Comments on the Draft EIR for PureWater Soquel

My comments on the dEIR address sections 1.1, 4.9, and 7.

1.1 Project Objectives

Among the project objectives are the following:

"Develop an affordable, reliable, and drought-resistant supplemental water source, which contributes to the diversification of the District water supply portfolio and enhances water supply resiliency" (dEIR 1-1)

"Continue to provide District customers with a high-quality and safe water supply" (dEIR 1-1)

I believe that PureWater Soquel (PWS) would not meet these objectives and that conjunctive use (aka water transfers) with Santa Cruz would do a better job of meeting them, as explained below.

Affordability:

The PWS project is significantly more expensive both to construct and to operate than in-lieu water transfers with Santa Cruz. At a recent Soquel Creek Water District Board meeting, wastewater treatment consultants questioned whether such a small district could handle the expense of building and operating a potable reuse system. That was an important question. The actual costs of indirect potable reuse (IPR), including intensive energy use, are very high; the long-term cost of Southern California's IPR systems (construction plus operating costs over 30 years) turns out to be about equal to that of desal (National Resource Council 2012, 162). As energy costs increase in the future, the cost of IPR water will also increase. While any water delivery system uses energy, the PWS project, which requires forcing water through reverse osmosis (RO) membranes, will necessarily be higher than the operational costs of conjunctive use.

Conclusion: The EIR should include total cost comparisons between PWS and both "passive conjunctive use" (in-lieu only) and "active conjunctive use" (in-lieu plus Aquifer Storage and Recovery (ASR)) alternatives.

Reliability, Resiliency, Drought Resistance:

The PWS project would be less, not more, reliable and resilient in the face of droughts, climate change, and other future challenges compared with conjunctive use:

1. Potable reuse works in opposition to water conservation.

Ironically, having a recycled potable reuse system can lead to unnecessary use of water, which would be particularly counter-productive during droughts. This is for three reasons: (1) Having what may seem to customers to be an unlimited water supply could be a disincentive to conserve water. (2) Conserving water inside the home puts less water into the sewers, making sewer water more viscous. But potable reuse requires low viscosity (plenty of water) in the sewers for effective operation (National Research Council 2012, 148). (3) Since the contaminant load in the sewers would remain the same regardless of the amount of water used, the resulting higher density of contaminants would tend to accelerate "the corrosion rate of the conveyance system" (Vo et al. 2014:14). Such circumstances would likely require more water to enter the sewers than would otherwise be necessary.

Conclusion: The EIR should consider the ways that PSR would likely work at cross-purposes to water conservation, thus making District customers more vulnerable to drought. The EIR should compare PWS with conjunctive use in this regard.

2. PWS's heavy energy dependence would make the District water supply especially vulnerable to grid failure.

As indicated above, the PWS is very energy intensive, which would make the District more dependent on the electrical grid. Not only is such high energy use financially expensive, but it would make the District's water supply vulnerable in the event of a massive earthquake or – even more likely – cyber attack on the grid or on the PWS plant itself. Such cyber attacks could happen in various ways, from sabotaging one or more regions of the U.S. to a targeted shut-down of one or more utilities, leaving us without power not just for a few days but potentially for several months. While such scenarios – including the resulting chaos and struggle to meet basic needs for water and food – used to be the stuff of science fiction, they are, unfortunately, quite realistic now, as *New York Times'* national security correspondent David E. Sanger argues in his new book (2018). With co-author Nicole Perloth, Sanger recently updated findings in his book regarding Russian infiltration of the U.S. power grid, noting that U.S. security firms and government officials now regard the 2015 and 2016 Russian attacks on the Ukrainian power grid as:

> …an ominous sign of what the Russian cyber strikes may portend in the United States and Europe in the event of escalating hostilities. Private security firms have tracked the Russian government assaults on Western power and energy operators … since 2011, when they first started targeting defense and aviation companies in the United States and Canada. By … December 2015, the … attacks were no longer aimed at intelligence gathering, but at potentially sabotaging or shutting down plant operations (Perloth and Sanger 2018).

While a prolonged power outage would be extremely challenging for our local community in any case – all water systems require some electricity to operate – we would be safer if our water supply system required less electricity (such as might be generated independent of the grid to operate triaged systems) rather than more. Conjunctive use would rely to some extent on gravitational energy and would not require the massive amount of energy needed to force water through RO membranes.

Conclusion: The EIR must consider the potential impacts of prolonged power-grid outages on PWS as compared with conjunctive use.

3. PWS's hi-tech complexity makes it more vulnerable to factors impacting access to chemicals, replacement filters, and other materials needed to maintain the plant in 24/7 operating condition.

Nowadays, it is not difficult to imagine how tariffs, regional wars, climate changes, cyber attacks, and political shifts and uncertainties could disrupt transportation and availability of chemicals, filters, and other replacement materials for the PWS plant. Such exigencies reduce resiliency and make PWS a poor bet for a safe, reliable water supply. To secure a safe water supply, a system that relies on fewer hi-tech components would be more reliable, thus enhancing resiliency.

Conclusion: The EIR should consider the many downsides to the hi-tech complexity of PWS in comparison to conjunctive use.

Safety:

In addition to the concerns about safety addressed above, I will examine other safety factors of the PWS project in the following section.

4.9 Hazards and Hazardous Materials

The dEIR 4.9.2 defines "hazardous material" to mean, "any material that because of its quantity, concentrations, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment" (dEIR 4.9-1). Yet the dEIR fails to consider whether the effluent from the PWS plant may pose a potential future threat to human or environmental health. The final EIR should be revised in accordance with findings of 21st-century science, which suggest that it could indeed pose such a threat.

Human Health Concerns

The California *2013 Recycled Water Policy* requires that the effluent of an advanced wastewater treatment plant be tested for just six chemicals (NDMA, DEET, 17beta-estradiol, triclosan, sucralose, and caffeine) prior to being directly injected into an aquifer (California State Water Resources Control Board 2013).

This short list of indicator chemicals, which includes no pesticides or pharmaceuticals, has been criticized by others, not only for its brevity but also because most of the chemicals are poor indicators (e.g., Eaton and Haghani 2012; Ferrer 2012; Eaton and Wilson 2013). Though it is hoped that a more appropriate, substantial list of indicators will be required in the next revision of the regulations (expected in December 2018), whether that revised version will be sufficiently protective of public health is far from certain, leaving open the potential for long-term health impacts and for the Purisima Aquifer to be permanently contaminated with trace levels of endocrine disruptors, carcinogens, and other substances hazardous to humans and other living organisms.

Yet the dEIR fails to address the possibility that PWS might be hazardous to District customers' health or might contaminate the aquifer with harmful chemicals or other contaminants.

Is that because the authors of the dEIR have such confidence in the State's regulation of potable reuse of recycled sewer water that has passed through an advanced wastewater treatment plant? If so, that confidence is misplaced, because the development of State regulations regarding recycled wastewater is heavily influenced by those within the industry itself (see Michaels 2008 for an excellent synopsis of how this sort of influence operates in various contexts). An important corollary is that toxicological and risk-assessment methods that would not yield industry-friendly results are ignored.

Outside of the water-reuse industry, which stands to gain from having ever more advanced wastewater treatment plants built, there is no consensus in the scientific community about either toxicological or risk-assessment methods to identify or cope with endocrine-disrupting chemicals (EDCs), carcinogens, and other contaminants of emerging concern (CECs). Professor Laura N. Vandenberg, Graduate Program Director at the Amherst School of Public Health, is one of several endocrinologists and public health experts who have been working to bring toxicology and risk assessment into the 21st century. She writes:

> Environmental health scientists, experts from The Endocrine Society, and other biomedical professionals have pushed for … regulatory agencies to accept 21st century science. Many of these groups have argued that … a narrow view focused solely on overt signs of toxicity (e.g.,

> death, severe loss of body weight, palpable tumors), is not sufficient to evaluate chemical safety. (Vandenberg 2017, 283)

Due to regulatory reliance on traditional methods of toxicology and risk assessment, she concludes, "The increased risk of diseases due to EDC exposures may be significantly underestimated by regulatory agencies around the world" (Vandenberg 2017, 284).

I will endeavor here to explain briefly how views such as those of Vandenberg and many other endocrinologists and other independent scientists relate to IPR in general and the PWS in particular. Please consider the following eleven points:

1. Numbers of chemicals and of known EDCs; inadequate testing for EDCs and CECs. There are now "more than 143 million unique organic and inorganic chemical substances, such as alloys, coordination compounds, minerals, mixtures, polymers and salts…" registered with the Chemical Abstract Service (CAS), a division of the American Chemical Society (American Chemical Society. 2018). Even though only about 85,000 of these chemicals are currently known to be in everyday use and thus likely to show up in municipal wastewater, some of the other 142,915,000 could appear there at any time. Moreover, according to the Endocrine Disruption Exchange, there are currently more than 1400 chemicals known or strongly suspected to be endocrine disrupting chemicals (EDCs) (TEDX 2017). EDCs can impact all the complex and delicate endocrine glands and systems, including the pituitary gland, hypothalamus, thyroid, cardiovascular system, mammary glands, pancreas, ovaries, uterus, prostate, and testes, as well as the brain and adipose tissue (Diamanti-Kandarakis et al. 2009:4). It is impossible to determine how many more chemicals are endocrine disruptors, carcinogens, or contaminants of emerging concern (CECs) because appropriate tests are very rarely undertaken.

2. Trace levels (parts per billion or trillion) of CECs remain in advanced wastewater treatment effluent. Currently, there is no wastewater treatment train, including those using reverse osmosis, that can remove all contaminants of emerging concern; trace levels – i.e., amounts in the parts per billion or parts per trillion levels – of many CECs, including endocrine disruptors and an array of disinfection byproducts, remain in the effluent (Asano et al. 2007:113; WEF and AWWA 2008:1-6; Raghav et al. 2013:4,7; Schnoor 2014:12A).

3. Trace levels (parts per billion or trillion) of EDCs can induce health problems. EDCs can have adverse impacts on health at extremely low concentrations, even down to parts per trillion. Since such trace levels of EDCs are likely to remain in the PWS plant effluent, District customers (and others who draw from the Purisima Aquifer) are likely to be exposed to EDCs on a regular basis. While acute reactions to such low levels of EDCs are not a concern, frequent exposure to those same levels of chemicals is associated with chronic illnesses, including childhood leukemia and other cancers, allergies, asthma and other respiratory problems, genital malformations in baby boys, early puberty in girls, ADHD, lowered IQ, autism, obesity, diabetes, cardio-pulmonary diseases, immune-system dysfunction, and Parkinsonism; evidence is mounting that endocrine disruptors may also play a role in development of Alzheimer's disease and other mental illnesses (Alonso-Magdalena 2006; Grandjean et al. 2007; Diamanti-Kandarakis et al. 2009; Birnbaum 2010; Burkardt-Holm 2010; Landrigan 2010; Soto and Sonnenschein 2010; Karoutsou and Polymeris 2012; Sargis et al. 2012; WHO/UNEP 2013; Weiss 2012; Zoeller et al. 2012; Birnbaum 2013; Carpenter 2013; Welshons 2013; Blaszczak-Boxe 2014; Grandjean and Landrigan 2014; Hamblin 2014; Richardson et al. 2014; Schiffer et al. 2014; Bellanger et al. 2015; Konkel 2014; 2015; Genuis and Kelln 2015; Grossman 2015; Trasande et al. 2015).

4. Trace levels of EDCs are especially dangerous for fetuses and young people. Such trace amounts of EDCs and other chemicals can be particularly dangerous for fetuses, infants, and children, whose glands and organs are rapidly developing. When present in the body of a pregnant woman, endocrine disruptors can be passed on via the placenta to the fetus and via breast milk to the infant. Maternal transmission of EDCs is particularly important because, as explained in the Endocrine Society's comprehensive review and analysis, *Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement,* the age at which one is exposed to these chemicals can make the health impacts more or less significant, and fetal and early postnatal-infant stages are developmental periods when mammals are most vulnerable (Diamanti-Kandarakis et al. 2009). The brain and nervous system, immune system, reproductive system, heart, lungs, and all other crucial organs are being developed at those times; illnesses due to malfunction of those systems and organs that are precipitated during those early months and years may not become apparent until years or even decades later (Diamanti-Kandarakis et al. 2009:3; see also Colborn, vom Saal, and Soto 1993; Colborn 1997, 2004; Burkhardt-Holm 2010; Kortenkamp et al. 2011; Landrigan and Goldman 2011; Braun 2014; Williams 2013/2014; Grandjean and Landrigan 2014; Whyatt et al. 2014). Moreover, illnesses triggered by chemicals during those vulnerable formative years are often irreversible (Zoeller et al. 2012:4101; WHO/UNEP 2013:13).

5. Transgenerational epigenetic inheritance of EDC-induced illnesses. The long delay between exposure to harmful chemicals and their health consequences reaches even longer than early-life exposure and later adult appearance of disease. Research in the last couple of decades has indicated that in some instances harms inflicted by endocrine disruptors and some other chemicals may be passed on to subsequent generations via a process known as transgenerational epigenetic inheritance (Edwards and Myers 2007; Grandjean et al. 2007; Diamanti-Kandarakis et al. 2009:4,7-8; Burkhardt-Holm 2010:484-487; Birmbaum 2010; Daughton 2010:54-55; Birnbaum and Jung 2011; Francis 2011; Guerrero-Bosagna and Skinner 2012; Martin 2013; Head 2014; Tollefsbol 2014).

Linda Birnbaum, Director of the National Institute of Environmental Health Sciences (NIEHS) and National Toxicology Program, has written extensively about the shortfall of traditional risk-assessment and outdated toxicological methods in evaluating the ways that endocrine disruptors and other synthetic chemicals can impact health (Birnbaum 2010). Birnbaum and her colleague Paul Jung, chief of staff at NIEHS, explain transgenerational epigenetics as follows:

> ...we're born with our genes, but epigenetic changes occur because of environmental influences during development and throughout life. Epigenetics thus provides a measurable "imprint" on DNA expression that may be useful as a biomarker for disease susceptibility. And these imprints can be carried and expressed across generations. (Birnbaum and Jung 2011:818)

It would thus seem advisable for people considering the possible health impacts of trace amounts of drugs and other chemicals in recycled wastewater to attend to epigenetic inheritance, but the topic is rarely addressed in the water-reuse literature or by regulators of the industry. As I'll discuss in #10 below, transgenerational epigenetic inheritance is one of the factors that makes epidemiological studies of potable reuse very difficult.

6. Mixture effects. Traditional risk assessment methods that are used to determine safe levels of chemicals typically consider just one chemical at a time. This practice ignores mixture effects; the problem of whether a given chemical's effects will be additive, antagonistic, or synergistic when ingested, inhaled, or absorbed through the skin does not figure into regulations of chemicals in recycled wastewater. To illustrate, studying antibiotics in wastewater treatment plants, Sungpyo Kim and Diana S. Aga, chemists at the State University of New York at Buffalo, note:

> Although a few environmental risk assessment studies suggest that the levels of pharmaceuticals in the environment, including antibiotics, are not a major threat to human health...**the chronic effects of mixtures of these microcontaminants remain unknown. Typical health risk calculations are based on a single drug exposure in a lifetime. The synergistic and**

> **antagonistic effects of pharmaceutical mixtures** on human[s] and ecology cannot be ruled out, and **need to be addressed in risk assessment.** For instance, it was demonstrated that a mixture of ibuprofen, prozac, and ciprofloxacin produced 10- to 200-fold higher toxicity in plankton, aquatic plants, and fish .... These results imply that a more sophisticated approach for the risk assessment of antibiotics... might be necessary to obtain a more accurate assessment of health and ecological risks associated with antibiotics in the environment. (Kim and Aga 2007:568-570, emphasis added)

Research done by endocrinologists, chemists, and many other independent scientists who have considered this issue indicates the need for a more sophisticated approach to risk assessment not only for drugs but also for personal care products, pesticides, and industrial chemicals that find their way into sewer water, trace amounts of which can remain in the treatment plant's effluent.

7. The more contaminated the source water, the more important the list of indicator chemicals. Since advanced wastewater treatment plants use sewage as their source water, and since that source gathers water from hospitals, long-term care facilities, prisons, schools, and other institutions as well as homes, the mix of chemicals going through the treatment train staggers the imagination. There is no way to take account of the ways that those chemicals may react with one another on contact, further complicating the task of evaluating the plant's final output. When testing for chemicals, "you can't find what you don't look for," and if the list of indicator chemicals used to monitor the plant's effluent is insufficient, it will be impossible to know whether the product water is actually safe. The current list of just six indicator chemicals to assure removal of EDCs and other CECs seems woefully inadequate.

8. Metabolic byproducts further complicate the picture. While some consumed drugs may pass through our bodies into sewers largely unchanged, many other drugs create metabolic byproducts after consumption, further complicating risk assessment of chemicals – and chemical mixtures – in recycled municipal wastewater. For example, the anticonvulsant drug carbamazepine is often found in wastewater treatment effluents, though its several metabolites are usually not included in assessments of wastewater plant efficacy. One exception is the study by Miao et al. (2005), which examined wastewater samples for caffeine, carbamazepine, and five of its known 33 metabolites, at least one of which "has been shown to possess similar anti-epileptic properties [to carbamazepine], and it may cause neurotoxic effects" (Miao et al. 2005:7470; see also La Farre et al. 2008). The authors found the treatment process to be effective in removing caffeine but not in removing the carbamazepine metabolites (Miao et al. 2005:7474). This result is significant because if a treatment plant's efficacy is assessed looking only for the original drug and not its metabolites, then the analysis could overestimate the plant's treatment efficacy. (Incidentally, this study also illustrates the futility of including caffeine as one of the six indicator chemicals that must be monitored prior to direct injection of advanced-treated wastewater into aquifers.)

9. Metabolites may reconstitute to the original compound. Once broken down, some metabolites can subsequently reconstitute themselves: "some excreted metabolites can also be transformed back into the parent compound" (Jjemba 2008:172; see also Escher and Fenner 2011). A recent study by Qu et al. (2013) on metabolites of the steroid trenbolone indicates that some drugs are transformed into other compounds by light but then revert to the parent drug in darkness. That study found that, while light breaks down trenbolone (TBA) metabolites, the phototransformation products re-convert to the parent compounds in dark conditions; this process "results in the enhanced persistence of TBA metabolites via a dynamic exposure regime that defies current fate models and ecotoxicology study designs" (Qu et al. 2013:350). The authors explain the implications:

> These reactions also occur in structurally similar steroids, including human pharmaceuticals, which suggests that **predictive fate models and regulatory risk assessment paradigms must**

> **account for transformation products of high-risk environmental contaminants such as endocrine-disrupting steroids** (Qu et al. 2013:347, emphasis added).

The ability of some endocrine disruptors' transformation products to revert to the original chemical in darkness may have implications for IPR. If testing for these revertible chemicals were done only under light conditions, that might potentially lead to erroneous conclusions about the quantity of drugs and their metabolites being introduced into aquifers. (However, the current regulations' list of six indicator chemicals for IPR does not include any pharmaceuticals.)

Similar studies are needed for a wide range of pharmaceuticals that may remain even in trace amounts in recycled municipal wastewater, which contains every type of drug taken by people in the community: statins, beta blockers, antidepressants, radiotherapeutic agents, sedatives, bronchodilators, antibiotics, diuretics, cytotoxic cancer drugs, anti-psychotics, analgesics, narcotics, drugs to facilitate gender changes, drugs to address erectile dysfunction, "recreational" drugs, etc. Some research has been done on transformation byproducts of X-ray contrast media (Schulz et al. 2008; Kormos, Schultz, and Ternes 2011) and chemotherapeutic cancer drugs (Kosjek and Heath 2011; Zhang et al. 2013).

Other chemicals besides drugs also undergo changes during wastewater treatment (Cwiertny et al. 2014; Ortiz de Garcia et al. 2014). While not much is known about the fate of chemical transformation byproducts in wastewater treatment plants, we can conclude that this phenomenon contributes to the problem of mixture effects discussed earlier. The existing studies suggest that metabolites and transformation byproducts need more research and more attention from the water-reuse industry.

10. Epidemiological research on IPR water is woefully inadequate. Advocates of potable reuse often point out that some IPR plants have been producing water for decades and that there have been no proven instances of people being made ill from drinking recycled water blended with water from other sources. They point to three epidemiological studies of the Montebello Forebay Groundwater Recharge Project in southern Los Angeles County, which produces tertiary-treated water that has been used for groundwater replenishment since 1962. According to the summary provided by Nellor Environmental Associates, "The results of these studies found that after almost 30 years of groundwater replenishment, there was no association between recycled water and higher rates of cancer, mortality, infectious disease, or adverse birth outcomes" (Nellor Environmental Associates n.d.:2). However, I don't believe that phrasing is accurate. **No study examined effects for 30 years.** Instead, each of the three studies focused on various illnesses, and they did so over different periods of time: 1962-1980; 1987-1991; and 1982-1993.

The most extensive of these epidemiological studies, *Health Effects Study Final Report*, by Nellor, Baird, and Smyth (1984), which attempted to control for population mobility, found no measurable adverse health effects, including cancer mortality rates, from 1962-1980. While a decade, or even longer in the case of the 1962-1980 study, may seem like a sufficient timespan for an epidemiological study, it is not an adequate period to discover possible effects of carcinogens. As the EPA's *Manual Guidelines for Water Reuse* point out regarding that study:

> [T]he minimal observed **latency period for human cancers that have been linked to chemical agents is about 15 years, and may be much longer**. Because of the relatively short time period that groundwater containing recycled water has been consumed, **it is unlikely that examination of cancer mortality rates would have detected an effect of exposure to reclaimed water resulting from the [Montebello Forebay] groundwater recharge operation**.... (US EPA 1992:104)

That time period is even more inadequate to discover diseases induced by EDCs. As we've learned from The Endocrine Society authors and others, the negative health impacts of endocrine-disrupting pharmaceuticals and industrial chemicals often do not show up for several decades. Various cancers often don't appear for decades, and Parkinsonism, heart disease, and Alzheimer's disease typically don't appear until a person is well into the second half of life. Also, as we've seen, EDCs can have negative impacts in the parts-per-trillion range, and if a fetus or infant consumes recycled water for even a short time, it is possible that that exposure could lead to health problems much later in life. Moreover, due to transgenerational epigenetic effects, when EDCs cause methylation of genes in developing oocytes, those impacts – including obesity, diabetes, ADHD, autism, as well as the diseases listed above -- might bypass the child but show up many decades later in disease afflicting his or her offspring.

It would therefore be very challenging to design an epidemiological study that could take account of population mobility and epigenetic effects across a sufficient period of time. Such a study would need to look at more than morbidity, mortality, carcinogenicity, and overt birth defects; all the diseases that EDCs and other CECs can give rise to should be considered. Moreover, a sampling of individuals exposed to the recycled water at various stages of life, along with their offspring (for at least one generation beyond the parents), should be traced. This might be doable, but it would not be easy and would take quite a long time.

More to the point, **a study like that, which could reveal long-term health problems generated by drinking recycled water, has not been done. The studies performed to date** demonstrate that statistically significant instances of infectious diseases are not caused by drinking recycled water, but they **do not support the argument, as advocates contend, that recycled water has no adverse health effects due to consumption of trace amounts of chemical contaminants.**

If we are to have useful epidemiology on the safety of potable reuse, controlled retrospective and prospective cohort studies are needed to mitigate health effects concerns.

11. Lack of cost-benefit analyses. Current cost-benefit analyses of IPR are inadequate because they exclude financial costs of healthcare and social costs of illnesses resulting from drinking and bathing in water containing endocrine disruptors and other such contaminants. Nor do cost-benefit analyses factor in potential costs of aquifer degradation due to contaminants of emerging concern.

Conclusion: The EIR should address the potential for the PWS project to have negative long-term health consequences for District customers. The EIR should recognize that State regulations are formulated by people who may have a favorable bias toward potable reuse and who rely on outdated risk-assessment methods; the EIR should balance those views by drawing from studies done by independent scientists (i.e., those with no ties to the water-reuse industry) including endocrinologists and public health experts who are knowledgeable about the features of EDCs discussed in this document. A cost-benefit analysis that includes relative costs of healthcare comparing PWS with conjunctive use should be included in the EIR – otherwise, the EIR is simply working toward recommending the District's preferred project without adequate consideration of more viable alternatives.

Environmental Health Problems

Addition of IPR water to an aquifer risks degrading its quality. When the recycled wastewater is put into an aquifer, it cannot be sequestered, so there is danger of contaminating the aquifer with trace amounts of endocrine disruptors, industrial chemicals, drugs, and other chemicals.

Performance evaluations and monitoring studies of existing IPR systems are not publicly available. The public should have access to data on effluent contaminants, as well as to analysis and preparation for system failure or a disastrous event that could contaminate water supplies for wildlife and humans alike, especially as aging infrastructure deteriorates.

These factors along with those addressed above regarding Human Health Concerns make the PWS project a high-risk venture.

Conclusion: The EIR should address the potential for aquifer contamination posed by PWS and compare it with the more environmentally friendly options of conjunctive use.

Chapter 7: Alternatives

The dEIR eliminates viable alternatives. I am aware that other writers are addressing this area in their comments, so I won't attempt to do so in mine. Suffice to say that Water for Santa Cruz has current data and explanations for how conjunctive use between the District and Santa Cruz could obviate any need for PWS. See https://waterforsantacruz.com/soquel-creek-water-district

I would like to close with observations regarding potable reuse by Peter Collignon, physician, microbiologist, and professor of clinical medicine at Australian National University. He writes that converting sewage into drinking water is, "from a health perspective," a "'Very High Risk' proposal" (2011, 4). His thesis is summarized in the title of his monograph: "Recycling Water from Sewage into Drinking Water: A 'High Level' Health Risk We Should Only Take as a 'Last Resort'." Fortunately for the Soquel Creek Water District, that "last resort" is not necessary because there is a viable alternative in the form of conjunctive use with Santa Cruz. It is imperative for the future health of the public and the local aquifer that the EIR fairly evaluate not just PWS apart from insufficient alternatives but PWS in comparison with conjunctive use – a much lower risk venture on all counts.

Thank you for considering these comments on the dEIR.

Sincerely yours,
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