groundwater Replenishment System.

⁶ Originally, SqCWD evaluated three options for supplementing existing water supplies: (1) ocean desalination; (2) river water transfers and conjunctive use; and (3) groundwater augmentation with recycled water. Based on an assessment of public support, water rights, multi-jurisdiction/multi-agency coordination, habitat conservation, and other issues, SqCWD identified Option 3 as the most viable approach to address groundwater basin overdraft and provide a local, sustainable supply of water.

In addition, as required by the California Sustainable Groundwater Management Act (SGMA),⁷ local stakeholders (including Soquel Creek Water District, Central Water District, City of Santa Cruz, County of Santa Cruz, and private well representatives) formed the Santa Cruz Mid-County Groundwater Sustainability Agency (MGA) to develop and implement a plan to manage the use of water within the Basin. Currently, the MGA⁸ is working to create a groundwater sustainability plan (GSP) designed to bring the Basin into SGMA compliance by 2040.

1.2 Pure Water Soquel Groundwater Replenishment Project

The District has proposed the Project to meet water supply needs. The Project would use advanced water treatment processes⁹ to produce highly treated recycled water (or “purified water¹⁰”) and inject it into the groundwater basin. The purified would mix with groundwater and eventually become part of the domestic water supply that is delivered to customers. By replenishing the groundwater basin with purified water, the Project would help groundwater in the basin recover to sustainable levels, protect the Basin from additional seawater intrusion (and the resulting impacts on water quality), and minimize future overdraft.

The conceptual components of the Project include:

- *Source Water:* Source water for the Project would be treated secondary effluent from the City of Santa Cruz Wastewater Treatment Facility (SCWWTF).
- *Treatment Facilities:* Options include treating the source water through multiple processes at both the SCWWTF and the advanced water treatment plant (AWTP). The treatment (purification) methods for a groundwater recharge project are, in part, prescribed by regulation: reverse osmosis (RO) followed by an advanced oxidation process. Effective pretreatment to RO includes microfiltration or ultrafiltration, and effective advanced oxidation is typically a UV-based process.
- *Purified Water and Recharge Wells:* The purified water would be conveyed to new recharge wells that would deliver the water into the Basin, thus replenishing groundwater and diminishing seawater intrusion.
- *Conveyance Systems:* New pipelines and conveyance improvements would transport (1) the source water to the AWTP and (2) the concentrate discharge flow to the SCWWTF. New pipelines and conveyance also would be needed to transport the purified water to the recharge wells.

⁷ More information on California’s Sustainable Groundwater Management Act (SGMA) can be found at <http://www.water.ca.gov/groundwater/sgm/>.

⁸ More information about the Santa Cruz Mid-County Groundwater Sustainability Association can be found at <http://www.midcountygroundwater.org/>.

⁹ Advanced treated water has undergone a process including filtration, reverse osmosis, and ultraviolet treatment and advanced oxidation and meets drinking water standards. Also referred to as “purified water” in this report.

¹⁰ “Purified water” is another term for “advanced treated water.”

1.3 Role of the Independent Advisory Panel

NWRI assembled a team of experts from relevant disciplines to provide independent, third-party review of the technical and scientific components of the proposed Project, including the sampling and monitoring plan for constituents of emerging concern (CECs). Refer to **Appendix A** for background information about the NWRI Panel process.

1.4 Panel Members

The Panel is composed of experts in disciplines related to groundwater replenishment with recycled water, including microbiology, water science and engineering, public health, risk assessment, regulatory issues, hydrogeology, toxicology, public perception, and advanced treatment technologies. Panel members include:

- Chair: Channah Rock, Ph.D. (University of Arizona)
- Joseph Cotruvo, Ph.D., BCES (Joseph Cotruvo & Associates)
- Jason Dadakis, PG, CHG (Orange County Water District)
- Lynne Haber, Ph.D., DABT (University of Cincinnati)
- Kara Nelson, Ph.D. (University of California, Berkeley)
- Gordon Thrupp, Ph.D., PG, CHG (Geosyntec Consultants)

Notably, Lynne Haber replaced Michael Dourson when he stepped down from the Panel in July 2017 to accept an appointment to the U.S. Environmental Protection Agency (USEPA). Brief biographies of the Panel members are provided in **Appendix B**. The Panel members collectively acknowledge and thank Dr. Dourson for his contributions and welcome Dr. Haber to the Panel.

2. PANEL MEETING #2

The Panel met at Capitola City Hall in Capitola, California, on September 20, 2017. At this meeting (Meeting #2), the District's Project Team provided an overview of the Project, shared information regarding other advanced water treatment facilities, and presented the results of the geochemical soil analysis and water quality monitoring study. Most of this meeting was open to the public and included verbal Panel responses to written public questions on the Project.

2.1 Pre-Meeting Material for Review

Prior to Meeting #2, the following material on the Project was provided to the Panel for review:

- *Technical Memo No. 2: CEC Removal Through Advanced Treatment, for Soquel Creek Water District Groundwater Replenishment Feasibility Study*, by Carollo Engineers (October 2015)
- *Addendum to Technical Memorandum 2 (CEC Removal through Advanced Treatment) Secondary Effluent Sampling Results, for Soquel Creek Water District Groundwater Replenishment Feasibility Study*, by Carollo Engineers (August 2017)
- *Source Water Sampling Plan for Soquel Creek Water District Pure Water Soquel Project*, by Carollo Engineers (Revised Draft, April 2017)

2.2 Panel Meeting #2 Attendees

Five of the six Panel members attended Meeting #2 (Dr. Haber was unable to attend, but provided written comments on the review materials and contributed to this report). Other attendees included NWRI staff, District staff and Project Team members, and members of the community served by the District. A complete list of known attendees is included in **Appendix C**.

2.3 Panel Meeting #2 Agenda

Staff from NWRI, the Panel Chair, and the District's Project Team collaborated on developing the agenda for Panel Meeting #2, which is included in **Appendix D**. Panel members arrived in Capitola on September 19, 2017, for a site tour of the potential sites for the proposed AWTP (including the SCWWTF, Chanticleer Site, and Soquel Creek Headquarters/West Annex Site, and the recharge wells). Staff at SCWWTF led Panel members on a tour of the wastewater treatment facility and explained details of the equipment and treatment processes currently in use. The tour schedule is included with the agenda.

The objectives for Panel Meeting #2 included:

- Present the NWRI Independent Advisory Panel to the Soquel Creek community.
- Describe the challenges of maintaining adequate drinking water supplies in Santa Cruz County.
- Address frequently asked questions related to purified water and potable reuse.
- Provide an opportunity for community members to engage with the Panel.

- Allow time for the Panel to meet in a closed session to discuss the water quality results and begin drafting recommendations.

The Project Team provided presentations on the following:

- *Why Pure Water Soquel? Perspectives from District Water Resource Managers*, by Melanie Mow Schumacher, P.E., Special Project-Communications Manager, Soquel Creek Water District.
- *Community Integration of Advanced Water Purification Facilities*, by Sunny Wang, P.E., Brown and Caldwell.
- *CECs in Water and Water Purification*, by Andrew Salveson, P.E., Carollo Engineers.

The Panel and the Project Team, including consultants from Carollo Engineers and Brown and Caldwell, met before the public meeting to discuss the meeting objectives. The Panel then participated in a public meeting in which Project Team staff presented information about the project, including the rationale for the Project, examples of other advanced water treatment facilities that have been integrated into communities, and the results of water quality monitoring on the source water that has been proposed for the Project.

After the Project Team completed their presentations, Panel member Dr. Kara Nelson provided her expert opinion on the peer review process used both in the United States and abroad to develop drinking water treatment criteria that are protective of public health and the environment. Dr. Nelson stressed that California is considered to have the strictest drinking water regulations in the world and emphasized the commitment of local water resource managers, their consultants, and the Panel to helping the Soquel Creek community maintain adequate and safe drinking water supplies.

Following the presentations, members of the public were invited to submit written questions to the Panel regarding the technical and scientific aspects of the Project. The meeting was recorded by video, and NWRI encouraged the submission of additional questions by mail and through the Project website managed by NWRI on behalf of the District. Individual Panel members responded orally to some of the written questions submitted by those in attendance based on their own expertise, professional judgement, and relevant experience. NWRI emphasized that the Panel would discuss the questions during the closed session later that day and respond to all questions within the Panel's scope of review in the consensus response; those responses are included in **Section 4**.

Questions from the public that were outside the scope of the Panel's charge were referred to the District. The District's written responses are provided in **Appendix E**.

2.4 Meeting Outcomes

The product of Meeting #2 is this consensus report, which includes both (1) findings and recommendations of the Panel based on information presented at Meeting #2 and (2) responses to questions submitted by the public both during and following the meeting. Written comments were accepted via e-mail and postal service through September 24, 2017. Responses to the public comments are included in **Section 4** (Panel responses) and **Appendix E** (District responses).

3. PANEL FINDINGS AND RECOMMENDATIONS

The principal findings and recommendations of the Panel regarding the proposed Project, as derived from the material presented and discussed during Panel Meeting #2, are provided in Sections 3.1 to 3.5. The findings and recommendations are organized under the following section headings:

- General Comments
- Results of the Water Quality Report for Constituents of Emerging Concern
- Design Considerations for the Advanced Water Treatment Plant
- Siting Considerations for the Advanced Water Treatment Plant
- Partnership with the Santa Cruz Wastewater Treatment Facility

3.1 General Comments

The following comments pertain to the overall review of the Project.

- The Panel appreciated the professional and comprehensive presentations the Project Team provided at the meeting. The presentations were informative and appropriate for the intended audience, which included the Panel and members of the community.
- The Panel concludes that the Project is plausible, feasible, and protective of public health, with respect to the following elements:
 - Quality of the source water that will be provided by the SCWWTF.
 - Use of proven advanced treatment technologies to produce water that meets all drinking water requirements and is protective of public health and the environment.
 - Projected safety and quality of the advanced treated water to be produced. The Panel's conclusion on this topic is based on the following:
 - Reports and presentations provided by the Project staff as part of Meeting #2.
 - Tours of the SCWWTF, Chanticleer Site, and Soquel Creek Headquarters and West Annex Site.
 - Panel members' technical knowledge and experiences with existing potable reuse projects in other locations in California.
 - Panel members' understanding of state and federal drinking water regulations and toxicity data on unregulated constituents.
- Although the public questions during Meeting #2 focused on chemical constituents rather than microbial constituents (i.e. pathogens), the Panel noted the following:
 - Microorganisms represent the most significant and acute public health risk associated with drinking water. Pathogen elimination represents the most important consideration in the design, operation, and maintenance of both drinking water and potable reuse treatment systems. The Pure Water Soquel treatment system will be designed to meet

pathogen reduction requirements established by federal and state drinking water regulations.

- Existing regulations and guidelines for drinking water and potable reuse are protective of public health with respect to both chemical and microbial water quality.

3.2 Results of the Water Quality Report for Constituents of Emerging Concern

The following comments pertain to *Technical Memo No. 2: CEC Removal Through Advanced Treatment* and the *Addendum to Technical Memo No. 2.*, both prepared by Carollo Engineers for the Soquel Creek Water District Groundwater Replenishment Feasibility Study.

- In general, the report was well-written and scientifically sound, and a valid rationale was used to arrive at the conclusions; however, the Panel feels that the methods used to predict the probable CEC concentrations in the purified water are conservative and, therefore, (a) underestimate the removal of CECs from the secondary effluent, and (b) may over-predict the concentration of CECs in the finished water.
- In regard to data reporting:
 - The datasets should be more consistent and understandable. Currently, there are some reporting inconsistencies within the results. Specifically, the text on Page 2 of the Addendum states that of 174 chemicals analyzed, 45 were detected and, of those, 17 were unregulated contaminants. Meanwhile, Table 3 in the Addendum lists 17 CECs with numerical exposure levels, five CECs as “<MRL” (so chemicals with <MRL appear to be counted as detects in Table 2, but as non-detect for Table 3), and five CECs as non-detect. It is not clear how the non-detects listed in Table 3 of the Addendum differ from other CECs that were non-detect.
 - It would be helpful to use the same terminology (“health screening” versus “health criteria”) and numbers/units reported throughout all data. For example, the values for Triclosan in Table 2 of *Technical Memo No. 2* and Table 3 in the Addendum and Table 2 in *Technical Memo No. 2* are inconsistent.
 - Use consistent units for all concentrations, or use what the drinking water standard uses (mg/L). Using different units for different chemicals can confuse readers, especially when no clear rationale for doing so is provided. Perhaps parts per billion (ppb) would be an appropriate consistent unit for trace chemicals in this context.
- Specific recommendations for the Addendum’s *Table 2: Detected Regulated Chemical Concentrations and MCLs, Secondary MCLs, and Notification Levels (NLs)* include:
 - Attribute each chemical’s screening level to the respective source document rather than using a series of three footnotes for the screening levels. If all three source documents reference the same health screening level for some or all the chemicals, then please indicate that. Otherwise, provide the range of values from the source documents.
 - Focus on substances that would be a challenge for the advanced water treatment process to remove.
 - Consider how the chemical results may provide insight for source control. For example, could some constituents be eliminated using improved control of sources such as

hospital waste or industrial discharges?

- For future testing, collect 24-hour composite samples rather than grab samples.
- Confirm whether the samples were analyzed for 1-4-dioxane and NDMA (and other nitrosamines); currently, neither chemical is included in the tabulated results. If these data were not collected, a series of grab samples should be undertaken.
- Given that some internal waste streams (e.g., concentrate generated from solids dewatering) are internally recycled back to the SCWWTF headworks and chlorine is not used for disinfection prior to outfall discharge (rather, UV disinfection is used), the NDMA data for the final effluent may not be representative of the nitrosamine concentrations that will be encountered by the proposed AWTP. To help control membrane biofouling, the AWTP is likely to use chloramine, which can form NDMA as a disinfection byproduct; therefore, a few NDMA formation potential (FP) tests should be conducted on the SCWWTF flows most representative of the feedwater to AWTP.
- Define “MFL.”
- Explain the difference between “detection” and “reliable quantification.”
 - Presumably, this difference is why two chemicals are listed in Table 2 as “<MRL,” but are still listed in the table, while “non-detects” are not listed.
 - Does the listing of a chemical as “<MRL” (as opposed to “non-detect”) mean that the chemical was detected, but the level was below the MRL and, therefore, could not be quantified reliably?
- Regarding the Addendum’s *Table 3: CEC Monitoring Results in SCWWTF Secondary Effluent and Associated Health Screening Levels*:
 - Include the full citation for all four source documents.
 - Update the Health Screening Levels for PFOA and PFOS to reflect the USEPA’s May 2016 Lifetime Health Advisory of 70 ng/L for combined PFOA + PFOS.
 - Refer to caffeine and sucralose as surrogates rather than as CECs. According to Trussell et al. (2013)¹¹, sucralose is included not as a CEC itself, but rather as a surrogate for water-soluble uncharged chemicals of moderate molecular weight. This reasoning should be stated.
 - Provide transparency on the methods by which the health screening levels are determined. Each agency uses its own approach for calculating benchmarks. Although the benchmark values calculated by individual agencies for a given constituent are similar enough that any difference would not affect the conclusions, for the sake of transparency the difference in assumptions and calculation methods should be acknowledged.
 - Note that the United States Food and Drug Administration (USFDA) does not calculate values for drinking water concentrations, but instead bases its recommendations on the Acceptable Daily Intake (ADI). The USFDA calculated the ADI for sucralose to be 5-

¹¹ Trussell, R.R., A. Salveson, S.A. Snyder, R.S. Trussell, D. Gerrity, and B.M. Pecson (2013). “Potable Reuse: State of the Science Report and Equivalency Criteria for Treatment Trains,” a Report for WateReuse Research Foundation Project 11-02, Alexandria VA.

mg/kg body weight/day, which includes a hundredfold safety factor. The sucralose ADI is equivalent to 350 mg/day (350,000 micrograms or 350,000,000 nanograms per day) for a 70-kg adult, or 50 mg/day (50,000 micrograms, or 50,000,000 nanograms per day) for a 10-kg child.

- Regarding the Addendum's *Table 5: Predicted SCWWTF Purified Water and Measured Untreated San Lorenzo River and Graham Hill Treated and SqCWD Groundwater CEC Concentration*:
 - Clarify the difference between non-detect and a blank cell in the table.
 - Explain what the blank cells represent.
- In addition, the Panel made the following recommendations on water quality monitoring:
 - Develop monitoring programs for the purified water to help ensure compliance with the California Anti-Degradation Policy for groundwater. These programs should include specifications to capture the temporal nature of water quality (i.e., monitoring at required intervals, such as continuous, hourly, and daily). The monitoring results will be used to evaluate treatment efficiency, as well as potential disease outbreaks within the community.
 - Remove asbestos from the future analysis for the following reasons:
 - Asbestos is not commonly present in source waters.
 - Asbestos only occurs at significant levels when (1) asbestos/cement pipe is used and (2) the water transmitted through the pipe is corrosive.
 - The advanced treatment technologies proposed for the Project would remove the asbestos fibers from the water.
 - The Maximum Contaminant Level (MCL) for asbestos in drinking water would never be approached.
- The Panel also noted that once the modeling results for aquifer residence time are available, the District will need to resolve how it will comply with the State of California's regulatory requirements for groundwater replenishment reuse of 12-log reduction of enteric virus, 10-log reduction of *Giardia* cysts, and 10-log reduction of *Cryptosporidium* oocysts. The proposed treatment technology has shown that it will achieve those conservative targets.

3.3 Design Considerations for the Pure Water Soquel Advanced Water Treatment Plant

The following recommendations would inform the AWTP design if the District decides to proceed with the Project:

- Consider conducting an appropriately designed and documented pilot study to test the microfiltration (MF) or ultrafiltration (UF) membranes, given the nature of the secondary effluent produced at the SCWWTF (i.e., tricking filter) and certain constraints of the SCWWTF's site. The impact of fouling on the MF or UF membranes is not a health issue, but will affect the final efficiency and cost of the Project.
- Consider a range of options for brine disposal and the safe discharge capacity of off-specification water during the design phase.

- Include redundancy for recharge well capacity in the design to allow for well maintenance and periodic rehabilitation activities.
- Review additional water quality and performance data from SCWWTF to inform decisions on the design of the Project.
- Review the levels and variability of total organic carbon (TOC) loads in the data collected by the SCWWTF. This variability could affect the operation of the full-scale Project, given the TOC limits in the State’s regulations on groundwater replenishment reuse and the possibility of using online TOC measurements as a surrogate for pathogen removal.
- Review the SCWWTF data for ammonia and total dissolved solids (TDS) (i.e., concentrations and variability), if available. Such information would be useful in optimizing the Project design.
- The Project Team should investigate the total nitrogen limit for future permitting and whether it is specific to the injection site. The State’s anti-degradation policy, the Regional Board’s Basin Plan, applicable Salt and Nutrient Management Plan, and/or local water quality may be relevant. This issue is important because ammonia levels may be high in the SCWWTF secondary effluent.

3.4 Siting Considerations for the Pure Water Soquel Advanced Water Treatment Plant

The Panel appreciated the opportunity to tour the SCWWTF and proposed sites for the AWTP and recharge wells. The Panel generated the following recommendations after observing these sites.

- It would be beneficial to build the AWTP at a site that has the capacity to expand for future growth and changing treatment needs.
- Building the AWTP at the existing SCWWTF will add complexity to the construction process due to currently existing site constraints and soil conditions.
- The Project Team should clarify where within the SCWWTF the source water for the AWTP will be collected. Specifically, will AWTP influent be sourced from a unit process located before or after the UV treatment? The Panel understands that the SCWWTF’s UV system is a low-dose system in the range of 15 to 25 mJ/cm² and may not provide significant value to a potable water reuse treatment train.

3.5 Partnership with the Santa Cruz Wastewater Treatment Facility

The District has an opportunity to further develop its collaborative relationship with the City of Santa Cruz and SCWWTF staff. To this end, the Panel recommended the following:

- Develop a collaborative working relationship between staff at the City, SCWWTF, and AWTP. A good model is the relationship between the Orange County Sanitation District and the Orange County Water District.
- Important topics to address include:
 - Optimizing the quality of the secondary- or tertiary-treated wastewater in preparation for the advanced treatment process. Treatment modifications at the SCWWTF could improve the quality of the secondary-treated effluent and, therefore, the performance, operation, and maintenance of the AWTP.

- Identifying opportunities for using any suspended capacity of existing infrastructure already within the footprint of the SCWWTF.
- Exploring strategies to further enhance source control to support groundwater recharge.
- Modifying the existing infrastructure and/or plant operations of the SCWWTF to enable flow equalization to mitigate the operational challenges posed by large diurnal fluctuation in daily wastewater flows.

The Panel emphasized that re-conceptualizing the wastewater treatment process as pretreatment for the AWTP rather than as the final step before ocean discharge is a significant shift in thinking about beneficial reuse and how the SCWWTF will be operated.

4. PANEL RESPONSES TO QUESTIONS FROM THE PUBLIC

The following table reflects questions submitted by the public that were addressed by the Panel.

Table 4-1: Public Questions Addressed by the Panel

No.	Question	Submitted	Panel Response
Topic: Health Effects			
P-2.1	What long-term (20 years or more) studies have been conducted to determine health effects on vulnerable segments of the population?	Written comment at Meeting #2 (Anonymous)	<p>There have been a few studies in Windhoek, Namibia, which has operated a direct potable reuse (DPR) system since 1969, and in Los Angeles, California, where tertiary-treated water has been spread at the Montebello Forebay since 1962. The results of those studies indicated that there were no adverse health effects resulting from these projects. An epidemiological study on water created by Pure Water Soquel would be unproductive because the water is purer than most drinking water sources and the risks, if any, would be minute and undetectable, based on what we know about toxicology and chemistry.</p> <p>The Panel notes that low-risk epidemiology is difficult because the process is not sensitive for detecting very low and perhaps hypothetical risks. A good experimental design requires an exposed group and a control group, but it is not ethical to conduct a study in which people are intentionally exposed to a chemical for 20 years to determine if they experience adverse effects. The approved and effective scientific approach to determine human health effects is to study specific chemicals at high doses in test animals, and then to extrapolate over several orders of magnitude of lower dose to determine if these chemicals are harmful at a certain concentration when ingested regularly over a certain amount of time. When animal data or <i>in vitro</i> data help us understand how the chemical acts and what potential sensitive populations might be, that information is included in the development of a “safe dose” estimate. Although not precise, these estimates of doses below a threshold are protective of public health for vulnerable populations with a margin of safety built in. The Panel also notes that the acute risks associated with drinking water are from microbial pathogens, which is why advanced treatment systems include multiple barrier technologies to reduce these risks to negligible levels. Nonetheless, it is advisable to monitor for residual</p>

No.	Question	Submitted	Panel Response
			chemicals in the purified water to determine if any are present in concentrations that may cause a risk to public health.
P-2.2	Approximately how many lives are saved and how many maladies are prevented by implementing the Pure Water Soquel Project versus keeping the present sources?	Written comment at Meeting #2 (Anonymous)	The answer is expected to be “none” because the community’s current water supply is of good quality, and the Project will create water of equal or better quality. The risk to human health from drinking the current groundwater source or advanced treated water is negligible. As long as the advanced treated water meets all drinking water and recycled water regulations, there should be no chemicals present at levels that are of health concern.
P-2.3	Soquel Creek Water District's consultant, Carollo Engineering, has admitted that NDMA cannot be removed in the advanced purification process. This is a carcinogen. What would be the long-term health risks associated with chronic low dose NDMA?	Email (9/26/2017) from Becky Steinbruner	<p>This question appears to be based on a misunderstanding. Although some advanced treatment processes do not degrade NDMA, it can be removed effectively by UV treatment through direct photolysis, which is a requirement of potable reuse in California. The Pure Water Soquel treatment train will include a UV and advanced oxidation process (AOP) that can reliably reduce NDMA concentrations to below 10 ng/l (10 parts per trillion), which is the Notification Level the State of California Division of Drinking Water has assigned and which they believe to be protective of public health. Typical purification system can remove NDMA to a concentration of 5 parts per trillion or less.</p> <p>The misunderstanding appears to have originated from a Carollo presentation on NDMA data from Santa Clara Valley Water District, which documented several occasions over 12 months of pilot testing in which NDMA in the UV effluent was greater than 10 ng/L. The UV reactors at the SCVWD facility that were the subject of the Carollo presentation were not designed for potable reuse, but rather for non-potable reuse, and therefore operated at a fraction of the dose used to treat recycled potable water. Properly designed UV reactors consistently achieve removal of NDMA to <10 ng/L and often <2 ng/L.</p> <p>Regarding the question about long-term health risks associated with NDMA: According to the World Health Organization (WHO) Guidelines for Drinking Water Quality, an NDMA concentration of 100 nanograms per liter (ng/L) (or, 100 parts per trillion) in drinking water was estimated to result in a projected upper-bound lifetime cancer risk of one in 100,000. This estimate was derived from a risk assessment conducted by the Canadian government; the actual risk may be lower. The USEPA’s drinking water regulations consider</p>

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			<p>the lifetime risk of 10^{-4} (or 1 in 10,000) or lower estimated using these methods to be “safe and protective of public health.” Furthermore, the purified water produced by the Project will need to meet California’s NDMA notification level of 10 ng/L, which is even more protective, and in which the lifetime risk for cancer is estimated to be below 10^{-6} (which is 1 in 1,000,000).</p> <p>It is also important to recognize that most of the human dose of small nitrosamine compounds is produced endogenously, meaning they are produced inside the body as part of normal metabolic processes. The WHO initially estimated that as much as 10 percent of the daily human dose of nitrosamines comes from drinking water; however, WHO did not consider the contribution to total dose from endogenous production in this estimation. A later, more refined independent published analysis calculated that when endogenous exposure is accounted for, less than 0.1 percent of the daily human dose comes from drinking water.¹²</p>
P-2.4	What percentage of the local population would be placed at risk by Pure Water Soquel's chronic injection of low dose contaminants?	Email (9/26/2017) from Becky Steinbruner	See response to P-2.1
Topic: Feasibility			
P-3	Does the Panel think this is an effective solution for a supplemental supply to the region, considering all alternatives?	Email (9/26/2017) from Becky Steinbruner	Based on the reports and presentations provided by the District, the tour of sites relevant to the Project, and the Panel's experience with recycled water n other locations, the Panel concludes that the concept of indirect potable reuse using groundwater replenishment as proposed for the Project is a plausible and feasible option from the perspective of the source water and technology, and that the quality of the water produced will be protective of public health.
Topic: Groundwater Modeling			
P-4.1	How will groundwater residence time be determined between injection and recovery for public water supply?	Written comment at Meeting#2 from Larry Freeman	For planning and permitting, a computer model that simulates groundwater flow and transport through aquifer system will be used to estimate the residence time of groundwater between the injection and extraction

¹² Steve E. Hrudey, Bull, R.J., Cotruvo, J.A., Paoli, G., and Wilson, M. “Drinking Water as a Proportion of Total Human Exposure to Volatile N-Nitrosamines.” *Risk Analysis*, Vol. 33, No. 12, 2013, pp.2719-2208.

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			locations. Per state regulations, these estimates will need to be verified by a tracer test prior to or during the initial operations of the Project.
P-4.2	Are CECs degraded as the purified water moves through the aquifer? How much time/travel distance is required for the degradation?	Written comment at Meeting #2 (Anonymous)	<p>The simplest mechanisms to dissipate minimal amounts of CECs that might survive the treatment process include: dilution with other groundwater, sorption of chemicals to soil, reaction with other chemicals or minerals in the soil or water, and consumption of the chemicals by microbes. Advanced water treatment technologies mimic and speed up these natural processes to purify water, and do it more quickly and efficiently.</p> <p>The presentation by Andy Salveson at Meeting #2 listed chemicals that were not detected in advanced treated water. At the Orange County Water District, which operates a similar project, the water is monitored through above-ground engineered treatment and, subsequently, in the aquifer using monitoring wells located between (1) the points of recharge/injection and (2) extraction by drinking water supply wells. CEC detections related to the presence of recycled water at monitoring wells are rare.</p>
Topic: Monitoring			
P-5.1	As new CECs continue to emerge, how can this project keep pace with ensuring they are monitored and removed to safe levels prior to recharging the aquifer(s)?	Written comment at Meeting #2 from Larry Freeman	<p>The quality of water produced by advanced systems is significantly better than the quality of water that comes from most conventional surface water supplies. Conventional treatment processes for billions of people around the world do not include these technologies. The advanced treated water contains fewer disinfection byproducts (DBPs) and other contaminants than treated water from traditional source waters, such as rivers. Keeping pace with CECs is a challenge because new chemicals are introduced into commerce regularly; however, these chemicals do not require unique treatment technologies. Treatment technologies do not pinpoint one specific chemical; rather, they are designed to remove whole categories of chemicals that have certain physical and chemical properties that we recognize and understand. It is not necessary to measure every chemical every day, but rather to monitor the treatment process to ensure it functions as designed.</p> <p>In addition, there is existing research around the world, including work on analyzing unique and unknown chemicals in raw sewage. For example, in Singapore, which uses advanced treated water as a municipal water supply, efforts are underway to develop analytical techniques to identify new</p>

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			<p>unknown compounds in raw sewage and in the finished water. At the NSF-funded Reinventing the Nation's Urban Water Infrastructure (ReNUWit) research center, researchers are analyzing the composition of what is left in the water, at extremely low concentrations, after advanced water treatment processes. Researchers and water managers are motivated to apply the latest science to ensure that public health is protected. If new methods can be developed to identify every compound that is present in purified water, then we should and will; however, there is no reason to believe that current practices and methods are not protective of public health.</p> <p>Finally, most chemicals found at very low concentrations in advanced treated water are likely simple common compounds, like acetic acid (vinegar), that are small enough to get through reverse osmosis membranes, but are innocuous. Large molecules such as pharmaceuticals are removed and destroyed during the advanced treatment process.</p>
P-5.2	After injection, how will the groundwater quality be best monitored prior to additional treatment for delivery to customers?	Written comment at Meeting #2 Larry Freeman	California regulations that govern potable water require quarterly testing at a minimum of two monitoring wells between the point(s) of recharge/injection and extraction for drinking water.
Topic: Pathogens			
P-6.1	Please address the recent Australian study showing a bacterial glue forming over time in RO membranes that cannot be removed by standard cleaning process.	Written comment at Meeting #2 (anonymous)	<p>The study was conducted by researchers at Murdoch University, who examined bacteria on RO membranes at a full-scale ocean desalination plant after 7 years of operation. The researchers found that the biofouling community was made up of <i>Proteobacteria</i>. In a low-nutrient environment such as seawater, <i>Proteobacteria</i> produce polysaccharides that form a strong glue-like substance. The bacteria are unlikely to behave in the same manner in the high-nutrient environment of the source water for the AWTP. The phenomenon is well known in many microbial environments, and pretreatment and disinfectants are applied to eliminate that problem. The membranes are routinely flushed and disinfected to control buildup of both biofilms and solids.</p> <p>From a practical standpoint, the Orange County Water District (OCWD) operates membrane treatment with a low-level chloramine residual, which is the standard industry practice to prevent biofouling. It is common practice to monitor feed pressure and salt passage to determine when a membrane</p>

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			<p>should be cleaned. The maintenance schedule includes a chemical cleaning every 6 to 12 months to remove the buildup of biofilms and mineral scale. By following regular cleaning intervals, the efficiency of the membranes can be maintained throughout a lifetime of use.</p>
P-6.2	<p>A recent review article by Gerba, Betancourt, and Kitajima on the problem of virus loads in recycled wastewater notes a number of factors that influence concentration of viruses in wastewater, including seasons of the year, times of the day, whether there is a viral outbreak in the community, and so on. This study also recommends against grab sampling as a reliable sampling method and warns us about the dangers of emerging viruses. The authors conclude that "an additional 2- to 3-log reduction of viruses above current recommendations may be needed to ensure the safety of recycled water" (Gerba, Charles P., Walter Q. Betancourt, and Masaaki Kitajima. (2017) How Much Reduction of Virus Is Needed for Recycled Water: A Continuous Changing Need for Assessment? Review. <i>Water Research</i>. 108:25-31.) Do you concur with their assessments? What is your recommendation to the Soquel Creek Water District to ensure safety from viruses found in sewer water?</p>	<p>Email (9/27/2017) from Jude Todd</p>	<p>The article by Gerba et al. (2017) raises good questions that should continue to be addressed by researchers and water professionals. The California State Water Resources Control Board has already recommended that additional research be conducted to improve the estimates of virus risks for direct potable reuse (DPR). This analysis is important for building confidence in DPR, which does not rely on an environmental buffer (e.g., the aquifer). Nonetheless, the Panel is familiar with the calculations and assumptions used to determine the log removal requirements for groundwater replenishment projects, which involve several conservative assumptions, and believes that these existing regulations are protective of public health. For example, the current regulations assume the concentration of viruses in the raw sewage is $10^5/L$. Only one of the six samples in Table 4 of Gerba et al. is above this concentration. Actual virus concentrations have been shown to vary dramatically, and high concentrations only occur periodically. Thus, assuming a constant concentration of $10^5/L$ is likely to be quite conservative. Future design considerations by the District will include log removal requirements for viral pathogens in accordance with the State of California's regulations. The District should determine whether it can gain additional log reduction credits for travel time within the ground after the injection of purified water, or whether it plans to meet LRVs strictly through advanced water treatment prior to injection. Viruses are relatively easily controlled by water treatment. They are readily killed or denatured by common disinfectants like chlorine, ozone, chlorine dioxide, and UV radiation. Viruses are very large organic chemicals, so they also are removed by RO and similar membranes.</p> <p>Notably, the study published by Gerba et al. focuses on alternative viral surrogates and pathogens. While this study does point out important sampling design considerations for future consideration, it is likely that microbiological monitoring will always rely on surrogates and indicators due to the inability to detect pathogens at a level that is representative of the protection of public health. The higher concentrations presented in Gerba's study are from molecular-based data (DNA or RNA) of the target</p>

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			microorganisms, and not from culture-based information; therefore, it is difficult to say what proportion of the detected virus(es) was living or dead and the implications of such information on public health protection. A recent study published by Chang et al. (2017) in <i>Environmental Science and Technology</i> (Issue 51 (11), pp 6185–6192) concluded that using short amplicon qPCR (i.e., short gene sequences) provides a conservative estimate of target mitigation with treatment (UV disinfection).
Topic: Plant Operations			
P-7.1	Are there cases in existing purification plants where there has been a failure of the system? Did this result in contaminated water entering the aquifer?	Written comment submitted at Meeting #2 (anonymous)	In all cases with potable reuse projects like this, there are measures in place to divert off-specification water to a different location. It is a planned scenario. In addition, the answer to this question depends on what is considered a “failure” or “contamination.” Many systems and sensors are in place to prevent treatment failures, and they work. The OCWD GWRS system has not had a situation in which there was a failure and contaminated water went into the aquifer. When OCWD’s previous Water Factory 21 was still in operation, there was documented occurrence of NDMA, a known carcinogen that is not removed well by reverse osmosis membranes, in the treated water and nearby groundwater. At that time, the project did not include UV treatment. OCWD then proceeded to characterize NDMA in the treatment plant and groundwater, and found one drinking water well that was affected. To remedy the issue, supplemental UV treatment was installed on that well. California’s current regulations for the treatment of recycled water were modified based on this experience from 17 years ago. The recently released <i>World Health Organization Guidelines for Potable Reuse</i> provides a methodology for managing reuse projects to ensure protection of public health. The document is available online for free at: http://www.who.int/water_sanitation_health/publications/potable-reuse-guidelines/en/ .
P-7.2	What failsafe procedures can be put in place post-treatment process to ensure that water quality will be maintained even in case of catastrophic treatment failures?	Written comment submitted at Meeting #2 from Carla Christensen, Soquel Creek Water District	Online processes at facilities are used to prevent failures from happening. Also, the District will be required to monitor groundwater prior to its extraction for potable use, so there will be opportunities to detect any off-specification water before it enters distribution. In addition, publicly available WHO Water Safety Plan Manuals provide step-by-step guidelines for risk management for drinking-water suppliers, including a management strategy to ensure failsafe operation.

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Topic: Regulations			
P-8.1	Does the Panel consider the 2013 California Recycled Water Policy regarding indirect potable reuse (IPR) to be adequately protective of public health? That policy requires monitoring just six indicator chemicals (N-nitrosodimethylamine, 17beta-estradiol, caffeine, triclosan, DEET, and sucralose).	Email (9/27/2017) from Jude Todd	Yes, the Panel considers the 2013 California Recycled Water Policy for groundwater recharge to be adequately protective of public health, and the indicators from the policy represent one of many monitoring requirements in California. The requirements were developed by a group of experts in water treatment and public health using information available at that time, with the intent of representing the range of physico-chemical properties of unregulated contaminants potentially in recycled water. The 2013 Recycled Water Policy CEC monitoring requirements are being reviewed and updated by the State Water Board through an expert panel. Also, the State's Final GRPP regulations adopted in 2014 contain additional requirements for monitoring regulated and unregulated contaminants.
P-8.2	If the Panel does not believe that the monitoring required by the California Recycled Water Policy is adequate, what does the Panel consider to be a sufficiently protective list of indicator chemicals for IPR?	Email (9/27/2017) from Jude Todd	The Panel does not believe that additional monitoring is needed beyond that already specified by the regulations. Also, as stated in P-8.1, there is already an ongoing CEC Panel convened by the State Water Resources Control Board, which will continue to evaluate any CECs that arise in recycled water.
Topic: Research			
P-9	What was the funding source for the 1975 and 2017 WHO studies and reports?	Written comment at Meeting #2 (anonymous)	The Singapore Public Utilities Board sponsored much of the 2017 WHO potable reuse guidance. The WHO does not accept money from organizations with commercial interests in the outcome. Projects like the WHO guidance documents are usually funded by several national governments in need of guidelines. The 2017 WHO Guidelines mentioned above are available online at http://www.who.int/water_sanitation_health/publications/potable-reuse-guidelines/en/ .
Topic: Sea Level Rise			
P-10.1	Given that the Santa Cruz Wastewater Treatment Plant is situated on a flood plain and sea level is rising and expected to continue rising in the coming years, do you think that having Soquel Creek Water District's drinking water depend on that facility for source water is advisable?	Email (9/27/2017) from Jude Todd	The influence of sea level rise and climate change will be considered in evaluating the feasibility and reliability of the project and locations for the treatment facilities.

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P-10.2	If Santa Cruz wastewater treatment needed to be relocated in the not-too-distant future, would it be advisable for Soquel Creek to invest in building pipelines from the existing location to their advanced wastewater treatment plant (or to build their plant adjacent to the existing wastewater treatment facility, which is one scenario that may be under consideration)? To what extent do you see the location of the source water treatment plant to impact Pure Water Soquel's potable water reliability?	Email (9/27/2017) from Jude Todd	The AWTP will be designed to produce purified water efficiently and reliably. The reliability of any AWTP depends on various factors, some of which are beyond the control of the project owner. The Panel feels strongly that the District and Project Staff have the expertise to determine the best option for locating or relocating the AWTP and operating it to produce a reliable source of potable water that will be protective of public health over a long time horizon, so that relocation should not be an issue in the future.
Topic: Soil Analysis			
P-10.3	What were the soil depths explored for the geological studies to explore aquifer chemistry? Why weren't the proposed injection sites sampled? (I understood that is to come soon.)	Written comment at Meeting #2 (anonymous)	Composite soil samples were collected over the range of 20- to 920-feet below grade for the geochemical analysis. No soil cuttings are available for the proposed injection sites because no wells have been drilled at those locations yet. If the District decides to move ahead with this project, then the geochemical analysis will be conducted on samples of soils collected during the drilling of the new wells.
P-10.2	How would reliable and representative soils samples be taken at proposed injection sites for indirect potable reuse?	Email (9/26/2017) from Becky Steinbruner	Government agencies, including the USEPA, US Army Corp of Engineers, and US Geological Survey, publish guidelines, templates, and examples of sample and analysis plans (SAPs). These SAPS adhere to well-established standards for procedural and analytical requirements for projects that require the collection of water, soil, sediment, or other samples to characterize the geological, hydrogeologic, chemical, geochemical, and/or other nature of an area. A SAP generally combines elements of a Field Sampling Plan (FSP) and a Quality Assurance Project Plan (QAPP) to ensure that: (a) samples are collected in a manner that is methodical and will accurately represent environmental conditions at the site, and (b) the laboratory analysis is conducted according to industry standards to ensure that analytical equipment operates as designed to produce reliable results.
Topic: Treatment Reliability			

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P-11	What can be done to add protections in to the treatment system in case of a system failure? If there is a break in microfiltration or reverse osmosis, how quickly could it be identified, and how could groundwater replenishment be stopped before contaminated water enters the groundwater?	Written comment at Meeting #2 (Tom LaHue, Soquel Creek Water District)	Online sensor technology is available to allow water managers the ability to control the treatment process in real time to ensure the process is working as intended. There are specific monitoring technologies for each process in the proposed Project treatment train (MF, RO, and UV-AOP). For example, with OCWD's GWRS project, if the required UV dose is not provided for pathogen disinfection, the plant automatically shuts down. Facilities can be designed, engineered, and operated to limit opportunities for failure and ensure processes operate as intended.
Topic: Water Quality (Constituents of Emerging Concern)			
P-12.1	You cannot test for every CEC. Are there classes of CECs that are tested that give confidence that CECs not tested for would be removed by purification?	Written comment a Meeting #2 (anonymous)	Yes, absolutely, classes of chemicals can be used to test for a range of CECs. Chemicals are characterized according to their physical and chemical properties, which dictate how they will respond to each treatment technology. Specific chemicals are then monitored as "indicators," meaning they indicate how well other chemicals in the same category are being removed by the treatment system. These indicators also are chosen because they are commonly present in the pre-treated water, which is necessary to determine how well they are removed by treatment. Before a project can be permitted, the project proponents must generate a list of site-specific compounds to use as indicators; these compounds are selected based on the treatment processes employed and the monitoring that has occurred.
P-12.2	Some 120,000 chemicals are registered, but the presentation seemed to show only a reactive few. Do these few chemicals account for 100 percent of the plant's non-H ₂ O output? If not, what percent?	Written comment a Meeting #2 (anonymous)	<p>There are likely some chemicals present in trace amounts in the plant's output, but the amounts are so small that they are not detectable or quantifiable with current methods. The fact that improved analytical methods now allow the detection of minute amounts of chemicals in water does not mean that these chemicals are a risk. Based on our understanding of the toxicity of similar chemicals, these trace levels would be below the levels that cause human health risk. Rather than attempting to detect every chemical in the output, the best way to protect human health is to monitor for "indicator" chemicals that ensure the removal of groups of chemicals based on their physical and chemical properties, as described in 12.1.</p> <p>It is important to note that people are exposed to chemicals all the time, such as pesticides, pharmaceuticals, and thousands of other products, mostly in the diet and inhaled air. Water is not unique in this issue, and treated drinking water may be the purest product that people are exposed to with respect to chemical presence. The job of water managers and researchers is</p>

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			to be proactive in implementing monitoring programs and to continually work to inform, update, and review these programs.
Topic: Water Quality (Disinfection Byproducts)			
P-12.3	What, if any processes short of Pure Water Soquel can be used to remove (or prevent) disinfection byproducts?	Written comment at Meeting #2 (anonymous)	There are several ways to reduce disinfection byproducts (DBPs) in treated water. Disinfecting the water with chloramine rather than free chlorine is one way to prevent some from forming. Once DBPs are formed, treatments – including granular carbon or RO, or more UV – can be used to remove them. Determining how to proceed is a matter of whether there is a significant risk to manage and how much money should be spent to ensure they are removed. The United States has been the most diligent at regulating and managing DBPs in water.
P-12.4	Could purified water help to reduce disinfection byproducts?	Written comment at Meeting #2 (Catherine Borrowman, Natural Resources Communications)	Yes, it is likely that the levels of organic carbon in the purified water will be lower than those in the natural groundwater, which could result in lower concentrations of disinfection byproducts. Advanced treatment removes some disinfection byproducts, and not all advanced treatment processes include chlorination, which can generate disinfection byproducts.
Topic: Water Quality (Purified Water)			
P-12.5	Have the LA area projects resulted in improvement in overall water table and/or salt water intrusion?	Written comment at Meeting #2 (anonymous)	Yes, the Southern California projects have resulted in overall improvements to the water table and/or saltwater intrusion, as well as help insulate the aquifer from the seasonal and drought conditions and reduce reliance on purchased imported water. OCWD has a functional seawater barrier because purified recycled water is available for injection into the barrier wells. Without recycled water, OCWD would need to import water to inject into the groundwater basin, which would cost more and potentially be less reliable. Plus, while both supplies meet drinking water standards, the recycled water is of equivalent or superior quality due the higher level of treatment it receives. OCWD's project provides a local, reliable source of high-quality water that keeps the basin sustainable.
P-12.6	How would contaminant levels of aquifer areas surrounding the indirect potable reuse injection wells be monitored for bacterial and chemical changes? How would this information be reported to the public, at what thresholds, and how often?	Email (9/26/2017) from Becky Steinbruner	Soquel Creek would be required to produce quarterly and annual reports detailing the results of required groundwater monitoring for both chemical contaminants and bacterial indicators. These regulatory reports are publicly available documents.

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P-12.7	If purified water is replenishing the groundwater basin, could this help with the arsenic problem by diluting the water with naturally occurring levels in it?	Written comment at Meeting #2 (Catherine Borrowman, Natural Resources Communications)	Yes, the injected purified water would reduce levels of chemicals in the groundwater by dilution. Also, because naturally occurring arsenic in the subsurface potentially could be mobilized by the injection of raw advanced treated water, the District will conduct post-treatment conditioning of the purified water to minimize the potential for the mobilization of arsenic. If mobilization occurs, it would be temporary.
Topic: Water Quality (Source Water)			
P-12.8	If Pure Water Soquel used Santa Cruz's treated drinking water (from Graham Hill) instead of secondarily treated wastewater, how much better or worse would the CEC outputs be?	Written comment at Meeting #2 (anonymous)	If you directly compared the CECs in the current drinking water supply and in advanced treated recycled water, the Project (advanced water treatment process, or AWT) water quality would be equivalent or superior to the current supply, depending on the specific parameter, due to its greater level of treatment. Both the conventional and AWT supplies would easily meet drinking water standards. If you treated both "normal" tap water and recycled water with AWT, the resulting water quality would be comparable, regardless of the quality of the source water.

APPENDIX A: PANEL BACKGROUND

About NWRI

For more than 20 years, NWRI – a science-based 501c3 nonprofit located in Fountain Valley, California – has sponsored projects and programs to improve water quality, protect public health and the environment, and create safe, new sources of water. NWRI specializes in working with researchers across the country, such as laboratories at universities and water agencies, and is guided by a Research Advisory Board (representing national expertise in water, wastewater, and water reuse) and a Board of Directors (representing water and wastewater agencies in Southern California).

Through NWRI's research program, NWRI supports multi-disciplinary research projects with partners and collaborators that pertain to treatment and monitoring, water quality assessment, knowledge management, and exploratory research. Altogether, NWRI's research program has produced more than 300 publications and conference presentations.

NWRI also promotes better science and technology through extensive outreach and educational activities, which includes facilitating workshops and conferences and publishing White Papers, guidance manuals, and other informational material.

More information on NWRI can be found online at www.nwri-usa.org.

About NWRI Panels

NWRI also specializes in facilitating Independent Advisory Panels on behalf of water and wastewater utilities, as well as local, county, and state government agencies, to provide credible, objective review of scientific studies and projects in the water industry. NWRI Panels consist of academics, industry professionals, government representatives, and independent consultants who are experts in their fields.

The NWRI Panel process provides numerous benefits, including:

- Third-party review and evaluation.
- Scientific and technical advice by leading experts.
- Assistance with challenging scientific questions and regulatory requirements.
- Validation of proposed project objectives.
- Increased credibility with stakeholders and the public.
- Support of sound public-policy decisions.

NWRI has extensive experience in developing, coordinating, facilitating, and managing expert Panels. Efforts include:

- Selecting individuals with the appropriate expertise, background, credibility, and level of commitment to serve as Panel members.
- Facilitating hands-on Panel meetings held at the project's site or location.
- Providing written report(s) prepared by the Panel that focus on findings and comments of various technical, scientific, and public health aspects of the project or study.

Over the past five years, NWRI has coordinated the efforts of more than 30 Panels for water and wastewater utilities, city and state agencies, and consulting firms. Many of these Panels have dealt with projects or policies involving groundwater replenishment and potable (indirect and direct) reuse. Specifically, these Panels have provided peer review of a wide range of scientific and technical areas related water quality and monitoring, constituents of emerging concern, treatment technologies and operations, public health, hydrogeology, water reuse criteria and regulatory requirements, and outreach, among others.

More information about the NWRI Independent Advisory Panel Program can be found on the NWRI website at www.nwri-usa.org/panels.htm

APPENDIX B: INDEPENDENT ADVISORY PANEL MEMBER BIOGRAPHIES

Channah Rock, Ph.D. (Panel Chair). Channah Rock serves as a Water Quality Extension Specialist and Associate Professor in the Department of Soil, Water, and Environmental Science at the University of Arizona. Her research interests include microbiology, molecular biology, and wastewater treatment. She evaluates water quality for the protection of public health and promotes water reuse as a safe and practical resource. Her background in both microbiology and civil and environmental engineering has focused her work on understanding the factors that influence the survival of pathogens through water treatment and their persistence in the environment. Rock received a B.S. in Microbiology from New Mexico State University and an M.S. and Ph.D. in Civil and Environmental Engineering from Arizona State University. She conducted post-doctoral research at the U.S. Department of Agriculture's Agricultural Research Service.

Joseph Cotruvo, Ph.D., BCES. Joe Cotruvo is President of Joseph Cotruvo & Associates, an environmental and public health consulting firm in Washington, DC, and is active in the World Health Organization (WHO)/National Science Foundation (NSF) International Collaborating Centre for Drinking Water Safety and Treatment. Previously, he served as director of the Criteria and Standards Division of the U.S. Environmental Protection Agency (USEPA) Office of Drinking Water, where his organization developed the Drinking Water Health Advisory System and numerous National Drinking Water-Quality Standards and Guidelines. He directed the USEPA's Risk Assessment Division and was a former vice president for Environmental Health Sciences at NSF International. He is a member of the WHO Drinking Water Guidelines development committees, and led the recently published monograph, "Desalination Technology: Health and Environmental Impacts." He also led studies on bromate metabolism through the American Water Works Association Research Foundation and on recycled water contaminants for the WaterReuse Foundation. In addition, he chaired the Water Quality and Water Services Committee of the Board of Directors of the District of Columbia Water and Sewer Authority. Cotruvo also chaired the WaterReuse Association National Regulatory Committee. He received a B.S. in Chemistry from the University of Toledo and a Ph.D. in Physical Organic Chemistry from Ohio State University, and is Board Certified in Environmental Sciences.

Jason Dadakis, PG, CHG. Jason Dadakis is Executive Director of Water Quality and Technical Resources for Orange County Water District (OCWD) in Fountain Valley, California, where he has worked since 2004. He is responsible for managing regulatory compliance for groundwater recharge activities and recycled water projects, including the Groundwater Replenishment System. He also coordinates and directs water quality monitoring programs and studies for surface water, groundwater, and recycled water. He has experience in the planning, development, and use of groundwater models and tracer tests for resource management and transport analysis. Mr. Dadakis received a B.A. in Earth Sciences from Dartmouth College and an M.S. in Hydrology from the University of Arizona. He is a licensed professional geologist and certified hydrogeologist in the State of California.

Lynne Haber, Ph.D., DABT. Lynne Haber is a Senior Toxicologist and Adjunct Associate Professor at University of Cincinnati's Risk Science Center (RSC). Dr. Haber has more than 20 years of experience in developing risk assessment methods and documents. Prior to joining RSC, she was Associate Director

for Science at Toxicology Excellence for Risk Assessment. She has authored or co-authored nine drinking water criteria documents for EPA's Office of Water. In addition, she is the primary author of more than 30 major documents for federal agencies including the USEPA and the Consumer Product Safety Commission (CPSC), other government agencies, and private sponsors, and was lead author of the noncancer risk assessment chapter for Patty's Toxicology (2001, 2011). Her research interests include mode of action, sensitive populations, and improving extrapolation from animal data. Dr. Haber has served on numerous peer review panels, both as chair and member, including for the RSC, USEPA, CPSC, National Academy of Sciences/National Research Council, and has been an officer of specialty sections in the Society of Toxicology and the Society for Risk Analysis. She is a Diplomate of the American Board of Toxicology, and holds a Ph.D. in Biology from Massachusetts Institute of Technology and a B.S. in Chemistry from University of California, Los Angeles.

Kara Nelson, Ph.D. Kara Nelson is a Professor in Civil and Environmental Engineering and Associate Dean for Equity and Inclusion at the University of California, Berkeley. Her research program addresses critical issues at the intersection of public health and the environment, with a focus on reducing the threat posed by waterborne pathogens by improving our engineering infrastructure to make it more effective, affordable, and environmentally beneficial. Specific research areas include the mechanisms of pathogen inactivation, molecular techniques for pathogen detection, optimization of treatment processes, water reuse, and challenges with providing safe drinking water and sanitation in the developing world. Nelson has published more than 75 articles in peer-reviewed journals, including two invited reviews, and one book chapter. She leads the Engineered Systems Research Thrust at the National Science Foundation Engineering Research Center for Reinventing the Nation's Urban Water Infrastructure (ReNUWIt). Nelson was awarded the Presidential Early Career Award for Scientists and Engineers (PECASE) at a ceremony at the White House in 2004; this award is the nation's highest honor for scientists in the early stages of their career. She received a B.A. degree in Biophysics from University of California, Berkeley, an M.S.E. in Environmental Engineering from the University of Washington, and a Ph.D. in Environmental Engineering from University of California, Davis.

Gordon Thrupp, Ph.D., PG, CHG. Gordon Thrupp is a senior hydrogeologist at Geosyntec Consultants in San Francisco, California, and has more than 30 years of experience providing hydrogeological consulting services, including developing groundwater flow models, designing wells and hydraulic testing programs, and directing environmental investigations. Thrupp has developed, applied, and reviewed groundwater models for many water resources and engineering design applications, including: evaluating groundwater resource capacity; assessing hydraulic connection between surface water and groundwater; investigating the potential for contaminant migration and sea water intrusion; designing hydraulic containment alternatives; locating and designing municipal supply wells and coastal margin subsurface intakes; designing sewage and groundwater infiltration basins; assessing impact of open-pit mines on groundwater systems; and predicting groundwater seepage rates into excavations for dewatering feasibility studies. He received a B.S. in Geology from Stanford University and a Ph.D. in Earth Sciences from the University of California, Santa Cruz.

APPENDIX C: PANEL MEETING #2 ATTENDEES

Panel Members

- Chair: Channah Rock, Ph.D., University of Arizona
- Joseph Cotruvo, Ph.D., BCES, Joseph Cotruvo & Associates
- Jason Dadakis, PG, CHG, Orange County Water District
- Kara Nelson, Ph.D., University of California Berkeley
- Gordon Thrupp, Ph.D., PG, CHG, Geosyntec Consultants

National Water Research Institute

- Kevin Hardy, Executive Director
- Dawna Hernandez, Events Coordinator
- Suzanne Sharkey, Water Resources Scientist and Project Manager
- Gina Vartanian, Communications Manager

Pure Water Soquel Project Team

- Taj Dufour, Soquel Creek Water District
- Ron Duncan, Soquel Creek Water District
- Lydia Holmes, Carollo Engineers
- Rebecca Rubin, Soquel Creek Water District
- Eileen Eisner-Streller, Soquel Creek Water District
- Andrew Salvesson, Carollo Engineers
- Melanie Mow Schumacher, Soquel Creek Water District
- Sunny Wang, Brown and Caldwell

Audience Members (from sign-in sheet)

- Catherine Borrowman, Natural Resources Communications
- Vai Campbell, Soquel Creek Water District
- Carla Christensen, Director, Soquel Creek Water District
- Larry Freeman, Public member subcommittee, Soquel Creek Water District Supply H2O
- John Henderson, Operations Supervisor, Soquel Creek Water District
- Anne Hogan, Engineer, City of Santa Cruz Wastewater Treatment Facility
- Carla James, Water Quality Program Coordinator, Soquel Creek Water District
- Jan Karwin (no affiliation provided)
- David Kehn, Engineer, Santa Cruz Water Department
- Jim Kerr, Board Member, MGA
- Christine Mead, Operations and Maintenance Manager, Soquel Creek Water District
- Jerome Paul, MSEE Retired, Member, Water for Santa Cruz County
- Dan Seidel, Wastewater Treatment Facility Superintendent, City of Santa Cruz Wastewater Treatment Facility
- Becky Steinbruner, Citizen, Member, Water for Santa Cruz County

Tour of the Proposed Locations for Pure Water Soquel Project

Tuesday, September 19, 2017

Time	Place
3:30 pm	Santa Cruz Wastewater Treatment Facility Tour with Anne Hogan, PE - City of Santa Cruz 110 California St, Santa Cruz, CA 95060 (proposed option for AWTF facility) 30 minutes
4:30 pm	Drive by Chanticleer Site 2505 Chanticleer Avenue, Santa Cruz, CA 95062 (proposed option for AWTF facility) Stop or drive by (do not have access to site)
5:00 pm	Tour of Soquel Creek Water District Headquarters/West Annex Site 5180 Soquel Dr., Soquel CA 95073 (proposed option for AWTF facility) 30 minutes

If time allows, District Staff will drive the Panel members to the locations of three of the proposed recharge well sites

Independent Advisory Panel for Soquel Creek Water District's Pure Water Soquel Project

Agenda

September 20, 2017

Location	Contacts
Capitola City Hall 420 Capitola Avenue Capitola, CA 95010	Kevin Hardy (NWRI) (760) 801-9111 (mobile) Suzanne Sharkey (NWRI) (714) 378-3278 (office) (949) 258-2093 (mobile)

Meeting Objectives:

- Present the NWRI Independent Advisory Panel to the Soquel Creek Community
- Describe the challenges of maintaining adequate drinking water supplies in Santa Cruz County
- Address frequently asked questions related to purified water and potable reuse
- Provide an opportunity for community members to ask questions about Pure Water Soquel
- Allow time for the Panel to meet in a closed session to discuss the water quality results and begin drafting recommendations

**CLOSED SESSION begins at 8:30 am in the Community Room adjacent to the Council Chamber.
Attended by Panel, Project Team, and NWRI.**

8:15 am	Continental breakfast provided	
8:30 am	Welcome and Introductions	Kevin Hardy, NWRI
8:45 am	Review agenda and meeting objectives	Channah Rock, Panel Chair
9:00 am	Discuss presentations to be delivered by Soquel Creek Project Team and Panel during the meeting	Moderated by Kevin Hardy
9:30 am	Discuss FAQs that may be asked of the Panel during the public meeting	Moderated by Kevin Hardy

OPEN SESSION begins at 10:00 am in Council Chamber Room. Attended by Panel, Project Team, NWRI, and members of the public.

10:00 am	Welcome and Introduction of the Independent Panelists and NWRI's Advisory Process	Kevin Hardy, Executive Director, NWRI
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10:30 am	Why Pure Water Soquel? Perspectives from District Water Resource Managers	Melanie Mow Schumacher, P.E., Special Project-Communications Manager, Soquel Creek Water District
10:45 am	Exploring Key Public Health and Water Quality Issues Related to Potable Reuse and Pure Water Soquel	Sunny Wang, P.E., Brown and Caldwell (District consultant) Andy Salveson, P.E., Carollo Engineers (District consultant) Kara Nelson, Ph.D., University of California, Berkeley (Panel)
12:00 pm	Public Questions & Answers	Facilitated by Kevin Hardy, NWRI
1:00 pm	PUBLIC MEETING ADJOURNS	

WORKING LUNCH begins at 1:00 pm in the Community Room adjacent to the Council Chambers. Attended by Panel, Project Team, and NWRI.

CLOSED SESSION begins at 1:30 pm. Attended by Panel and NWRI.

3:30 pm	Panel debriefs Project Team
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4:00 pm	PANEL MEETING ADJOURNS
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APPENDIX E: PUBLIC QUESTIONS ADDRESSED BY SOQUEL CREEK WATER DISTRICT STAFF AND THE CONSULTANT TEAM (CAROLLO/BROWN AND CALDWELL)

Table E-2: Questions from the Public to be Addressed by Soquel Creek Water District

Some of the questions submitted contain assumptions and assertions that are not completely accurate. The District and its consultants have responded to each question with relevant facts and data to address the public’s concerns as thoroughly as possible.

No.	Question	Submitted	District Response
Topic: Consumer Confidence			
D-1	Soquel Creek Water District’s consultant, Carollo Engineering, has admitted that NDMA cannot be removed in the advanced purification process. This is a carcinogen. What would be the long-term health risks associated with chronic low dose NDMA? How would Soquel Creek Water District convey that information to its customers and surrounding Aquifer users?	Email dated 9/26/2017 from Becky Steinbruner	The District’s consultant was referring to another agency’s demonstration facility (that did not include UV process). With the proposed Pure Water Soquel project, the full advanced treatment process would include UV-AOP. NDMA is well removed by purification, with ~35% removal by RO and 90%+ removal by the final UV system (the UV-AOP). The UV system would be designed to whatever dose is necessary to get NDMA below regulated levels. State of California Division of Drinking Water has assigned a Notification Level of 10 parts per trillion for NDMA, a level they believe to be protective of public health. Typical purification system designs drop NDMA to <5 parts per trillion.
Topic: Costs			
D-2.1	Pure Water Soquel is expensive and uses a lot of energy. However, it appears to yield such good water quality that some would say it is overkill. What cost-savings measures/modifications could be opted for so as to slightly lessen the overkill?	Written comment at Meeting #2 (anonymous)	Water supply projects, whether surface water transfers, desalination, or purified water, are costly due to the technical/environmental evaluation and capital costs to construct. The quality of water produced from the purification process would be designed to meet the state/federal water quality regulations for groundwater recharge. Also, the Pure Water Soquel project has been designed to use secondary treated effluent as the source water rather than untreated wastewater in order to reduce energy and capital costs. The District is also considering grants and low interest loans as funding options in order to control costs.
D-2.2	This technology is expensive to build and maintain, but must operate perfectly to ensure safe water. How can the public afford this expensive water when already many in this area are unable to pay their water bills?	At meeting. Becky Steinbruner.	The District is considering grants and low interest loans as funding sources to reduce the implementation costs of the proposed Pure Water Soquel project and thereby reduce costs to ratepayers. The District agrees that a new water supply project will not be inexpensive. However, the District’s sole source of water is a critically overdrafted groundwater basin with seawater intrusion at the coastline, and therefore must move forward with diversifying its water supply portfolio and developing a new supply. This new supply is essential for resiliency, environmental stewardship, and reliability. In addition, the Pure

No.	Question	Submitted	District Response
			Water Soquel project will protect existing drinking water wells from seawater contamination is invaluable.
D-2.3	At the Panel Meeting, Dr. Nelson and Dr. Cotruvo both expressed some hesitation regarding the relatively small size of the Soquel Creek Water District and cost effectiveness of an advanced water treatment process, and also the ability of the District to effectively manage such a highly-technical facility. The District already has use rates that are the second-highest in the state, with a 17.5-percent rate increase effective January 1, 2018. Is it really equitable to burden the ratepayers with an expensive water treatment facility and infrastructure in which everything must work perfectly 100 percent of the time when there are other less-expensive and more readily-available supplies such as river water transfers and Raney Collectors?	Email dated 9/26/2017 from Becky Steinbruner	<p>As AWPf is a proven technology and there are numerous operating systems in California already, we would leverage this knowledge in developing an operational plan for the Pure Water Soquel project. Co-location with existing operations, such as the SCWWTF or SqCWD, could help increase efficiencies. Additionally, an operational services agreement could be an option (similar to West Basin’s AWPf). SqCWD will consider exploring options.</p> <p>In terms of water rates, SqCWD aims to seek outside funding through grants and low-interest loans to help reduce ratepayer costs. The District recognizes that SqCWD’s water bill, approximately ~\$80/month for 7 units (2017), is higher than some other agencies in the area. This is partly because the District has led the management of the basin. Thus, one should not look at cost only, but value provided.</p> <p>In addition, the option of river water projects being evaluated by the City of Santa Cruz is not necessarily less expensive than the Pure Water Soquel Project. Published costs for that option in the City’s Water Supply Advisory Committee report is \$131M (in-lieu) and \$159M (in-lieu +ASR).</p>
D-2.4	What are the cost implications of the Pure Water Soquel project?	Email dated 9/26/2017 from Becky Steinbruner	This information can be found in the Soquel Creek Water District Regional Recycled Water Feasibility Study dated November 2017.
Topic: Energy			
D-3.1	What are the energy requirements of the Pure Water Soquel project? Does the region have the ability to reliably supply clean energy to operate the water treatment plant and all pumps associated with the infrastructure system?	Email dated 9/26/2017 from Becky Steinbruner	This information can be found in the Soquel Creek Water District Regional Recycled Water Feasibility Study dated November 2017.

No.	Question	Submitted	District Response
D-3.2	To what extent does the Pure Water plan take protracted grid failure into account? Is there sufficient off-grid power to run sewer water through the advanced wastewater treatment train, which includes energy-hungry reverse osmosis, for two weeks? Two months? Perhaps longer?	Email dated 9/27/2017 from Jude Todd	The Pure Water Soquel project is for indirect potable reuse to recharge and replenish the groundwater basin and prevent seawater intrusion from moving farther inland. If there is a power grid failure, it is not critical to operate the AWPf or the recharge wells for a period of time until power is restored.
D-3.3	What is your advice regarding the system's reliance on electricity and ways to ensure potable water supply in the event of prolonged grid failure?	Email dated 9/27/2017 from Jude Todd	See response D-3.2 above. The Pure Water Soquel project does not need to operate during power failures. In critical power grid failures, the District would operate generators at drinking water wells and pump station sites, as needed, to ensure potable water supply to customers.
Topic: Environmental Impacts			
D-4.1	What are the effects of the concentrated brine effluent discharge to the Monterey Bay National Marine Sanctuary habitats?	Email dated 9/26/2017 from Steinbruner	The RO concentrate from the AWPf would be conveyed to the Santa Cruz Waste Water Treatment Facility. The SCWWTF discharge shall meet National Pollutant Discharge Elimination System permit limits and requirements.
D-4.2	How would Soquel Creek Water District monitor the immediate and long-term effects of the concentrated brine effluent discharge?	Email dated 9/26/2017 from Becky Steinbruner	See comment D-4.1 above.
D-4.3	How would Soquel Creek Water District monitor the concentrated brine effluent infrastructure for breaches, especially in or near riparian areas and schools? How would the District notify affected neighborhoods and local health and environmental agencies?	Email dated 9/26/2017 from Becky Steinbruner	Any potential breach or break in the brine/RO concentrate line would be handled in a similar way as the County Sanitation or City of Santa Cruz currently handles their collection system breaches.
Topic: Geochemical Study			
D-5	What is recommended for post-treatment of purified water in Soquel given the differences in groundwater basin qualities to minimize mobilization of arsenic? Would you use information from OCWD and Stanford to adjust the purified water?	At meeting. Catherine Borrowman, Natural Resources Communications.	The information presented at the NWRI Panel meeting on September 20, 2017, was the District's first step in characterizing the groundwater aquifer. Additional soil samples may be collected to conduct post-treatment testing and develop the post-treatment regime. Information from OCWD and Stanford will be used as a reference and guide to develop the post-treatment regime.
Topic: Liability			

No.	Question	Submitted	District Response
D-6	What percentage of the local population would be placed at risk by Pure Water Soquel's chronic injection of low dose contaminants? Would Soquel Creek Water District assume all legal responsibility for damages to these at-risk population segments? Would Soquel Creek Water District assume liability for allergic reactions to low dose pharmaceuticals not removed by the advanced water treatment process and injected into the aquifer?	Email dated 9/26/2017 from Becky Steinbruner	As the NWRI Expert Panel stated at the meeting on September 20, 2017, the concentration of low dose chemicals is so low that risks to public health cannot be calculated accurately.
Topic: Miscellaneous			
D-7	What is the percent probability that Pure Water Soquel will be DPR (not IPR) within 6 years?	Written comment at Meeting #2 (anonymous)	Pure Water Soquel is a groundwater replenishment and seawater intrusion prevention barrier project designed to achieve sustainable management of the groundwater basin. At this point, the probability that the Pure Water Soquel project will become DPR is zero. The DPR process is not currently regulated or permitted in California. If the District were to ever consider a DPR project, it would first undertake a new feasibility study and environmental review and involve obtain community input.
Topic: Noise			
D-8.1	What is the decibel level of the advanced purified water process facilities operation (i.e., noise produced)?	Written comment at Meeting #2 (anonymous)	This information will be addressed in the forthcoming draft Environmental Impact Report (EIR) that will be released in Spring 2018.
D-8.2	How would Soquel Creek Water District mitigate the constant and damaging noise of a treatment facility in a residential community, such as is the case with the West Annex location?	Email dated 9/26/2017 from Becky Steinbruner	This information will be addressed in the forthcoming draft Environmental Impact Report (EIR) that will be released in Spring 2018.
Topic: Notification and Communication			
D-9.1	How would Soquel Creek Water District notify all related agencies and marine recreational users/tourists of problems?	Email dated 9/26/2017 from Becky Steinbruner	The Pure Water plant would comply with all local, state, and federal water quality standards. Any emergencies that may arise will be addressed using the guidelines from the District's Emergency Action Plan.
D-9.2	What communication and energy systems would the District use during emergencies	Email dated 9/26/2017 from	Any emergencies that may arise will be addressed using the guidelines from the District's Emergency Action Plan.

No.	Question	Submitted	District Response
	and natural disasters? How would the District notify customers and other area aquifer users of any and all problems with disinfection and testing during emergencies and natural disasters?	Becky Steinbruner	
D-9.3	How would the District and local hospitals and clinics communicate public epidemic contaminant spikes and associated water treatment anomalies with each other and with ratepayers and other aquifer users?	Email dated 9/26/2017 from Becky Steinbruner	Any emergencies that may arise will be addressed in the District's Emergency Action Plan.
D-9.4	How will the District notify other aquifer users (private wells, small water companies) of future contamination problems? Cambria (Community Services District) has had LOTS of problems with this.	Written comment at Meeting #2 (anonymous)	Water quality monitoring results will be published and submitted to the State Water Resources Control Board. The District will address emergencies using the guidelines from the District Emergency Action Plan.
Topic: Operations			
D-10.1	How will the District ensure a 2-month hold time for injected water?	Written comment at Meeting #2 (anonymous)	The District will use a comprehensive Groundwater Model that includes particle tracking. To demonstrate that the actual retention time underground is no less than the required response required time, an added tracer or a DDW-approved intrinsic tracer may be used. In addition, every potable reuse project must have two monitoring wells for each recharge well.
D-10.2	What chemicals are used to treat RO and MF components of the purification process?	Written comment at Meeting #2 (anonymous)	This information is in the Regional Recycled Water Feasibility Study for Soquel Creek Water District (Carollo, 2017).
D-10.3	How does the scale, scope, and level of operator and management expertise of Soquel Creek Water District compare with the City of Cambria, which has been plagued with a high occurrence of administrative and operational problems and violations with penalties imposed by the State Regional Water Quality Control Board?	Email dated 9/26/2017 from Becky Steinbruner	The Cambria Community Services District (CCSD) Sustainable Water Facility (SWF) for indirect potable reuse is a different type of project. The facility pulls brackish water out of the San Simeon Creek Aquifer and treats it through reverse osmosis (RO). Originally called the Emergency Water Supply Project., this project was approved and built as an emergency project without an EIR. Pure Water Soquel cannot be built until the District has completed the EIR process; and, if built, the District would develop an operational plan to be in compliance with the State Regional Quality Control Board Water rules and regulations.

No.	Question	Submitted	District Response
D-10.4	How would the District transport chemicals necessary for cleaning and maintaining the bio-membranes and other components of the advanced water treatment process? Is the proposed transport route one that has been approved by the California Department of Transportation for such hazardous materials?	Email dated 9/26/2017 from Becky Steinbruner	<p>To clarify, the purification process using secondary treated effluent will not require bio-membranes or bio-reactors.</p> <p>The chemicals for the AWPf will be transported by a truck that is specially licensed to carry chemicals and will follow California DMV routing requirements, similar to the District's current operations for chemical deliveries.</p>
Topic: Other Stakeholders			
D-11.1	Local users other than Soquel Creek Water District depend on the Purisima Aquifer for clean, safe potable water. How would these users be considered in relation to the required 2-month retention times of indirect potable use?	Email dated 9/26/2017 from Becky Steinbruner	The District will use a complex Groundwater Model that includes particle tracking. To demonstrate that the actual retention time underground is no less than the required response required time, an added tracer or a DDW approved intrinsic tracer may be used. In addition, every potable reuse project must have two monitoring wells for each recharge well.
D-11.2	How would other users of the Purisima Aquifer be notified of any Pure Water Soquel System failures and/or injection contaminant violations?	Email dated 9/26/2017 from Becky Steinbruner	The Pure Water Soquel system will be designed to include real-time, 24/7 monitoring of water quality and treatment performance. The purified water produced by the Pure Water Soquel system to recharge the groundwater aquifer will meet all drinking water quality requirements. Should any treatment issues arise that may impact water quality, the purification process would be stopped and the purified water would not be used groundwater recharge until the issue is resolved. Any emergencies that may arise will be addressed using the guidelines from the District's Emergency Action Plan.
Topic: Timeline			
D-12	How will the Board work toward making a water supply decision? What does a timeline look like?	Written comment at Meeting #2 (Anne Hogan)	As the District works toward addressing California's mandate of making our groundwater basin sustainable, four water supply options are currently being considered. Each option is currently at a different stage of evaluation and none of them have been implemented yet. The four options to augment our water supply include: (1) developing groundwater replenishment with purified recycled water; (2) purchasing treated surface water from the City of Santa Cruz; (3) purchasing desalinated water from Moss Landing; and (4) developing decentralized groundwater recharge with storm water. The approach is to provide a comprehensive water supply solution that may likely involve a combination of options. It is the Board's intent to complete the environmental review process for the Pure Water Soquel project to better inform the path forward and next steps of design/permitting. The Board will

No.	Question	Submitted	District Response
			review the other options under consideration that could be implemented to meet their goal of having a supplemental water supply on-line by 2022-2023.
Topic: Transparency			
D-13	How would Soquel Creek Water District build trust with its customers and surrounding Aquifer users that they would always alert all parties if there were system problems and contaminant injection violations? The District recently continued to pump from a well known to have three times the draft MCL of 1,2,3-TCP and was not transparent about sharing this information with District customers. The District continued to pump the contaminated water into customer supply lines up until the hour that the Draft MCL was adopted by the State Water Board. One Board member shared with me that the District had to keep pumping from the well or the State would make them abandon it, and it would cost a lot of money to drill a replacement well. Who can trust a water district that uses profit over human health risk to make decisions and is not transparent about that decision-making process? Citizens who ask questions are dismissed and are considered an annoyance for questioning anything. How can we trust the District to be honest and transparent about this highly-technical system that must function well at all times?	Email dated 9/26/2017 from Becky Steinbruner	<p>The District’s mission is to provide a reliable water infrastructure and deliver high-quality, safe water. If the Pure Water Soquel project is implemented, the District would test the water to ensure that it complies with all local, state, and federal standards and meets all required testing/monitoring standards for drinking water.</p> <p>The District has been a recipient of the Transparency Award since 2015 and is committed to being accessible to our customers and providing community outreach. The annual Water Quality Reports are made accessible to all customers.</p> <p>The District is working to address the MCL for 1,2,3 TCP which goes into effect in January 2018. More information can be found here: http://www.soguelcreekwater.org/water-quality/123-trichloropropane-0</p>
Topic: Water Quality (Results)			
D-14.1	Can Andy Salveson explain the percent detect/non-detect graph in his presentation?	Written comment at Meeting #2 (Anne Hogan)	The graph in the presentation explains the approach for percent detect/non-detect. Percent detections refers to the number of CECs detected above the method reporting limit divided by the total number of samples analyzed. For example, if 100 samples were analyzed, and 2 results were a CEC detection, then the total detections were 2%, and the total non-detects were 98%.

No.	Question	Submitted	District Response
D-14.2	Will the small (four-sample) CEC study be enlarged to include more samples taken over a larger composite?	Written comment at Meeting #2 (Anne Hogan)	More testing would be required as part of the final project design.
Topic: Water Quality (Source Control)			
D-14.3	Water quality is a main reason which some Pure Water Soquel advocates have cited for justifying the expenditure of some \$100 million more than an alternative which would use Santa Cruz City Water instead. What specific treatment stages would need to be added as a minimum so that this city water would yield comparable health outcomes to Pure Water Soquel?	Written comment at Meeting #2 (anonymous)	Santa Cruz City Water would need to be treated by three advanced water treatment processes (filtration, reverse osmosis, and UV/AOP to meet the same finished water quality as the Pure Water Soquel project.