Item 6 - Appendix D

Comment Letters Received by March 13, 2017

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Comment Letters Received

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Protecting Alameda County Creeks, Wetlands & the Bay

clean water PROGRAM

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Zone 7 Water Agency

March 10, 2017

San Francisco Bay Regional Water Quality Control Board
Attention: Richard Looker
1515 Clay Street, Suite 1400
Oakland, CA 94612

Dear Mr. Looker,

This is in response to your Notice of Opportunity for Public Comment and Notice of Public Hearing dated February 10, 2017. I am submitting these comments on behalf of the Alameda Countywide Clean Water Program (Program). We appreciate the opportunity to provide these comments. We have reviewed the proposed revisions to the CWA 303(d) and 305(b) listings as they relate to Alameda County water bodies and have comments that specifically relate to the proposed new listings for Arroyo Las Positas Toxicity and Oakland Inner Harbor Indicator Bacteria.

<u>Arroyo Las Positas Proposed Toxicity Listing.</u>
The Water Board's Fact Sheet bases this proposed listing on the Region 2 Surface Water Ambient Monitoring Program's results for water collected at three sites[1] in late dry season of 2001 and spring 2002, of which several caused a reduction in the growth of the aquatic algae test species *Selenastrum capricornutum*. However at least two of these sites drain areas of the Livermore Valley characterized by special alkali-saline soils[2] that can be expected to elevate adjacent waterbody levels of Electrical Conductivity (EC), an indirect measure of freshwater salinity.[3] A 2007 study using SWAMP water samples from the Los Angeles and San Diego regions identified 1500 microSiemens per centimeter (µS/cm) as an EC tolerance limit for *S. capricornutum* in standard toxicity tests and recommended that sample waters exceeding this EC level be tested

[1] *Water quality monitoring and bioassessment in nine San Francisco Bay Region watersheds: Walker Creek, Lagunitas Creek, San Leandro Creek, Wildcat Creek/San Pablo Creek, Suisun Creek, Arroyo Las Positas, Pescadero Creek/Butano Creek, San Gregorio Creek, and Stevens Creek/Permanente Creek. Oakland, CA: Surface Water Ambient Monitoring Program, San Francisco Bay Regional Water Quality Control Board, 2007.*
http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/SWAMP/Yr_1-2_Rpt_08232007.pdf

[2] Soil characteristics for the central Springtown Alkali Sink are documented in connection with vegetation surveys and reports at
https://www.wildlife.ca.gov/Conservation/Plants/Endangered/Chloropyron-palmatum

[3] SWAMP documents sometimes use the related, temperature-corrected measurement for specific conductance interchangeably with Electrical Conductivity. Units may be expressed as µS/cm or the equivalent micromhos/cm.

against "high EC controls" of similar salinity to differentiate actual toxicity from reductions in growth due to elevated EC;[4] this had not previously been standard practice for SWAMP and was not fully incorporated in SWAMP protocols until later.[5] Discrete field measurements recorded during collection of water samples for toxicity testing (Appendix F in the Region 2 SWAMP monitoring report) show that specific conductance exceeded 1500 µS/cm for three of the five samples that showed significant *S. capricornutum* growth reductions in the laboratory tests.[6] Although these toxicity test data met the SWAMP Quality Assurance guidelines in effect in 2001-2002, it is highly likely that the algae growth results for up to three samples would be reported as not significantly toxic under the updated testing guidelines currently in effect.

Because of improved understanding of constraints on toxicity testing procedures, the SWAMP data cited do not present a reasonable case for this proposed Arroyo Las Positas toxicity listing. Therefore, we request the deletion of this proposed listing from the draft 303(d) list.

<u>Oakland Inner Harbor Proposed Listing for Indicator Bacteria</u>
It is proposed to list the Oakland Inner Harbor for Indicator Bacteria based upon data submitted by San Francisco Baykeeper. However, as stated in the staff report, the locations where the samples were taken "appear to be chosen not to represent water quality ... in this water body as a whole, but rather the study targeted locations ... where one would expect to find elevated levels of indicator bacteria." Therefore, this dataset should not be used to list this water body as the data do not meet the criteria of Section 6.1.5.2 of the 303(d) Listing Policy regarding spatial representation.
In addition, replacement of old sanitary sewer lines and laterals is already required by the consent decree covering the East Bay Municipal Utility District (EBMUD), Oakland and other cities in the EBMUD service area.[7] Thus, this impairment is being adequately addressed. Therefore, if this water body is listed despite the lack of spatial representativeness of the sampling locations, it should be listed in Category 4b Water Quality Limited Segments Being Addressed by Actions Other Than TMDLs.

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[4] Werner, I, Stillway, M.,Markiewicz, D., Khamphanh, J., and L. Deanovic, 2007. *Surface Water Ambient Monitoring Program (SWAMP) Toxicity Testing and Toxicity Identification Evaluation, Final Report.* Prepared for State Water Resources Control Board. April 30, 2007.
http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/tox_rpt0407.pdf

[5] See memo from SWAMP Toxicity Work Group to SWAMP Round Table dated July 8, 2013 (http://www.waterboards.ca.gov/water_issues/programs/swamp/docs/qa_memos/2013jul08_salinity_conductivity_control_issues.pdf) which provides guidance that labs should "include appropriate controls when sample conductivities exceed 1500 µS/cm, updating the directions in Table A10 of the 2008 version of the SWAMP Quality Assurance Program Plan that *S. capricornutum* tests should "Include appropriate controls when sample conductivities are <100 or >2000 µS/cm."

[6] Spring sample at site 204ALP010, dry season and spring samples at 204ALP100.

[7] (Consolidated Case Nos. C09-00186-RS and C09-05684-RS, approved by Northern California US District Court on 9/22/14)

Conclusion

The Program requests that you take the actions summarized above. Additional listings should all be based on sufficient and relevant data to assess impairment and impose the designation. It should also be noted that such listings have significant cost impacts on the storm water agencies in the Bay area and may require them to divert resources away from other critical program areas of their municipality to take the actions required by the new designation. Thus, it is particularly important that the data presented for the listings lead to an accurate determination that the particular water body contains pollutants at levels that exceed protective water quality standards.

Sincerely,

James Scanlin

James Scanlin, Program Manager

copies: Program member agencies

March 13, 2017

Richard Looker
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

VIA EMAIL: rlooker@waterboards.ca.gov

Subject: BACWA comments on proposed revisions to the Clean Water Act Section 303(d) List of Impaired Water Bodies in the San Francisco Bay Basin

Dear Mr. Looker:

The Bay Area Clean Water Agencies (BACWA) appreciates the opportunity to comment on the proposed revisions to the Clean Water Act Section 303(d) List of Impaired Water bodies in the San Francisco Bay Region. BACWA is a joint powers agency whose members own and operate publicly-owned treatment works (POTWs) and sanitary sewer systems that collectively provide sanitary services to over 7.1 million people in the nine-county San Francisco Bay Area. BACWA. Members are public agencies, governed by elected officials and managed by professionals who protect the environment and public health. BACWA supports the 303(d) review process, and would like to thank the San Francisco Regional Water Quality Control Board (Regional Water Board) for delisting indicator bacteria for eight San Francisco Bay Area beaches.

BACWA understands that the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List does not include a provision for retiring data when considering which pollutants to add to the list. However, the data that are used to generate the new proposed 303(d) listings are generally at least ten years old. For example, the new heptachlor listing for the South San Francisco Bay is based on fish tissue and water column concentrations from a data set that ranges from 1993 to 2008. POTWs began their industrial pretreatment programs in 1989, and since then there has been a marked improvement in effluent quality. The general trend for priority pollutants, and especially industrial pollutants, in our Region has been decreasing, generally to below the limit of detection. Furthermore, a recent search of the Department of Pesticide Regulation database shows that heptachlor is not an active ingredient registered in any product at this time. Since the purpose of the 303(d) list is ostensibly to identify contaminants that will be targeted for management action, it would make sense to use data that is no older than a decade.

BACWA's primary concern with the proposed 303(d) List update is the new toxicity listing for each segment of the San Francisco Bay. Toxicity is an effect, rather than a pollutant, so it does not make sense to add it to a list that is used to identify pollutants for which Total Maximum Daily Loads are to be developed. Toxicity itself cannot be given a waste load allocation. The purpose of the toxicity test is to provide a diagnostic tool for the identification of a toxicant. For example, if further investigations show that pesticides are causing toxicity, then the pesticides themselves should be listed and controlled, not the toxic effect.

The Diazinon and Pesticide-Related Toxicity in San Francisco Bay Area Urban Creeks TMDL is an excellent example of how toxicity test results can be a first step in investigating and addressing the cause of an observed toxic effect. In the 1990s, high observed toxicity was linked to pesticides. The Stormwater Municipal Regional Permit (R2-2015-0049) includes a provision for addressing pesticide-related toxicity. Regional Water Board staff have worked with POTWs and Stormwater agencies through the Bay Area Pollution Prevention Group to develop outreach programs, educate the public about responsible pesticide use, and to urge regulators at the EPA and the California Department of Pesticide Regulation (DPR) to consider aquatic toxicity and paths to receiving waters when registering pesticides. The linkage of toxicity to pesticides has also spurred further investigations through the RMP, the Surface Water Ambient Monitoring Program, and the DPR. Without a direct linkage between observed toxicity and the toxicant, none of these actions would have been possible.

Observed toxicity effect may also be unrelated to the presence of a toxicant. The data used to generate the listings in each segment of the San Francisco Bay showed significant toxicity in sediments, but very little toxicity in the water column. The 10-day survival toxicity test with the amphipod *Eohaustorius estuarius* is the primary sediment test protocol used in the Regional Monitoring Program and the State Water Resources Control Board's Sediment Quality Objective (SQO) program. In 2014, the Regional Monitoring Program conducted a study[1] looking at the response of *E. estuarius* to kaolin clay particles in sentiment. The results of the study showed that clay concentrations in the sediment reduced the survival rates of this species, and the effect was particularly pronounced in larger organisms. Therefore, it is probable that at least part of the observed toxic effect observed was due to interference by clay particles in the sediment itself, rather than a chemical toxicant.

This example illustrates how toxicity itself is a problematic parameter to list. Without knowledge of the toxicant, or whether the observed toxic effect is in fact due to a toxic contaminant rather than interference such as kaolin clay, it is impossible to develop a control

[1] *The effects of kaolin clay on the amphipod* Eohaustorius estuaries, Brian Anderson, Bryn Phillips, and Jennifer Voorhees Department of Environmental Toxicology, University of California, Davis May 5, 2015 SFEI Report No.: 755, See
http://www.sfei.org/sites/default/files/biblio_files/755_Anderson%20et%20al_Clay%20Effects_2015%20Final%20Report.pdf

strategy. Additionally, designating the entire San Francisco Bay as toxic has a significant impact on public perception, since it is difficult to communicate to the public the nuances and uncertainties of the toxicity test results. As such, BACWA strongly recommends dropping the toxicity listing for San Francisco Bay segments pending further investigation into the cause of the observed toxic effect.

Respectfully Submitted,

David R. Williams

David R. Williams
Executive Director
Bay Area Clean Water Agencies

cc: BACWA Board
Eric Dunlavey, BACWA Permits Committee Chair

Summited via email

San Francisco Bay Regional Water Quality Control Board
Attention: Richard Looker
1515 Clay Street, Suite 1400
Oakland, CA 94612
Phone: (510) 622-2451
Email: rlooker@waterboards.ca.gov

Re: Comment letter on proposed revisions to the proposed 2016 Section 303(d) and 305 (b) Integrated Report for the San Francisco Bay Basin

Dear Mr. Looker,

On behalf of the Center for Biological Diversity (The Center), I submit this letter to the San Francisco Bay Regional Water Quality Control Board to highlight that the threat of ocean acidification should have been explicitly considered in the proposed 2016 section 303(d) and 305(b) Integrated Report for the San Francisco Bay basin (SFBB). The proposed integrated report found several harbor, bay, and estuarine water bodies throughout the SFBB may be threatened by low pH, but were classified as Category 2. However, we urge you to acknowledge that ocean acidification is already affecting the SFBB for these waters.

In previous comments, the Center has provided significant information and supporting materials about the impacts of ocean acidification on the California coast. As shown in the record for this draft integrated report, on February 27, 2007, the Center for Biological Diversity submitted scientific information supporting the inclusion of ocean waters on California's 303(d) list to each of the coastal regional water boards. I was informed that the regional board deferred action on ocean acidification to the State Water Resources Control Board. On June 11, 2008; February 4, 2009, May 28, 2010; August 27, 2010, April 16, 2014, and Feb. 5, 2015 the Center submitted additional information and comments on ocean acidification for consideration in the water quality assessment. Those comments are incorporated here by reference and are available upon request. Since then, it has become more apparent that ocean acidification poses a serious threat to seawater quality with adverse effects on marine life.

The San Francisco Bay Regional Water Quality Control Board should acknowledge that ocean acidification driven by atmospheric carbon dioxide deposition is happening in waters of the SFBB. Ocean acidification should be included in the final integrated report and the objectives for beneficial uses should also include mitigation for this problem. Coastal, estuarine, and bay waters throughout the SFBB may already be experiencing the harmful effects of ocean acidification. Increasing concentrations of atmospheric carbon dioxide and the contribution of pollution, sedimentation, and inadequate watershed management can substantially amplify the fluctuating pH conditions in these waters making them more corrosive. Thus, the estuarine and coastal ecosystem of the SFBB may further suffer due to ocean acidification.

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There is strong scientific evidence showing that growth, survival, and behavioral changes in marine species are linked to ocean acidification. These effects can extend throughout the food web, threatening estuarine and bay ecosystems, coastal fisheries, and humans. For example, some bay and estuarine waters in the SFBB are already experiencing conditions that can impair the survival and growth of calcifying organisms such as oysters and mussels. Here, we present a summary of the most current scientific information on ocean acidification that the San Francisco Bay Regional Water Quality Control Board should acknowledge in the 2016 Integrated Report.

1. Ocean acidification should be acknowledged in the 2016 SFBB Integrated Report

a. Waters in the San Francisco Bay basin are affected by ocean acidification

Ocean acidification is already affecting estuarine and bay waters of the San Francisco Bay basin by impairing the capacity of organisms to produce shells and skeletons, altering food webs, and affecting the dynamic of entire estuarine ecosystems and coastal ecosystems such as kelp forests [1–7]. Small increases in acidity of coastal and estuarine waters can substantially reduce the ability of marine organisms to produce shells and skeletons. Microscopic algae and calcifying zooplankton are especially at risk and changes in their abundance and survivorship can result in cascading effects that ripple through the food web affecting other marine organisms from fishes to whales. But rising CO_2 in seawater can also directly affect marine fishes by affecting critical behavior such as orientation, predator avoidance, and the ability to locate food and suitable habitat.

Coastal waters of the San Francisco Bay basin are vulnerable to ocean acidification because two natural phenomena work together with anthropogenic CO_2 deposition and bay pollution: ocean currents and coastal upwelling. Acidification of coastal waters starts with surface oceanic currents carrying waters throughout the North Pacific to the west coast. This water transport takes decades, absorbing atmospheric CO_2 produced by global human activity and accumulating CO_2 by natural respiration. Coastal upwelling along the coast brings deep water rich in CO_2 and low in dissolved oxygen to the continental shelf driving chemical conditions that are harmful to marine life [8–14]. As these processes happen in a multi-decadal time frame, the effects of ocean acidification due the absorption of CO_2 across the North Pacific will become more severe overtime. That is, waters in transit to the west coast will carry increasingly more anthropogenic CO_2 as they arrive and upwell along the northern California coast [6]. Even if CO_2 emissions are stopped today the west coast states have already committed to increased ocean acidification for the next three to four decades. Meanwhile, coastal upwelling is projected to intensify in response to stronger winds due to global warming, which will only increase the prevalence of waters of acidic and low oxygen conditions [15,16].

Most importantly for local management, ocean acidification in coastal regions interacts with natural and anthropogenic processes that further reduce pH and carbonate saturation state [9,17–20]. Although, Northern California coastal waters are relatively more acidic because oceanographic processes such as oceanic currents and coastal upwelling [8–12,21,22], surface waters already show undersaturation with respect to aragonite due to anthropogenic ocean acidification independently of upwelling pulses [9,23]. In fact, without acidification, undersaturated waters would have been as much as 50 m deeper than they are today [9].

Recent declines in aragonite saturation states due to anthropogenic ocean acidification have been compounded by changes in the circulation of the California Current [24], likely connected to climate change [15,16,25]. Strong coastal upwelling along the coast of the San Francisco Bay basin occurs in the spring and summer bringing nutrients and even more CO_2 rich waters from the deep ocean due to ocean acidification [9]. Upwelling in this region has been intensified in the past decades [26] and it is predicted to become stronger with more favorable winds [15,16,25]. Models predict that by the mid-century, surface coastal waters in this region would remain undersaturated during the entire summer upwelling season and more than half of nearshore waters throughout the entire year [12,13].

Coastal, bay, and estuarine waters of the San Francisco Bay basin are influenced by local variability, and ocean acidification can amplify these fluctuations. Daily and seasonal fluctuations in pH are due to changes in respiration, salinity, temperature and several local factors such as river discharge, eutrophication, hypoxia, and chemical contamination that amplify the deleterious effects of anthropogenic ocean acidification in coastal and estuarine waters [27–30]. For example, ocean acidification combined with eutrophication can alter phytoplankton growth and succession affecting the entire base of food webs [31,32]. Studies also show that under ocean acidification conditions heavy metal pollution can be more severe. In more acidic waters, sediments become more toxic as they easily bounds to heavy metals making them more available and thus more toxic for aquatic life (Roberts et al. 2013). For example, ocean acidification increases the toxicity effects of copper in some marine invertebrates [33,34].

b. Empirical and field studies show that marine calcifiers are highly vulnerable to ocean acidification

Experiments have shown that ocean acidification has deleterious effects on many marine organisms [1,8,35–38] with long-term consequences for marine ecosystems [39–43]. Recent studies have confirmed that these adverse impact can be already detected in the field, despite several confounding factors such daily fluctuations in temperature, oxygen levels, salinity, and other variables [38,44–46]. Calcifying organisms are clearly more vulnerable to the effects of ocean acidification than non-calcifying species [36] especially those that use aragonite as their calcium carbonate minerals (Ries 2010).

Most extant calcifying organisms use aragonite as the preferable crystal form of calcium carbonate to produce shells and skeletons and they are the most vulnerable to acidification [47,48]. Since aragonite is more soluble than calcite, undersaturated conditions for aragonite will be reached before they are for calcite. Therefore, those organisms that use aragonite as the preferable form of calcium carbonate for calcification are the first to be affected as calcium carbonate plummets due to acidification. However, calcifying species have different thresholds for aragonite (i.e., the aragonite saturation state that prevents calcification and leads to dissolution is species specific), thus some marine calcifier species will be more vulnerable than others [49,50]. Because marine calcifiers have different capacity to use the same concentration of calcium carbonate to secret shells and skeletons [49], certain species are highly sensitive to the same aragonite saturation conditions and suffer the effect of ocean acidification with greater intensity [48]. However, those species that are able to calcify and growth under acidic conditions may suffer physiological constrains that impairs fertilization, reproduction, settlement, and their capacity to resist diseases and other stressors [45,48,51,52].

c. Shellfish in the California region are vulnerable to ocean acidification

Among the marine species most vulnerable to ocean acidification in the San Francisco Bay basin waters are shelled mollusks. Studies have shown that most shelled mollusks are especially sensitive to small pH changes, in particular carbonate saturation states [53–55] (Fig. 1). Shelled mollusks such as oysters are keystone species in estuarine areas that provide great economic value for local and regional economies, and ecosystems services such as water filtration, estuarine protection, and habitat [56]. With ocean acidification oysters are at risk due to corrosive waters.

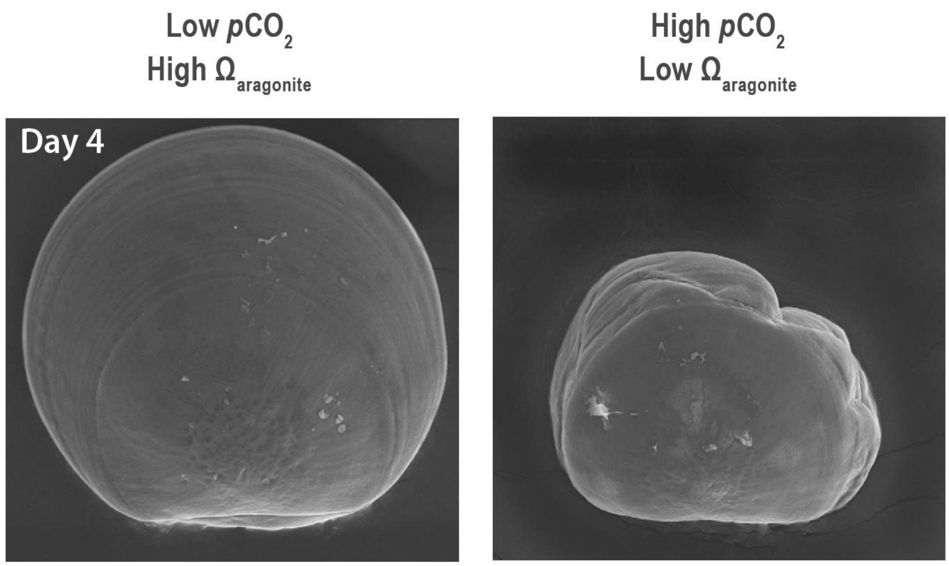


Figure 1 Pacific oyster larvae from the same spawn, raised by the Taylor Shellfish Hatchery in natural waters of Dabob Bay, WA, exhibiting favorable (left, $pCO_2 = 403$ ppm, $\Omega_{aragonite} = 1.64$, pH = 8.00) and unfavorable (right, $pCO_2 = 1418$ pp, $\Omega_{aragonite} = 0.47$, pH= 7.49) carbonate chemistry during the spawning period. Scanning Electron Microscopy images show representative larval shells from each condition at four days post–fertilization. *Figure and legend after Barton et al. 2015*

Ocean acidification has already affected oyster populations in estuarine waters of the U.S. Pacific Northwest [53,57,58]. For example, oyster production in the Pacific Northwest declined 22% between 2005 and 2009 because ocean acidification directly affected oyster seed production [53,57]. In fact, Washington and Oregon alone experienced production declines of oyster seed hatcheries of up to 80% from 2006 to 2009 [6]. In 2006, oyster larval production at the Whiskey Creek Hatchery (Netarts Bay, Oregon) substantially declined due to acidic water conditions leading to halted growth and oyster die offs [53].

Oysters and other marine bivalves show permanent negative effects due to ocean acidification when pH and aragonite saturation state decline below certain thresholds [37,53,54,57,59–63]. Barton el al. (2012) first demonstrated that larval production and mid-stage growth of Pacific oyster (*Crassostrea gigas*) significantly declined as rearing water decreased below 7.8 pH units and below 1.7 in aragonite saturation state. In waters with elevated CO_2 concentrations, oyster larvae have difficulty with growth and development, drastically reducing oyster production [53]. Even when larvae are able to develop under moderate aragonite saturation states, studies show they growth smaller [37] and very few develop to metamorphosis [53]. Similarly, experimental studies with the Olympian oyster (*Ostrea lurida*), a foundation species of the Pacific Northwest, have shown that as pH declines to 7.8 units (well within the numerical standard pH criteria for the state of California), juvenile oysters exhibited a 41% decreased in shell growth rate, and negative effects persist even after oysters are returned to normal conditions [62,64].

Ocean acidification can cost the shellfish industry millions of dollars in economic losses and thousands of jobs. In fact, ocean acidification has already cost the oyster industry in the U.S. Pacific Northwest approximately $110 million dollars and compromised ~3,200 jobs [57,65]. As the shellfish industry faces the increasing effects of ocean acidification, sales and job security will be drastically impacted affecting coastal communities, particularly in areas where fishing and coastal tourism provide the main economic support [5,6]. For example, a Canadian shellfish company reported losses of ~ $10 million during its scallop fisheries in 2014 because acidic waters [66].

These findings in the Pacific Northwest are a wake-up call for action. Such negative effects of ocean acidification on shelled mollusk like oyster support the results from laboratory experiments. It is alarming that negative effects of ocean acidification are already seen under current and fluctuating pH conditions. As the ocean acidification trend continues, the shellfish industry in the San Francisco Bay basin that include oysters, mussels, scallops and crabs will be subject to substantial economic loses [6].

d. Ocean acidification affects crucial zooplankton groups such as pteropods

Ocean acidification in California waters also affects important shelled organisms such as pelagic pteropods. Pteropods are small sea snails that use the aragonite form of calcium carbonate to secrete their spiral shells. Pteropods can be use as indicator for water impairment due to their striking vulnerability to ocean acidification. These mollusks are among the calcifier groups most sensitive to declines of aragonite saturation conditions because their delicate aragonite shells [45,67,68]. In fact, in-life dissolution of pteropods-shells fossil can be used as an indicator of past ocean carbonate saturation conditions [69]. In the California Current Ecosystem, pteropods are already impacted by ocean acidification with reduction in abundance and signs of shell damages due to acidic waters [14,70]. For example, sampling studies along the Washington-Oregon-California coast showed that on average, severe dissolution is found in 53 % of onshore pteropods and 24 % of offshore individuals due to undersaturated waters in the top 100 m with respect to aragonite [14].

Field studies have demonstrated that pteropod's shell exhibit increasing dissolution as aragonite saturation declines below 1.3 [70] and extensive dissolution (e.g., 30-50% shell surface area) in areas where aragonite saturation state (Ω) is below 1.0 [70,71]. Values of Ω aragonite from 1.1 to 1.3 causes stress in pteropods and calcification is maintained at the expense of higher energy consumption (N. Bednaršek Per. Com.). At values below Ω aragonite = 1.1 extensive shell dissolution and irreparable damage is often observed (N. Bednaršek Per. Com.) (Fig. 2). This highlights how aragonite saturation state is an important proxy to directly detect the impacts of ocean acidification on these organisms and how water quality standards must include this parameter [72]. Pteropods are so sensitive to acidic waters that their vertical distribution track changes in water chemistry in the southern California Current System [70]. As aragonite saturation horizon (Ω aragonite = 1.0) shoals (from >100 m to <75 m deep) pteropod abundance declines at depth below 100 m where waters are less saturated with respect to aragonite. In addition, severe shell dissolution is observed at depths where Ω aragonite equals 1.1 to 1.4 [70]. This dynamic in pteropod abundance due to change in sea water chemistry can directly affect those species that feed on them (Doubleday and Hopcroft 2015).

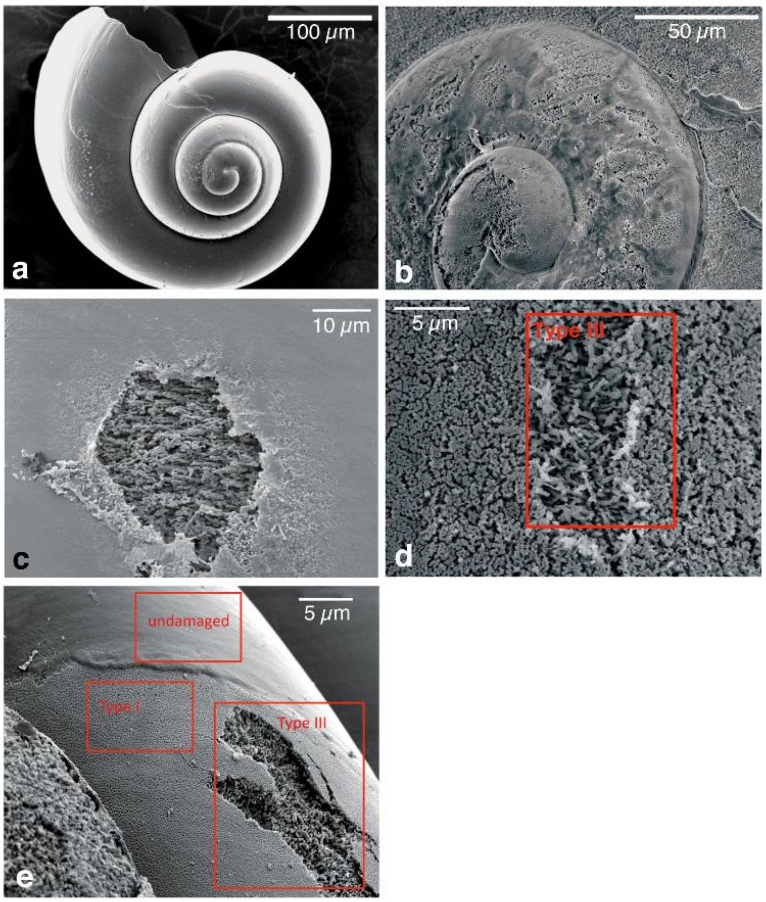


Figure 2 Scanning electronic micrographs illustrating types of shells dissolution in the thecosome pteropod Limacina helicina. (a) whole animal with no shell dissolution, (b) Type II dissolution; (c,d) Type III dissolution; (e) mixture of no dissolution, Type I and Type III on a single shell surface. As Ωarag decreases with ocean acidification, pteropods' biological condition deteriorates. Under low level of stress (Ω > 1.3) dissolution is insignificant and shell calcification is maintained. As Ω decreases, dissolution increases, calcification decreases and pteropod shells go through stress to damage to irreparable and ultimately leads to organism mortality. Below Ω < 1.1 moderate to extensive shell damage and decrease calcification occurs. Under undersaturated conditions (Ω <0.9) extensive severe dissolution and absence of calcification occurs. *Figure and legend modified after Bednaršek and Ohman* [70].

Pteropods are one of the most important species in oceanic marine food webs and their decline could threaten the functioning of entire coastal ecosystems and commercially important fisheries such as salmon [73]. Pteropods are common prey for important commercial fishes such as anchovies, herring, jack mackerel, sablefish, and pink, chum, Coho, and sockeye salmon [74–77]. In addition, zooplankton, squid, whales and even birds can eat pteropods. Pteropods are the main food sources for commercially and culturally important species such as Pacific salmon, herring, and squid [73]. Therefore, temporal or spatial reduction in pteropod abundance will have drastic cascading effects on the species that rely on them as the main food source. For example, 30 % of the variability of pink salmon survival during spring-summer in Prince Williams Sound, southern

Alaska, has been directly associated with changes in the abundance and distribution of the pteropod *Limacina helicina* [73].

Vertical distribution of pteropods is already affected by ocean acidification which may have important consequences for the species that feed on them. Pteropods show vertical migrations to deeper waters during the day and feed in shallower waters at night to avoid predation. Ocean acidification can drastically constrain these vertical migrations by narrowing the range of optimal carbonate saturation and thus calcification. For example, in the Pacific Northwest, diel migration for *L. helicina* is relatively shallow (100 m) because undersaturated waters with respect to aragonite [78]. Thus, as pteropods are affected by ocean acidification through calcification and survivorship, ocean acidification indirectly affects species higher in the food web that depend on them as food source.

e. Ocean acidification affects a variety of other marine organisms

Laboratory and mesocosm experiments show that pH and calcium carbonate saturation state levels observed in coastal and estuarine waters of the San Francisco Bay basin also impair calcification rates of other marine calcifiers such coccolithophorids, foraminifera, other mollusks, and sea urchins [38,48,49,79–81]. Many calcifying species are directly affected by ocean acidification by decreasing calcification rates and compromising growth and survival. Overall calcifying organisms such as corals, echinoderms, and mollusks tend show higher sensitivity than crustaceans and fish species [48,49] (Fig. 3). For example, in experimental conditions, calcification rates in temperate corals, urchins, limpets, clams, scallops, and oysters decrease considerably as aragonite saturation state declines below 1.5 corresponding to very elevated pCO_2 (i.e., over 900 µatm) [49]. Studies also suggest that some species of juvenile fish of economical important coastal regions are highly sensitive to higher than normal pCO_2 concentrations and lower pH, exhibiting high mortality rates [82].

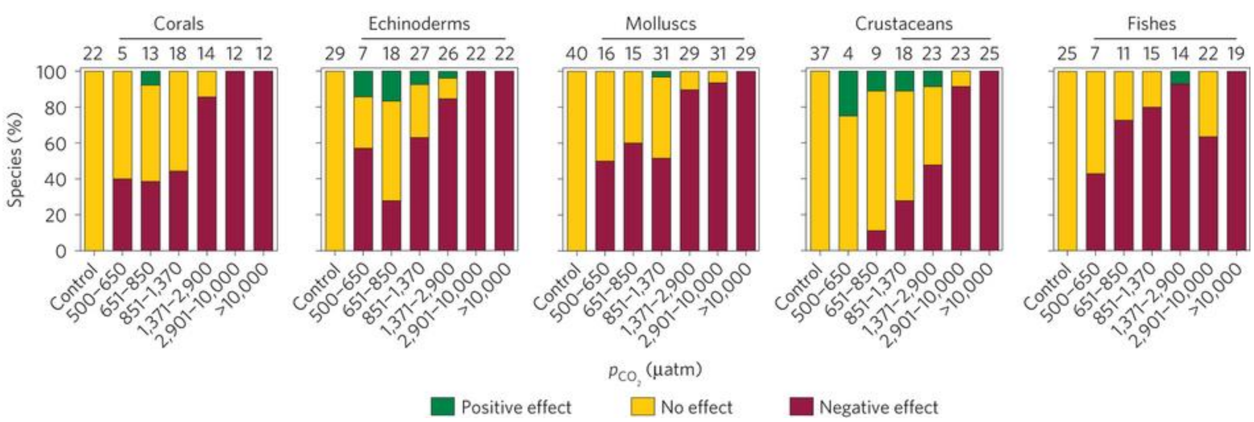


Figure 3 Fractions (%) of coral, echinoderm, mollusk, crustacean and fish species exhibiting negative, no or positive effects on performance indicators reflected as individual fitness in response to the respective p_{CO2} ranges (µatm). The numbers of species analyzed on each CO_2 range are on top of columns. Bars above columns denote count ratios significantly associated with p_{CO2} (according to Fisher's exact test,

p<0.05, used to analyze species counts of pooled groups of negatively affected species versus not negatively affected species. *Figure and legend modified after Wittmann and Pörtner 2013.*

Ocean acidification will have negative impacts on calcification, survival, growth, reproduction and other physiological processes at the species level in the absence of evolutionary adaptation or acclimatization over the coming decades [36]. These effects can accumulate through marine communities disrupting ecological process and energy fluxes [42,43]. Together, these studies forecast drastic changes in species composition with negative impacts through marine populations and communities that ultimately affect ecosystem functionality and services.

f. Local stressors magnify anthropogenic ocean acidification

Local stressors can drastically magnify and contribute to acidification in the San Francisco Bay basin coastal and estuarine waters. Local stressors such as eutrophication [29,83], pollution [32,84], sulfur dioxide deposition [85], hypoxia [86,87], river discharge [18], runoff from acidic fertilizers [88], and harmful algal blooms [89] can substantially contribute to ocean acidification in coastal waters [30,90]. Acidification can also be exacerbated by non-uniform changes in water circulation and biological processes, e.g., respiration [91] and precipitation runoff [1,2,80]. Non-atmospheric sources combined with anthropogenic CO_2 can result in sudden negative ecosystem consequences when they coincide with physical processes such as upwelling that bring O_2 deprived, CO_2-enriched and low-pH waters to nearshore regions [10]. For example, high mortality rate of oyster larvae from oyster hatcheries in the Pacific Northwest have been linked to the combination of multiple stressors in a lower pH environment [53,58].

The Pacific Norwest had one of the worst harmful algal blooms recorded in 2015 with the highest concentrations of domoic acid yet observed [92] and ocean acidification may have increased their toxicity. These toxic algal blooms led managers to close down the entire west coast recreational and crab fisheries from the southern Washington coast to Southern California[93]. The toxicity of harmful algal blooms increases with ocean acidification and eutrophication can alter phytoplankton growth and succession [32,89].This means that the water quality standard for toxic and other deleterious organic and inorganic substances for marine waters can be affected by both pH and pollution. For example, the toxicity of some harmful algal blooms can increase with ocean acidification [94] and with land-runoff and/or water column stratification [95].

Harmful algal blooms can cause mass mortality of wildlife, shellfish harvesting closures, and tremendous risk to human health. Some species of *Pseudo-nitzschia*, a global distributed diatom genus, produce domoic acid, a neurotoxin that causes amnesic shellfish poisoning. Studies have shown that acidified conditions due to increasing pCO_2 can increase toxin concentrations as much as five-fold in this harmful microalgae [94,96]. Toxicity levels are positively correlated with mortality of shellfish, fish, marine mammals, and can cause deleterious effects in the central nervous system in humans known as paralytic shellfish poisoning [96–98]. For example, results from laboratory experiments indicate that levels of the toxin domoic acid and growth rate in the diatom *Pseudo-nitzschia multiseries* increases as pCO_2 in water increases from 220 to 730 ppm [94].

g. Ocean acidification can be partially addressed locally

Currently, several approaches can be used to prevent locally intensified ocean acidification. Recently, the West Coast Ocean Acidification and Hypoxia Science Panel working in partnership with the California Ocean Science Trust published a report highlighting major findings, recommendations, and actions that West Coast states can take now to address ocean acidification locally [6]. This report suggested that the effectiveness of local actions will be higher in semi-enclosed water bodies such as estuaries and bays where local physical-chemical processes dominated over oceanic forcing [6]. As such local actions will be paramount in California since semi-enclosed water bodies such as estuaries and bays represent a substantial portion of marine waters in the region. The state of California has already a legal framework to address not only local stressors that amplify the effects of ocean acidification, but also reduce local and state level carbon dioxide emissions that primarily contribute to the problem.

Ocean acidification can have a localized impact and often acts synergistically with other stressors. Marine species have a limited capacity to deal simultaneously with several stressors, and often the negative combined effects of ocean acidification with other local stressors are stronger than the sum of their parts. This is because ocean acidification in coastal areas can be intensified by the negative effects of local stressors (e.g., pollution, hypoxia, warming) [99]. Additional declines of pH, aragonite saturation states and dissolved oxygen associated with local stressors can suddenly push marine species across a critical threshold that drastically impairs their physiology and can cascade up through the food web affecting entire ecosystems [42,81]. As marine species fare better dealing with one stressor instead of multiple stressors, the most practical, fast, and direct approach to deal with ocean acidification is to eliminate other local stressors and therefore increase the resilience of marine species to corrosive waters.

Under the Clean Water Act, California has ample authority to address local sources that contribute to ocean acidification, including storm water runoff, sewage contamination, and management actions to build resilience. Anthropogenic ocean acidification combined with local stressors that lower pH greatly magnifies the global ocean acidification problem and have drastic effects in coastal and estuarine waters affecting entire shellfish fisheries [6]. Ocean acidification can be especially problematic in estuarine and coastal waters adjacent to urban areas drastically reducing water quality that impairs the survival and growth of marine species. By addressing local pollution, eutrophication, river runoff and shore line erosion (among others), the San Francisco Bay basin region will not only prevent the magnification of the ocean acidification problem, but also provide marine organisms with better capacity and more time to resist ocean acidification while we work globally to reduce atmospheric CO_2.

Although the primary solution to eliminate ocean acidification is to drastically curb CO_2 emissions globally, local management actions that directly address water quality by eliminating pollution, hypoxia, excess of land-based nutrient runoff, and sedimentation from land erosion will substantially ameliorate the likely stronger and synergistic deleterious effects of ocean acidification on marine species [6]. Addressing local stressors may alone improve the health of coastal waters and protect coastal economies that depend on shellfish fisheries. Moreover, under the Clean Water Act, California has the authority to reduce atmospheric CO_2 that contributes to ocean acidification water quality violations. The Clean Water Act has a long history of being used to address water pollution from atmospheric deposition. For example, section 303(d) of the

Clean Water Act has been used to address cross-border pollution from atmospheric mercury, PCBs, and acid rain. California can do its part, as well as hold other states accountable for their contributions to ocean acidification.

2. Current water quality criteria for pH are inadequate to address ocean acidification

The estuarine/marine habitat pH criterion in the Water Quality Control Plan for the San Francisco Bay basin is inadequate to protect aquatic life. The plan states: "The pH shall not be depressed below 6.5 or raised above 8.5, and changes in normal ambient pH levels shall not exceed 0.2 units". Based on the scientific available information on the deleterious effect of ocean acidification on marine life in estuarine waters, these water quality objectives regarding pH standards are inadequate, because negative effects can be observed at pH levels well within the current range that is considered normal. Thus, the San Francisco Bay Regional Water Quality Control Board should develop new water quality standards for ocean acidification (either numerical or narrative) that better reflect natural variability and potential negative effects of acidification on vulnerable coastal and estuarine species.

Current water quality criteria for pH were developed over four decades ago and are scientifically inadequate to address the effects of ocean acidification. The numerical criteria are not based in the most current science and are not ecological relevant for marine and estuarine species [6]. These thresholds, while providing guidance, are insufficientwith respect to ocean acidification applications [6]. Several studies (see above) have shown biological impacts at pH levels well above 7.5 units. Moreover, this pH range represents up to two order of magnitude difference in acidity since the pH is in logarithm scale. Finally, a deviation of no more than 0.2 units from ambient is difficult to apply. The state and regional water boards must take steps to define historical ambient pH levels for its waters.

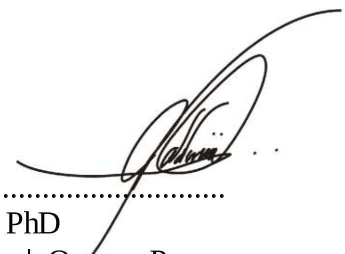
New ecologically meaningful water quality criteria for ocean acidification must be developed and recent studies recommend more appropriate approaches [72]. In addition, ocean acidification water criteria should be expanded to include other acidification parameters (e.g., pCO_2, aragonite saturation state, carbonate ions concentration) that may be more relevant than pH and may affect many marine species [6]. For example, aragonite saturation state is more biologically relevant than pH for shell formation in calcifying organisms such as pteropods and oysters, and recent studies have already established chronic and acute thresholds that can be used (see above). In contrast, parameters such as pCO_2 instead of pH are more relevant for fish which can drastically impair their ability to avoid predators, find food, and identify suitable habitat.

3. Conclusion

The Center urges the San Francisco Bay Regional Water Quality Control Board to amend the Integrated Report to include ocean acidification as water quality issue and to include water quality objectives for pH that avoid harmful biological impacts. Even though most pH values of coastal and estuarine/bay waters across the San Francisco Bay basin may fall within the ranges attaining pH numeric standards for California, scientific evidence over the past decade clearly shows that these waters are becoming more acidic, directly compromising the growth and survival of important calcifying coastal and estuarine species. It is imperative that state and regional water quality control boards take concern and action now on ocean acidification to address this increasingly important water quality problem before it has devastating consequences on coastal, estuarine and bay ecosystems. Delaying action could make future management strategies substantially less effective and likely more costly. Minimizing or preventing additional local stressors on coastal ecosystems such as nutrient inputs associated with development and urbanization can ameliorate compounding threats of ocean acidification. In estuaries and bay waters natural factors including acidic freshwater inputs, restricted circulation, and hypoxic conditions can amplify the effects of anthropogenic carbon dioxide deposition and nutrients inputs and predispose these ecologically and economically important habitat to corrosive waters. The actions that San Francisco Bay Regional Board can take now based on the best available science would ameliorate the negative effects of ocean acidification. Inaction on ocean acidification will result in drastic biological, ecological and socioeconomic negative effects that will be more severe in coastal and estuarine environments compromising sensitive species, ecosystem services and the human populations that rely on them.

Please contact me if you require further information or have questions.

Sincerely,



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4. Literature cited*

*(All references are found here: https://www.dropbox.com/sh/xgmz19idj7tgqth/AABdoa9hFMeTovmWWtdiwZL6a?dl=0)

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NORTH COAST STREAM FLOW COALITION

March 13, 2017

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Oakland, CA 94612

VIA ELECTRONIC MAIL: rlooker@waterboards.ca.gov

Re: Section 303(d) and Section 305(b) Integrated Report

Dear Chair Young and Board Members:

On behalf of the undersigned environmental groups, fishing groups, and others, we welcome the opportunity to submit these comments in support of inclusion of hydrologically-impaired (*i.e*., flow-impaired) waterways in the region's Integrated Report Category 4C. Such waterways or waterway segments include but are not limited to the Napa River (non-tidal) (*see* Attachment 1).

The San Diego Regional Water Quality Control Board (SD RWQCB) recently approved identification of 30 hydrologically impaired waterway segments in Category 4C of their Integrated Report.[1] We urge the San Francisco Bay RWQCB to follow the lead of the SD RWQCB, as well as U.S. EPA and numerous other states (including California itself), in similarly identifying hydrologically impaired waters in its Integrated Report. We offer below our support for this request.

1. Full Compliance with Clean Water Act Sections 305(b) and 303(d) Requires Identification of Hydrologically Impaired Waterways

Clean Water Act (CWA) Section 303(d)(1)(A) requires California to "identify those waters within its boundaries for which the effluent limitations … are not stringent enough to implement any water quality standard applicable to such waters." This must be a robust listing, with sufficient details

[1] *See* attached ELC's August 2016 comments on the SD RWQCB hydrologic impairment listings.

about the waterways (including flow) to allow the state to "establish a priority ranking" for the waterways, also required by Section 303(d)(1)(A). In other words, California's 303(d) list must provide a comprehensive list of all impairments. The state's Listing Policy provides some mixed direction, stating on the one hand that 303(d) list only covers impairments by "pollutants" (rather than also by "pollution," such as flow),[2] but on the other hand stating that Regional Water Board Fact Sheets supporting Section 303(d) listings "shall contain . . . Pollutant *or type of pollution* that appears to be responsible for standards exceedance."[3] The latter path is the appropriate course.

No objection, further, can be made to including flow-impaired waterways on the Section 303(d) list on the basis that the state is not required to prepare TMDLs to address "pollution." First, Section 303(d)(1)(A) makes no mention of limiting the 303(d) list to those waterways requiring Total Maximum Daily Loads (TMDLs). In fact, no mention of TMDLs is made until Section 303(d)(1)(C), which sets requirements on how to manage impaired waterways. Moreover, the state itself does not take this position for waterways impaired by pollutants. Instead, the state lists in Category 5 (what it deems its Section 303(d) list) pollutant-impaired waterways that do, and do not, require TMDLs by state evaluation.[4] Accordingly, the state must include hydrologically impaired waterways, including those impaired by altered flow, on its 303(d) list.

The state must also include hydrologically impaired waters in its broader, CWA Section 305(b) report. Section 305(b) requires states to submit biennial[5] reports that "shall" describe the "water quality of all navigable waters," including an analysis of the extent to which the waters protect fish and wildlife, for compilation and submission to Congress.[6] Federal regulations describe this requirement and its purpose, stating that **the Section 305(b) report "serves as the primary assessment of State water quality" and the basis of states' water quality management plan**

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[2] SWRCB, "Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List," p. 3; at: http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf (Listing Policy).

[3] *Id*. at p. 18 (emphasis added).

[4] Even the state does not take that position, choosing instead to include in the Section 303(d) list Category 5 waters that do, and do not, require TMDLs. Listing Policy, *supra*, at Section 2.2, p. 3; *see also* San Francisco Bay Regional Water Quality Control Board Clean Water Act Sections 305(b) and 303(d) 2016 Integrated Report for the San Francisco Bay Region: Staff Report (2017) ("staff report"), p. 6 (stating that "…waterbodies remain in Category 5 until all 303(d)-listed pollutants are addressed by USEPA-approved TMDLs *or by another regulatory program that is expected to result in the reasonable attainment of the water quality standards*….") (emphasis added).

[5] We note for the record that the state's Section 303(d) and 305(b) reports are extremely overdue. The 2014 regions (Central Coast, Central Valley, and San Diego Regions) are now almost three years overdue, while the 2016 regions (Los Angeles, Santa Ana, and San Francisco Bay Regions) are now almost one year overdue, contrary to the clear language of the CWA (*see* 33 U.S.C. § 1313(d), 1315(b); 40 C.F.R. § 130.7(d)(1)). *We object strongly to this continued, illegal, statewide delay in compliance with CWA Sections 303(d) and 305(b).*

[6] 33 U.S. Code § 1315(b)(1); *see also* 40 CFR § 130.8. Section 305(b)(1) states that the biennial report "shall include": "(A) a description of the water quality of all navigable waters in such State during the preceding year, with appropriate supplemental descriptions as shall be required to take into account seasonal, tidal, and other variations, correlated with the quality of water required….;
(B) an analysis of the extent to which all navigable waters of such State provide for the protection and propagation of a balanced population of shellfish, fish, and wildlife, and allow recreational activities in and on the water; …
(E) a description of the nature and extent of nonpoint sources of pollutants, and recommendations as to the programs which must be undertaken to control each category of such sources, including an estimate of the costs of implementing such programs." As to this last point, the SWRCB itself has recognized flow alterations as a form of nonpoint source pollution, reinforcing the need to properly account for it in the Section 305(b) report. *See, e.g.*, "Hydromodification, Wetlands and Riparian Areas Technical Advisory Committee: Recommendations to the SWRCB" (Dec. 6, 1994), at: http://www.waterboards.ca.gov/water_issues/programs/nps/tacrpts.shtml.

elements, which "help direct all subsequent control activities."[7] States must use the Section 305(b) report to develop their annual work program under Sections 106 and 205(j).[8] California's Integrated Report accordingly must include an adequate Section 305(b) report if the state is to develop meaningful water quality plans that appropriately direct staff and resources to the most important control activities.

The Section 305(b) report must particularly include information regarding waterway flows to ensure that the fundamental purpose of Section 305(b) in guiding workplanning is met. The provision of information regarding waterway flow is also called for by CWA Section 101, which sets the **national objective of restoring and maintaining the** "**chemical,** ***physical*****, and biological integrity of the Nation's waters**." (Emphasis added.) The U.S. Supreme Court itself explicitly affirmed the importance of addressing physical elements of waterway health such as flow, stating that **the distinction between water quality and quantity under the CWA is "artificial."**[9]

By contrast with this direction, the Staff Report runs afoul of the CWA by ignoring Category 4C entirely for inclusion in either its 303(d) list or its 305(b) report, incredibly reporting that *zero* water bodies in the San Francisco Bay region are impaired due to altered hydrology.[10] As with other regional water boards, the San Francisco Bay RWQCB appears to rely on the Listing Policy for this decision, which states that the 303(d) list only includes those water segments that require the development of a TMDL.[11] Here, again, the Staff Report assumes an illegally narrow definition of its requirements under the CWA. The Integrated Report is supposed to include *both* a robust and legally adequate 303(d) list *as well as* a robust and legally adequate 305(b) report. These requirements are combined; they are not the same (*see also* sec. 8). If the State Water Board and Regional Water Boards take the position that pollution-impaired waterways (including flow-impaired waters) cannot be included in the Section 303(d) list, then the Listing Policy – which by definition applies *only* to the Section 303(d) list – is irrelevant. It cannot be used as an excuse to ignore flow impairments entirely. The state in that case must then turn to its requirements under Section 305(b), which broadly require it to report on water quality, including as impacted by altered flow.

Indeed, the Staff Report recognizes that it must consider flow-impaired waterways in its assessment, describing Category 4C as being applicable if "[t]he non-attainment of any applicable water quality standard for the waterbody is the result of pollution and is not caused by a pollutant."[12] No legitimate reason is given for entirely failing to comply with this requirement, however. A legally adequate Section 305(b) report must include waterways impaired by pollution, including hydrologically impaired waterways, whether or not the waterways are also impaired by a pollutant. This information is also critical for the state to set waterway protection priorities properly.

Proper identification of hydrologically impaired waterways is also important if the state is to fully comply not only with Section 305(b), but with CWA Section 303(d) as well. This section not only calls for identification of impaired and threatened waterways, but also requires the state to prepare a "*priority ranking*" of such waters, "taking into account the severity of the pollution" and waterway

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[7] 40 CFR § 130.8(a) (emphasis added).
[8] *Id.*
[9] *PUD No. 1 of Jefferson County v. Washington Department of Ecology,* 511 U.S. 700 (1994).
[10] Staff Report, *supra*, at p. 6.
[11] *See* Listing Policy, p. 3.
[12] *Id*. at p. 6.

uses.[13] Flow and other hydrologic alteration data and information are critical to proper prioritization of impaired waters for further staff and resource attention.

Finally, we reiterate that because Section 303(d)(1)(A) broadly requires identification of impairments *regardless* of whether TMDLs are needed, the state's Section 303(d) list should include a robust Category 4C set of listings. State law cannot weaken the requirements of the CWA by artificially limiting the scope of this list.

2. U.S. EPA Guidance and Reports, and the State Water Board Itself, Have Called for Identification of Hydrologically Impaired Waterways in Category 4C of the Integrated Report

U.S. EPA issued formal Integrated Report Guidance (*i.e.*, for the combined Sections 303(d) and 305(b) reports) to states and territories in August 2015; in it, EPA specifically addresses the topic of hydrological impairment.[14] The U.S. EPA Guidance clearly states that

> If States have data and/or information that a water is impaired due to pollution not caused by a pollutant (e.g., aquatic life[15] use is not supported due to hydrologic alteration or habitat alteration), those causes should be identified and that water should be assigned to Category 4C.[16]

The Guidance specifically references hydrologic alteration as an example of a Category 4C listing.[17] It further references EPA Guidance going back at least to 2006, which similarly said that flow-impaired waters should be identified in the Integrated Report under Category 4C (the 2010 CCKA *et al.* Letter references this 2006 Guidance in support of flow listings; *see* attachment 4).

U.S. EPA and USGS reinforced this mandate in a joint report in February 2016 on flow, stating in part that "EPA recommends reporting impairments due to hydrologic alteration in Category 4c, which are those impairments due to pollution not requiring a TMDL."[18]

Even more specifically, U.S. EPA Region 9 has *directly* told the State Water Board that the Board is "well aware of [EPA's] interest toward listing selected streams for 'flow impairments' (at least under 305(b)) where lines of evidence are strong."[19]

Further, the State Water Board Executive Director himself decided that the state should identify flow-impaired waters in its Integrated Reports, stating that California "would now list for flow alterations" and that "[l]istings would be made under category 4C for impaired [sic] by pollution not

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[13] 33 U.S. Code § 1313(d)(1)(A) (emphasis added).
[14] 2015 EPA Listing Guidance, *supra*, pp. 13-16.
[15] Note here that U.S. EPA specifically calls out protection of aquatic life as a reason to identify flow-impaired waters. The Staff Report similarly calls out aquatic life for specific protection (p. ii), but then ignores the next step of identifying flow impairments that injure aquatic life.
[16] *Id.* at p. 15.
[17] *Id.*
[18] U.S. EPA and USGS, "Draft EPA-USGS Technical Report: Protecting Aquatic Life from Effects of Hydrologic Alteration," Chapter 5 (Feb. 2016); at: https://www.epa.gov/sites/production/files/2016-03/documents/aquatic-life-hydrologic-alteration-report.pdf (U.S. EPA/USGS Report).
[19] Email from Tim Vendlinski, U.S. EPA Region 9 to Diane Riddle, SWRCB (Jan. 7, 2015); available upon request.

a pollutant, and be based on staff's professional judgment as well as the evidence submitted by the data."[20] Again, no reason is given in the Staff Report for ignoring the clear flow impairments throughout the region in light of the CWA, guidance, and state direction.

3. The San Diego RWQCB Has Adopted Numerous Listings for Hydrologic Impairment for Its Current Integrated Report

The SD RWQCB recently adopted an Integrated Report and Staff Report[21] that **identified 30 waterway segments for listing in Category 4C, either with a Category 5 pollutant listing or alone**.[22] Consistent with U.S. EPA Guidance, the SD RWQCB recognized that identifying *all* pollutant and pollution impairments provides a far more accurate picture of the challenges before the state than ignoring key impairments. For example, the Staff Report found that "over 96 percent of streams that exhibited biological degradation had both an associated pollutant(s) and supporting information showing pollution from in-stream habitat/hydrologic alteration and/or watershed hydrologic alteration (hydromodification, Table 3)." If the Regional Board had ignored such pollution impairments, then virtually all of the impaired streams in the San Diego Region would have been under-assessed, likely resulting in misallocation of limited resources and attention. ELC commented to the San Diego Board in support of these listings; these comments are attached.[23]

4. California Has Identified Hydrologically Impaired Waterways in the Past

In California, "Pumping" and "Water Diversion" are listed as the *sole* causes of impairment for Ventura River Reach 4, in the Los Angeles Region. Also in the Los Angeles Region, Ventura River Reach 3 lists for "Pumping" and "Water Diversion," and Ballona Creek Wetlands is listed as impaired by "Hydromodification," among other impairments. All three water body segments are listed for these specific flow-related impairments in Category 5.[24] California's history of identifying flow-related impairments under Section 303(d) should be considered precedential.

5. Numerous Other States Have Identified Hydrologically Impaired Waterways in Categories 4C and 5

Many states around the country have followed U.S. EPA Guidance and the CWA by properly identifying flow-impaired waterways in their Integrated Reports. These include, but are not limited to, Western states such as Idaho, Montana, Wyoming, Washington, and New Mexico.[25] One listing methodology that may be of particular interest to the San Francisco Bay Region is that used by Ohio, which identifies waters impaired by flow alteration by linking biological community degradation with upstream dams. Notably, a number of these states regularly include flow-impaired waterways on their 303(d) list as well as their 305(b) Report. ELC has collected a significant amount of information on other states' hydrologic impairment listings and processes (and provided

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[20] Email from Nicholas Martorano, SWRCB to SWRCB/RWQCB staff (July 22, 2013) (referencing decision by Thomas Howard, SWRCB); available upon request. Note that such Category 4C listings can and should be made for waterways that are also listed for other categories, including Category 5 (*see* Sec. 8).
[21] *See* Draft adopted Oct. 12, 2016 at: http://www.waterboards.ca.gov/sandiego/water_issues/programs/303d_list/.
[22] http://www.waterboards.ca.gov/sandiego/water_issues/programs/303d_list/docs/IR_RB_StaffReport_R9_07-11-16_Clean.pdf, Table 3.
[23] Also found at: http://bit.ly/SDRWQCB (note attachments to this letter as well for further supporting information).
[24] http://www.swrcb.ca.gov/losangeles/water_issues/programs/303d/2008/Final%20303(d)/Appendix_E_08Aug09.pdf.
[25] *See* detailed memorandum on this topic prepared by ELC for the SWRCB at: http://bit.ly/303d305b.

this to the State Water Board); this can be made readily available to the San Francisco Bay RWQCB if desired.

6. Flow Standards Are Not Required to Identify Hydrologically Impaired Waterways in Category 4C

Most, if not all, of the states that identify hydrologic (including flow) impairments make those listing decisions based on best professional judgment and the information before them. Flow standards are not required to be developed first. Even the State Water Board has stated that flow listings could be done "based on staff's professional judgment as well as the evidence submitted by the data," and that they "would likely be mostly narrative . . . unless there are specific numeric targets for flow in place."[26] In other words, the state itself has recognized that flow criteria are not necessary for flow impairment listings. ELC has compiled significant information collected on various states' hydrologic impairment listing strategies and would be pleased to provide this additional information if desired.

U.S. EPA addresses the process of identifying hydrologically impaired waters in its 2015 EPA Listing Guidance, stating that:

> if States have data and/or information that a water is impaired due to pollution not caused by a pollutant (e.g., aquatic life use is not supported due to hydrologic alteration or habitat alteration), those causes should be identified and that water should be assigned to Category 4C. Examples of hydrologic alteration include: a perennial water is dry; no longer has flow; has low flow; has stand-alone pools; has extreme high flows; or has other significant alteration of the frequency, magnitude, duration or rate-of-change of natural flows in a water; or a water is characterized by entrenchment, bank destabilization, or channelization. Where circumstances such as unnatural low flow, no flow or stand-alone pools prevent sampling, it may be appropriate to place that water in Category 4C for impairment due to pollution not caused by a pollutant. In order to simplify and clarify the identification of waters impaired by pollution not caused by a pollutant, States may create further sub-categories to distinguish such waters.[27]

Note that this description of the process for identifying flow impairments does *not* require adoption of flow standards as a prerequisite for listing.

The SD RWQCB Staff Report also addressed this topic in their just-approved Staff Report and Integrated Report, similarly stating that:

> where a water segment exhibited significant degradation in biological populations and/or communities as compared to reference site(s) the San Diego Water Board assessed the segment for inclusion in Category 4c using data and information as prescribed in USEPA's 2015 Guidance . . .. Where in-stream data was lacking, stream segments were evaluated using desktop aerial reconnaissance for potential in-stream habitat and hydrologic alteration associated with channel modifications, stream diversion or augmentation, and to evaluate the

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[26] Email from Nicholas Martorano, SWRCB to SWRCB/RWQCB staff (July 22, 2013); available upon request.
[27] 2015 EPA Listing Guidance, *supra*, p. 15.

> level of associated development and use of best management practices to mitigate hydromodification.[28]

7. Sound Public Policy Dictates that Flow-Impaired Waterways Must Be Identified

States, including California, have identified and are identifying flow-impaired waterways in their Integrated Reports not only because the Clean Water Act calls for it and U.S. EPA Guidance reinforces it. They also do so because it makes smart policy sense. Why would a state limit the amount of information it releases, information that could help it make better decisions about how to prioritize its resources? If the main problem with a waterway is not temperature or dissolved oxygen but flow, for example, then that information should be available so the best permitting and resource allocation decisions can be made to protect affected waterways.

Identification of flow-impaired waterways is also important because those listings help the public exercise their own responsibility to help improve waterway health. U.S. EPA agreed in its Guidance, stating that "a variety of watershed restoration tools and approaches to address the source(s) of the impairment" exist even in the absence of TMDLs, increasing the importance of full and complete identification for impaired waterways.[29]

Hydrologic impairment listings also can and should be used in CEQA analyses of proposed projects that could further impact the flow of identified waterways, thus preventing additional damage to already-impacted waterways and fish. ELC has prepared and submitted extensive comments to the state on the numerous policy benefits of properly identifying flow-impaired waterways.[30]

8. Water Bodies Can and Should Be Placed in *All* Relevant Categories of Identification

The Staff Report states that "[t]o meet CWA section 305(b) requirements of reporting on water quality conditions, the Integrated Report places each assessed waterbody into one of five *non-overlapping* categories based on the overall beneficial use support of the waterbody."[31] This statement appears to limit the RWQCB to placing water bodies in only one category, an interpretation presumably reflected in the recommendation to include zero listings in Category 4C.

This approach is simply incorrect. U.S. EPA has been quite clear that water bodies can be placed into multiple categories, and in fact should be in order to provide the best available information to U.S. EPA and Congress. As explained by the SD RWQCB in its Staff Report:

> It is important to note that USEPA recommended in its 2015 guidance that "States assign all of their surface water segments to **one *or more* of five reporting categories**"....[32]

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[28] SD RWQCB, "Clean Water Act Sections 305(b) And 303(d) Integrated Report for The San Diego Region (July 2016); at: http://www.waterboards.ca.gov/sandiego/water_issues/programs/303d_list/docs/IR_RB_StaffReport_R9_07-11-16_Clean.pdf, pp. 13-14.

[29] For an analysis of water governance tools that could effectively restore flows to California waterways, *see* Linda Sheehan *et al.*, "California Water Governance for the 21st Century" (2017), available at: http://bit.ly/CAwatergovernance.

[30] Letter from ELC, CCKA to SWRCB, "Inclusion of Impairments Due to Low Flow in the California 2012 Section 303(d) List" (May 15, 2013); at: http://bit.ly/SWB303d.

[31] Staff Report, *supra*, p. 5 (emphasis added).

[32] SD RWQCB, *supra*, p. 14 (emphasis added).

U.S. EPA reiterated this point in its joint report with USGS, stating that "EPA's guidance has noted that **assessment categories *are not mutually exclusive*, and waters may be placed in more than one category (for example, categories 4C and 5)**."[33] Accordingly, flow impairments should be reflected in Category 4C *whether or not* there is a pollutant present, the approach taken recently by the SD RWQCB. Otherwise, the state is conflating the Section 303(d) and 305(b) reports rather than combining them, ignoring its Section 305(b) responsibilities in the process.[34] Because the state must comply with *both* Sections 305(b) and 303(d), it must provide information relevant to all categories applicable to a single water body.[35] The Integrated Report does not meet these mandates.

9. Reasonably Available Data Exist and Have Been Provided in Support of the Listing of Waterways as Hydrologically Impaired

As detailed in Attachment 1, and as evident based on significant, readily available information, the lines of evidence for hydrologic impairment are strong for San Francisco Bay Region waterway segments, including but not limited to the Napa River (non-tidal).[36] Federal regulations state that states must evaluate "all existing and readily available information" in developing their 303(d) lists and prioritizations.[37] The SWRCB's Executive Director reinforced the breadth of this requirement in a memorandum on the scope of listing regulations at 40 CFR § 130.7(b)(5).[38] This information must include flow, a position recently reinforced by U.S. EPA, who stated that the integrated reporting format is key to "acknowledge the important role of flow in contributing to water-body impairments."[39]

Attachment 1 provides summaries of such information, including in regards to the severe dewatering of the Napa River (non-tidal), due largely to excessive groundwater pumping as well as surface water diversions – both legal and illegal. The San Francisco Bay RWQCB has more than enough data needed to list one or more waterways, and at a minimum the Napa River (non-tidal), as hydrologically impaired. Proper identification under the Clean Water Act of all hydrologically impaired waterways in the San Francisco Bay's Integrated Report is required and critical to setting appropriate plans and priorities that will help reverse the decline in San Francisco Bay aquatic species. California has long-recognized inadequate Napa River flows and possesses broad authority to reduce diversions (such as through use of the waste and unreasonable use doctrine[40]), yet it has

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[33] U.S. EPA/USGS Report, *supra*, Ch. 5 (emphasis added).
[34] 33 U.S.C. §§ 1315(b), 1313(d); 40 C.F.R. §§ 130.7, 130.8.
[35] This is consistent with the statutory intent of the CWA, which distinguishes the related Section 305(b) reports and Section 303(d) lists. In 2002, the EPA for the first time released guidance calling for a single "Integrated Report" merging Section 305(b) water quality reports and Section 303(d) lists. *See* U.S. EPA, 2002 Integrated Water Quality Monitoring and Assessment Report Guidance.
[36] See Attachment 1 for detailed information drawn from such sources.
[37] 40 CFR § 130.7(b)(5).
[38] At: http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/impaired_waters_list/clarification_30jan07.pdf (placing "no limits" on the data that can be provided to the RWQCBs for development of the Integrated Report's 303(d) and 305(b) lists).
[39] U.S. EPA/USGS Report, *supra*, Ch. 5.
[40] The SWRCB found diversions for frost protection to be "unreasonable" from March 15 to May 15 under Art. X, Section 2 of the California Constitution and Section 100 of the Water Code. *See* Cal. Code Regs. tit. 23, § 735. However, this action was motivated by the desire to protect water interests for frost protection rather than ecosystem needs. *See People ex rel. State Water Resources Control Bd. v. Forni* (1976) 54 Cal.App.3d 743, 747. Meanwhile, the Napa River continues to regularly run dry due to water over-use (*see* Attachment 1).

failed to take necessary action. Listing the Napa River as impaired due to altered flows is an important first step.

In sum, the data and information proffered in Attachment 1 and readily available elsewhere must be considered and applied to identify relevant San Francisco Bay RWQCB water bodies for listing for flow/hydrologic impairments, as was done in the SD RWQCB Staff Report and as called for by U.S. EPA and the CWA.

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In conclusion, we once again urge the San Francisco Bay RWQCB to follow the lead of the SD RWQCB, as well as U.S. EPA and numerous other states, in identifying flow- and otherwise hydrologically-impaired waters in the region's Integrated Report, such as the Napa River (non-tidal).

Thank you for the opportunity to submit these comments. If you have any questions or would like additional information, please do not hesitate to contact us.

Sincerely,

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Attachment 1: Flow-Related Decline of the Napa River (Non-Tidal)
Attachment 2: Comment Letter from ELC to San Diego RWQCB, "Comment – CWA Section 305(b)/303(d) Integrated Report" (Aug. 8, 2016)
Attachment 3: "Ten California Waterways Being Drained Dry" (May 2013)
Attachment 4: Letter from CCKA *et al* to State Water Resources Control Board, "Re: Notice of Public Solicitation of Water Quality Data and Information for 2012 California Integrated Report [Clean Water Act Sections 305(b) and 303(d)]" (Aug. 30, 2010)

- Napa County Resource Conservation District, "Northern Napa Watershed Plan" (Report prepared for the California Department of Fish and Game) (Apr. 2002), at: http://naparcd.org/wp-content/uploads/2014/10/NorthernNapaRiverWatershedProjectFinalReport2002.pdf.

- Napa River Flow Enhancement Study, "Center for Ecosystem Management and Restoration" (2013), at www.cemar.org/pdf/2013-12-31%20Napa%20River%20Flow%20Enhancement%20Study.pdf.

- R.A. Leidy, G.S. Becker & B.N. Harvey, "Historical Distribution and Current Status of Steelhead/Rainbow Trout (Oncorhynchus Mykiss) in Streams of the San Francisco Estuary, California," Center for Ecosystem Management and Restoration (2005).

- Stillwater Sciences and W.E. Dietrich, "Napa River Basin Limiting Factors Analysis. Technical Report," Prepared for the San Francisco Regional Water Quality Control Board and California State Coastal Conservancy (2002), at: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/napasediment/lfa_tech_report.pdf.

- U.S. Fish and Wildlife Service, "Analysis of Fish Habitat of the Napa River and Tributaries, Napa County, California, with Emphasis Given to Steelhead Trout Production" (1968).

- USGS Stream Gauge No. 11456000, NAPA R NR ST HELENA CA, available at: https://waterdata.usgs.gov/nwis/uv?site_no=11456000.

- USGS Stream Gauge No. 11458000 NAPA R NR NAPA CA, available at: https://waterdata.usgs.gov/nwis/uv?site_no=11458000.

Attachment 1

FLOW-RELATED DECLINE OF THE NAPA RIVER (NON-TIDAL)

Pollution: Altered Flow

Beneficial Uses Being Impaired: Cold Freshwater Habitat, Warm Freshwater Habitat, Fish Migration, Preservation of Rare and Endangered Species, Fish Spawning, Wildlife Habitat, Commercial and Sport Fishing, Contact and Non-Contact Water Recreation.

Description: The Napa River (non-tidal) suffers from reduced flows due to human activities. Causes include groundwater pumping and direct surface water diversions within the Napa River watershed,[1] as exacerbated by periods of low rainfall. In regards to the former, excessive pumping of groundwater that is hydrologically connected to surface water has severely reduced Napa River instream flows. As a result, the Napa River (non-tidal) regularly becomes nearly or completely dry, clearly impairing beneficial uses.

The dewatering of the Napa River (non-tidal) negatively impacts numerous aquatic species, including populations of steelhead trout (listed as "threatened" under the federal Endangered Species Act[2]). These steelhead trout are part of the Central California Coast Steelhead Distinct Population Segment (DPS).[3] They have been suffering from a general population decline in the Napa River watershed ever since the 1940s,[4] including due to reduced flows. Reduced Napa River flows can strand steelhead trout in isolated pools and impede their ability both to reach tributaries to spawn[5] and outmigrate in the spring.[6] The dewatering of the Napa River also impedes juvenile growth, increases predation, and limits food and rearing habitat availability for steelhead trout, amongst other impacts.[7] Steelhead runs in the Napa River – once comprising 6,000 to 8,000 fish – are now estimated only to range from the hundreds up to 1,000.[8]

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[1] *See e.g.* Napa River Flow Enhancement Study, "Center for Ecosystem Management and Restoration" (2013), at

[2] *See* Federal Register, Vol. 71, No. 3, Final Rule, "Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead" (Jan. 5, 2006).

[3] Federal Register, Vol. 71, No. 3, Final Rule, "Endangered and Threatened Species: Final Listing Determinations for 10 Distinct Population Segments of West Coast Steelhead" (Jan. 5, 2006).

[4] *See* Napa County Resource Conservation District, "Napa River Steelhead and Salmon Smolt Monitoring Program: Annual Report - Year 2," p. 4 (Aug. 2010) at: http://naparcd.org/wp-content/uploads/2014/10/NapaRiverSmoltMonitoringFinalReport2010.pdf (*citing* U.S. Fish and Wildlife Service, "Analysis of Fish Habitat of the Napa River and Tributaries, Napa County, California, with Emphasis Given to Steelhead Trout Production" (1968); K. R. Anderson, "Steelhead Resource, Napa River Drainage, Napa County," California Department of Fish and Game (1969); R.A. Leidy, G.S. Becker & B.N. Harvey, "Historical Distribution and Current Status of Steelhead/Rainbow Trout (Oncorhynchus Mykiss) in Streams of the San Francisco Estuary, California," Center for Ecosystem Management and Restoration (2005)).

[5] Napa River Watershed Steelhead and Salmon Monitoring Program, Napa County Resource Conservation District, at: http://naparcd.org/wp-content/uploads/2016/09/Fish-monitoring-fact-sheet-2016.pdf.

[6] "Milliken Creek - Steelhead Habitat Modeling and Instream Flow Study," prepared by Napa County Resource Conservation District, p. 2 (Dec. 2010), at: http://naparcd.org/wp-content/uploads/2014/10/Milliken_Flow_Study_Final_Report_Dec_2010.pdf.

[7] Stillwater Sciences and W.E. Dietrich, "Napa River Basin Limiting Factors Analysis: Technical Report," Prepared for the San Francisco Regional Water Quality Control Board and California State Coastal Conservancy, p. 49 (2002), at: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/napasediment/lfa_tech_report.pdf.

[8] Napa River Watershed Steelhead and Salmon Monitoring Program, Napa County Resource Conservation District, at: http://naparcd.org/wp-content/uploads/2016/09/Fish-monitoring-fact-sheet-2016.pdf.

A multitude of other species benefit from adequate Napa River flows, as well, including fall-run Chinook salmon and California freshwater shrimp (listed as “endangered” under the federal Endangered Species Act[9]). While many of Napa River’s fall-run Chinook salmon may be “strays” from other basins,[10] they appear to be recolonizing their former habitat in the Napa River basin and require adequate flows to survive.[11] As for Coho salmon, they once numbered in the thousands but were extirpated entirely from the Napa River in the late-1960s.[12] The severe dewatering of the Napa River threatens other aquatic species with the same fate.

There is readily available information demonstrating the historic decline of Napa River (non-tidal) flows. For example, analyzing data from the Napa River at St. Helena stream gauge, fisheries biologist Patrick Higgins found “statistically significant declining trends in minimum 30-day average [], minimum 7-day average [], mean August, and mean September stream flow … for both the 1930-2013 and 1960-2013 time periods….”[13] Additionally, looking at the Napa River at Napa stream gauge, Higgins found “declining trends for 1960-2013 […] in minimum 30-day average [] and mean monthly stream flows for September-November [].” Although the minimum 7-day average streamfows recorded at this stream gauge did not present a statistical trend, Higgins found that “7-day average flows have fallen to zero in 12 of 14 years since 2000….”[14]

The National Marine Fisheries Service (NMFS) made similar conclusions to Higgins and specifically highlighted the impacts of groundwater pumping in its comments on the 2016 Napa Valley Basin Analysis Report (“Napa Valley Basin Report”). The NMFS found that Napa River at St. Helena flow data “shows a general increase in zero-flow days over time” (*see* Figure 4-28 from the Napa Valley Basin Report, below).[15] Addressing the Napa River at Napa flow data,

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[9] Napa County Resource Conservation District, "Northern Napa Watershed Plan" (Report prepared for the California Department of Fish and Game) (Apr. 2002), at: http://naparcd.org/wp-content/uploads/2014/10/NorthernNapaRiverWatershedProjectFinalReport2002.pdf.

[10] Jonathan Koehler & Paul Blank, "Napa River Steelhead and Salmon Monitoring Program - 2015-16," Napa County Resource Conservation District, p. 8 (Sept. 2016), at: http://naparcd.org/wp-content/uploads/2016/09/2016-Napa-River-Fish-Monitoring-Report-and-Attachments.pdf.

[11] Stillwater Sciences and W.E. Dietrich, “Napa River Basin Limiting Factors Analysis. Technical Report,” Prepared for the San Francisco Regional Water Quality Control Board and California State Coastal Conservancy (2002), at: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/napasediment/lfa_tech_report.pdf; *see also* Napa County RCD, "Napa River Watershed Steelhead and Salmon Monitoring Program," at: http://naparcd.org/wp-content/uploads/2016/09/Fish-monitoring-fact-sheet-2016.pdf..

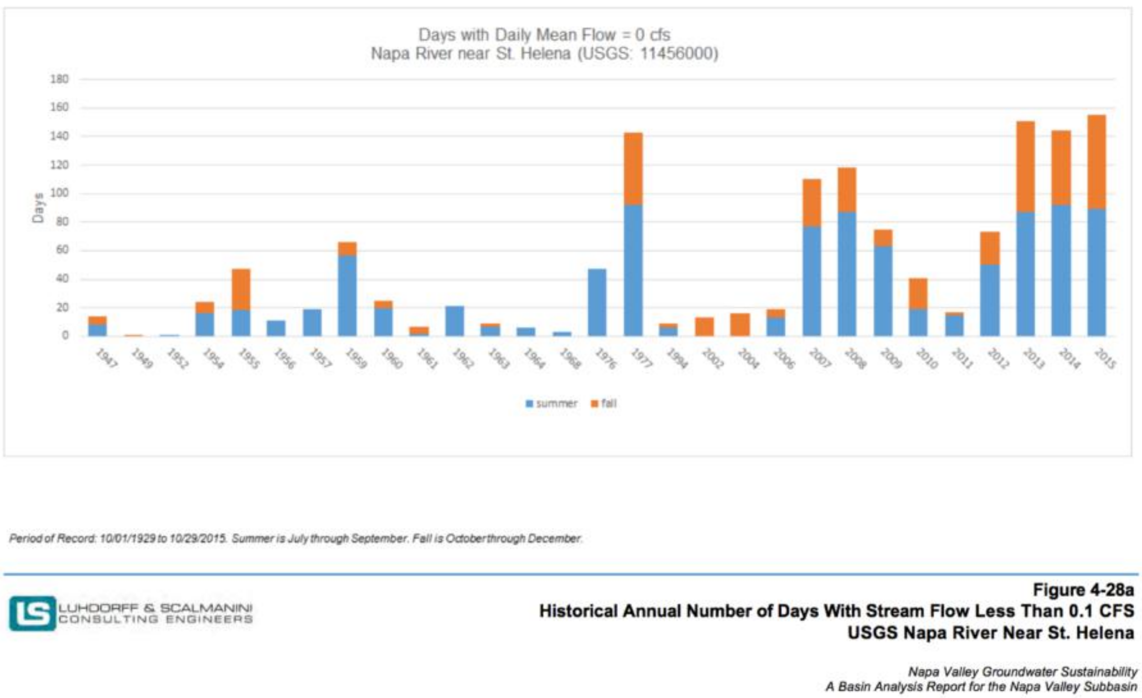
[12] Watershed Information & Conservation Council, "Native Fish," at: www.napawatersheds.org/app_pages/view/126.

[13] As noted by fisheries biologist Patrick Higgins, “Anderson (1969) chronicled problems with insufficient tailwater flows to support steelhead trout below [Napa Valley] dams, a condition that persists to this day.” *See* letter from Patrick Higgins to San Francisco Bay Regional Water Quality Control Board, "Re: Proposal to Remove the Napa River and Sonoma Creek from the California Impaired Water Bodies (303d) List for Nutrient Pollution” (Jan. 10, 2014), at: www.waterboards.ca.gov/sanfranciscobay/board_info/agendas/2014/February/6C.pdf.

[14] *Id*.

[15] NMFS notes that “[s]ome of the increase may be due to the St. Helena gauge being relocated in 2005.” *See* Letter from National Marine Fisheries Service (NMFS) to the California Department of Water Resources (DWR), Re: “Napa County’s December 26, 2016 submission of an Alternative Groundwater Sustainability Plan (Napa Alternative Plan) to the DWR pursuant to the Sustainable Groundwater Management Act (SGMA) of 2014 and Subsequent Emergency Regulations,” p. 3 (Feb. 15, 2017).

NMFS observed that “during the three decades before 1996, the Napa River at Napa rarely dried during the summer” despite this being a relatively dry period. Yet “since 2001, twelve of fifteen summers have experienced periods when the Napa River at Napa has dewatered, despite well above average precipitation trends during that period.”[16] NMFS concluded that “[t]his information suggests worsening streamflow depletion over time that is, in part, related to groundwater extraction.”[17]



Source: Luhdorff & Scalmanini, "Napa Valley Groundwater Sustainability: A Basin Analysis Report for the Napa Valley Subbasin," Figure 4-28a (Dec. 13, 2016).

Finally, photographic evidence underscores the clear impairment due to altered flows occurring regularly on the Napa River (non-tidal). Where a waterway – specifically, one that serves as crucial fish habitat for a federally-listed species such as steelhead trout – is completely dewatered due to human activities (particularly excessive groundwater pumping), a beneficial use impairment due to altered flows is beyond doubt.

[16] *Id.*
[17] *Id.*

Dry Napa River at Pope Street Bridge (2013), Napa County, California
Photo (unedited) by Mark Yashinsky (available at: http://bit.ly/2mBRET9)

Disconnected pools on the Napa River (2005)
Photo by Chris Malan

Dead Chinook salmon found in the Napa River near the Pope Street Bridge (2005)
Photo by Chris Malan

Conclusion: Available data demonstrates that flow alterations are impairing beneficial uses in the Napa River (non-tidal), particularly those beneficial uses related to aquatic life and habitat. This long history of flow impacts is well-documented by the USGS, U.S. Fish & Wildlife Service, Stillwater Sciences, and other government agency-conducted and -recognized studies. In accordance with Section 3.11 of the Listing Policy, when information indicates non-attainment of standards by a water body, the appropriate methodology for evaluation is weight of evidence to determine listing under Section 303(d).

This recommendation is consistent as well with Section 3.9 of the Listing Policy, which supports listing if the water body exhibits degradation in biological populations and pollutants sufficient to impair, or threaten impairment of, beneficial uses. The Napa River (non-tidal) has exhibited degradation in populations of fish (including federally-listed steelhead trout) that rely upon adequate flows for survival. Based on the readily available data and information, the evidence is sufficient to support the listing of the Napa River (non-tidal) on the 303(d) list for impairment caused by altered flow. This evidence also supports including the Napa River (non-tidal) in the 305(b) report.

DATA REFERENCES

- Jonathan Koehler & Paul Blank, "Napa River Steelhead and Salmon Monitoring Program - 2015-16," Napa County Resource Conservation District, p. 8 (Sept. 2016), at: http://naparcd.org/wp-content/uploads/2016/09/2016-Napa-River-Fish-Monitoring-Report-and-Attachments.pdf.

- K. R. Anderson, California Department of Fish and Game, “Steelhead Resource, Napa River Drainage, Napa County” (1969).

- Letter from National Marine Fisheries Service (NMFS) to the California Department of Water Resources (DWR), Re: “Napa County’s December 26, 2016 Submission of an Alternative Groundwater Sustainability Plan (Napa Alternative Plan) to the DWR Pursuant to the Sustainable Groundwater Management Act (SGMA) of 2014 and Subsequent Emergency Regulations,” p. 3 (Feb. 15, 2017).

- Letter from Patrick Higgins, Consulting Fisheries Biologist to Thomas Lippe, Living Rivers Council, “Sufficiency of SFBRWQCB Staff *Napa River Sediment TMDL Appendix D: Responses to Comments*” (Aug. 17, 2010).

- Letter from Patrick Higgins to San Francisco Bay Regional Water Quality Control Board, "Re: Proposal to Remove the Napa River and Sonoma Creek from the California Impaired Water Bodies (303d) List for Nutrient Pollution" (Jan. 10, 2014), at: www.waterboards.ca.gov/sanfranciscobay/board_info/agendas/2014/February/6C.pdf.

- Luhdorff & Scalmanini, "Napa Valley Groundwater Sustainability: A Basin Analysis Report for the Napa Valley Subbasin" (Dec. 13, 2016).

- Napa County Resource Conservation District, "Northern Napa Watershed Plan" (Report prepared for the California Department of Fish and Game) (Apr. 2002), at: http://naparcd.org/wp-content/uploads/2014/10/NorthernNapaRiverWatershedProjectFinalReport2002.pdf.

- Napa River Flow Enhancement Study, "Center for Ecosystem Management and Restoration" (2013), at www.cemar.org/pdf/2013-12-31%20Napa%20River%20Flow%20Enhancement%20Study.pdf.

- R.A. Leidy, G.S. Becker & B.N. Harvey, "Historical Distribution and Current Status of Steelhead/Rainbow Trout (Oncorhynchus Mykiss) in Streams of the San Francisco Estuary, California," Center for Ecosystem Management and Restoration (2005).

- Stillwater Sciences and W.E. Dietrich, "Napa River Basin Limiting Factors Analysis. Technical Report," Prepared for the San Francisco Regional Water Quality Control Board and California State Coastal Conservancy (2002), at: http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/napasediment/lfa_tech_report.pdf.

- U.S. Fish and Wildlife Service, "Analysis of Fish Habitat of the Napa River and Tributaries, Napa County, California, with Emphasis Given to Steelhead Trout Production" (1968).

- USGS Stream Gauge No. 11456000, NAPA R NR ST HELENA CA, available at: https://waterdata.usgs.gov/nwis/uv?site_no=11456000.

- USGS Stream Gauge No. 11458000 NAPA R NR NAPA CA, available at: https://waterdata.usgs.gov/nwis/uv?site_no=11458000.

Attachment 2

earth
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FIGHTING FOR NATURE'S RIGHTS

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tel (650) 877-2710
www.earthlawcenter.org

August 8, 2016

Henry Abarbanel, Chair and Board Members
San Diego Regional Water Quality Control Board
2375 Northside Drive, Suite 100
San Diego, California 92108

VIA ELECTRONIC SUBMITTAL: sandiego@waterboards.ca.gov

Re: Comment – CWA Section 305(b)/303(d) Integrated Report, Attn: Xueyuan Yu

Dear Chair Abarbanel and Board Members:

On behalf of Earth Law Center (ELC), I welcome the opportunity to submit these comments on the above-referenced CWA Section 305(b)/303(d) Integrated Report (Report). ELC has been working at the state and national levels for a number of years to ensure that waterbodies impaired by "pollution," particularly altered flow and hydrology, are represented in either Category 5 or Category 4C of the 305(b)/303(d) Integrated Report. Our recent comment letter to U.S. EPA and USGS in support of such listings is attached.

We write today in support of your proposal to list waterways as impaired due to hydromodification and habitat alteration in Category 4C, as discussed in the July 2016 Draft Staff Report[1] at pages 12-17. As noted in the Staff Report, on August 13, 2015 U.S. EPA released guidance on Integrated Reporting and Listing Decisions that reaffirmed the duty to list in Category 4C those waters impaired by "pollution."[2] In this guidance, U.S. EPA notes that "[w]hile TMDLs are not required for waterbody impairments assigned to Category 4C, States can employ a variety of watershed restoration tools and approaches to address the source(s) of the impairment," raising the importance of full and complete listing identification for these impaired waterways. The Staff Report echoes EPA's finding, stating that Category 4C listed waters "may be a priority for restoration by a Regional Water Board."

We further support your staff's work, consistent with U.S. EPA guidance and regulations, to identify flow-impaired stream segments where in-stream data was lacking, using such tools as

[1] At: http://www.waterboards.ca.gov/sandiego/water_issues/programs/303d_list/docs/IR_RB_StaffReport_R9_07-11-16_Clean.pdf.

[2] Memorandum from U.S. EPA, Office of Wetlands, Oceans, and Watersheds Information to Water Division Directors, Regions 1 – 10, Concerning 2016 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions (August 13, 2015), at: https://www.epa.gov/sites/production/files/2015-10/documents/2016-ir-memo-and-cover-memo-8_13_2015.pdf. *See also* U.S. EPA, "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act," p. 56 (July 29, 2005), at: http://bit.ly/2aIVP8h.

"desktop aerial reconnaissance for potential in-stream habitat and hydrologic alteration associated with channel modifications, stream diversion or augmentation."

Finally, we support staff's assertion that it is "important to note that USEPA recommended in its 2015 guidance that 'States assign all of their surface water segments to *one or more* of five reporting categories'." (Emphasis added.) In other words, a stream segment can be listed for *both* impaired hydrology and pollutant contamination, rather than one or the other.

Specific listing of all waters impaired by "pollution" gives a far more accurate picture of the challenges facing state agencies and Californians than ignoring pollution impairments. For example, the Staff Report states that "over 96 percent of streams that exhibited biological degradation had both an associated pollutant(s) and supporting information showing pollution from in-stream habitat/hydrologic alteration and/or watershed hydrologic alteration (hydromodification, Table 3)." If pollution impairments were ignored, then virtually all of the impaired streams in the San Diego Region would be under-assessed, likely resulting in misallocation of limited resources and attention.

The Clean Water Act calls on the nation to protect the chemical, biological *and physical* integrity of our waters. The full and proper identification of all impaired waterways, including for altered flow and hydrology, is an important step in meeting this mandate. We urge the San Diego Regional Water Quality Control Board to adopt the proposed listings for habitat alteration/hydromodification, as described in Table 3 of the Draft Staff Report and elsewhere. Thank you for the opportunity to submit these comments.

Sincerely,

Linda Sheehan
Executive Director
lsheehan@earthlaw.org

attachments

Attachment 3

Ten California Waterways Being Drained Dry

Using the Clean Water Act to Resuscitate Disappearing Waterways *(May 2013)*

In August 2010, environmental, tribal, and fishing groups submitted more than one thousand pages of detailed studies, data, and analysis to inform the Board's development of the 2012 Clean Water Act Section 303(d) List. As detailed in that letter, and at the August 2012 Water Board informational item on this matter, California is legally required to include on its Section 303(d) list *all* of the waterways for which "readily available" data indicate impairment, including impairments due to alterations in natural flow.

Other states have begun this essential task of identifying water bodies impaired by altered flows, with support by U.S. EPA. Within California, U.S. EPA's Bay Delta Action Plan[i] anticipates flow listings, noting that "identifying those impairments and identifying the cause (whether it is a "pollutant" for purposes of Section 303(d) or some other cause) is a critical part of the Clean Water Act response to the Estuary's problems."

Given California's current struggles with water, and the challenges to come with climate change, every tool must be used to prevent further damage and to restore degraded waterways to full health. California must begin a process of identifying and listing flow-impaired waterways in its 2012 303(d) list, as detailed in our 2010 scoping letter and the 2012 flows listing informational hearing.

To help begin this Board effort, we have developed a shortlist of waterways that are clearly and incontrovertibly impaired, and for which low flows are so clearly a cause that there are no reasonable arguments against their 303(d) listing for flow, in either Category 4C or 5. Preference was given in this initial shortlist to mainstem waterways as opposed to tributaries, as mainstem flow issues are more likely to impact entire watersheds and regions. At a minimum, these critically impaired waterways should be included on the draft 2012 303(d) List and released for public review at Regional and State Water Board hearings.

We worked closely with local groups to create this list based on the following criteria, among others:[ii]

a. Significant data was submitted by August 2010 as part of the CWA 2012 303(d) scoping process, or is otherwise readily available (e.g., such as in government databases), and demonstrates altered flows such that impairment could not be dismissed as either naturally occurring or episodic.
b. Local stakeholders are invested in the health of the waterway, and could inform and participate in restoration of the health of the listed waterway.
c. Prior formal recognition of flow issues with the waterway by State Water Board, Department of Fish and Wildlife, or other state or local agencies.
d. Ongoing or potential injury to threatened or endangered species.
e. Waterways within the National or California Wild and Scenic River System, or Class I streams (habitat for fishery resources) or Class II streams (habitat for aquatic non-fish vertebrates and/or aquatic benthic macroinvertebrates).
f. Waterways where listing would help prevent waste, unreasonable use or unreasonable method of use of water, or unreasonable diversion or method of diversion of water.

Listed from north to south, our proposed "top ten" candidates for which altered flow is a basis for listing on California's 2012 Section 303(d) List are as follows:

1. **Scott River** (Region 1) Sections of the Scott River are completely dewatered during summer months, while other sections are severely flow-impaired. Adjudicated water rights alone are sufficient to allow complete dewatering of the Scott River during the summer and early fall. In

addition, a shift from surface diversions, which are naturally self-limiting, to groundwater wells has made worse the apparent over-appropriation of water in the watershed.[iii, iv]

2. **Shasta River** (Region 1) The hydrology of the Shasta River is strongly affected by surface water diversions, groundwater pumping, and Dwinnell Dam. Seven major diversion dams and numerous smaller structures located on the Shasta River substantially and rapidly reduce flows in the main stem when they are in operation. In addition, Dwinnell Dam, located at about river mile 40, has dramatically altered the flow regime in all seasons of the main stem river. During various times of the year, no water is released from Dwinnell Dam for fish in the Shasta River. These flow alterations have adversely affected salmonid populations in the river.[v]

3. **Eel River** (Region 1) Historic land use, including pervasive logging and road construction that reduced shade, vastly increased sedimentation and altered hydrology and soils, is exacerbated in many areas by unregulated dry-season diversions related to marijuana cultivation. As a result, Eel River and its tributaries suffer from low flows that often produce temperatures lethal to listed fish species.[vi]

4. **Mattole River** (Region 1) A detailed study of the Mattole River Basin found that lack of adequate late summer and early fall stream flow is recognized as one of the most important limitations on salmonid habitat in the Mattole River basin. In recent years, juvenile salmonids have become stranded in pools due to excessively low flows, causing mortality and necessitating fish rescue operations.[vii]

5. **Mark West Creek** (Region 1) Ten years ago all 28 miles of Mark West Creek had water in the summer. Today, because of increased diversions, only approximately 3½ miles have water. Mark West Creek provides important habitat to steelhead trout and endangered coho salmon, whose populations are being adversely affected by elevated water temperatures.

6. **Napa River** (Region 2) Numerous studies referenced in the development of AB 2121 Instream Flow Guidelines for Northern Coastal Streams, among other places, illustrate the significantly degraded habitat of the Napa River, which can only be restored with a focus on reversing severely reduced natural flows.[viii]

7. **San Joaquin River, inflow to the Delta** (Region 5)[ixx] The San Joaquin River was selected as a shortlist priority in light of the data contained in the proceedings being held on potential revisions to the Bay-Delta Water Quality Control Plan to increase flows from the San Joaquin River into the Delta. Current flows are wholly inadequate, as the state and federal wildlife agency, EPA, and NGO analyses show (as well as the SWRCB’s own analyses and peer reviews).

8. **San Francisco Bay-Delta, outflow to Suisun Bay and San Francisco Bay** (Region 5) In addition to the above information, one of the key findings of the SWRCB’s 2010 Public Trust flows report is that Delta outflow is significantly impaired, and that substantially greater outflow is needed to protect Public Trust fishery populations. This is especially true in the spring and fall months. Consideration should also be given to listing other portions of the Delta as flow-impaired, again in light of the data/information and agency processes described above.

9. **Salinas River** (Region 3) “Channel alteration and changes in flow regime have caused a virtual loss of the anadromous life history of three steelhead in the Salinas River.” More generally, “flows in lower reaches for adult and juvenile steelhead passage are often lacking,” with “[g]roundwater pumping related to agricultural activities . . . caus[ing] the loss of surface flow in winter and spring.”[xi] This detailed analysis concluded that “unless the Salinas River channel and flow move back towards their more normal range of variability, steelhead cannot be restored.”

10. **Santa Clara River** (Region 3) The Santa Clara River is Southern California's last major free flowing waterway and is home to 17 species listed as threatened or endangered under the state and federal Endangered Species Acts. At River mile 10.5, United Water Conservation District (United) diverts almost all of the River's flows outside of large storm events. United, USGS, and local agency data show that water diverted at the Vern Freeman Diversion Dam for agricultural usage, groundwater recharge, and other uses, deprive migrating steelhead of sufficient flows and juvenile steelhead of healthy estuary rearing grounds. [xii] In addition to impacting beneficial uses associated with the provision of adequate steelhead habitat, surface water withdrawals also destroy downstream native riparian and endangered bird habitat, degrade the ecological integrity of the River's estuary, and impair a plethora of cultural and recreational beneficial uses downstream.

Contacts for Additional Data & Information

(1) and (2): for Scott and Shasta River and other flow listings in the Klamath Basin, contact Konrad Fisher (konrad@klamathriver.org) at Klamath Riverkeeper or Craig Tucker (ctucker@karuk.us) with the Karuk Tribe.

(3): for Eel River listing, contact Zeke Grader (zgrader@ifrfish.org) with PCFFA, Darren Mierau (dmierau@caltrout.org) with CalTrout, or Scott Greacen (scott@eelriver.org) with Friends of the Eel River.

(4): for Mattole River listing, contact Brian Johnson (bjohnson@tu.org) with Trout Unlimited or Hezekiah Allen (Hezekiah@mattole.org) with Mattole Restoration Council.

(5) and (6): for Sonoma waterways, contact Don McEnhill (don@russianriverkeeper.org) with Russian Riverkeeper.

(7) and (8): for San Joaquin River and Delta, contact (among others) Bill Jennings (deltakeep@aol.com) with California Sportfishing Protection Alliance or Zeke Grader (zgrader@ifrfish.org) with PCFFA.

(9): for Salinas River, contact Steve Shimek (exec@montereycoastkeeper.org) with Monterey Coastkeeper.

(10): for Santa Clara River, contact Jason Weiner (jweiner.venturacoastkeeper@gmail.com) with Ventura Coastkeeper, Ron Bottorff (bottorffm@verizon.net) with Friends of the Santa Clara River or Cameron Yee (cyee@causenow.org) with CAUSE.

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[i] U.S. EPA. August 2012. Water Quality Challenges in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary: EPA's Action Plan, p. 9, *available at* http://www2.epa.gov/sites/production/files/documents/actionplan.pdf.

[ii] Criteria 4-6 are taken from the State Water Board's AB 2121 Enforcement Priorities, Appendix G, available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/instream_flows/docs/ab2121_0210/adopted050410instreamflowpolicy.pdf.

[iii] National Research Council (NRC). 2004. Endangered and Threatened Fishes in the Klamath River Basin – Causes of Decline and Strategies for Recovery. The National Academies Press, Washington, DC.

[iv] S.S. Papadopulos & Associates Inc. 2012. Groundwater Conditions in Scott Valley, California. Report prepared for the Karuk Tribe, Happy Camp, CA.

[v] Lestelle, L. 2012. Effects of Dwinnell Dam on Shasta River salmon and considerations for prioritizing recovery actions. Report prepared for the Karuk Tribe, Happy Camp, CA.

[vi] Higgins, Patrick, Consulting Fisheries Biologist. Feb. 2010. Evaluation of the Effectiveness of Potter Valley Project National Marine Fisheries Service Reasonable and Prudent Alternative (RPA): Implications for the Survival and Recovery of Eel River, Coho Salmon, Chinook Salmon, and Steelhead Trout.

[vii] Klein, Randy D., Hydrologist. March 2007. Hydrologic Assessment of Low Flows in the Mattole River Basin 2004-2006, p. 1.

[viii] Letter from Patrick Higgins, Consulting Fisheries Biologist to SWRCB. April 2, 2008. *Comments on Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams,* pp. 13-15 (in Appendix A).

[ix] For both of the Region 5 sets of waterways, there are agency processes ongoing to address flow issues. However, the lengthy time frame and uncertain future of these processes, and the sensitive and declining health of these waterways, demands that we use all available tools to (at a minimum) prevent waterway health from deteriorating further as these processes play out. Formal listing as "flow impaired" on the 303(d) list would provide invaluable assistance in this regard.

[x] Based on the agency, NGO and academic testimony presented at the State Board's 2010 "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" hearing and State Board's Phase I SED hearing, as well as Fish and Wildlife's 2010 "Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta," we believe the Merced, Tuolumne, Stanislaus and San Joaquin Rivers would all qualify to be listed as flow impaired.

[xi] *Id.*

[xii] Letter from Jason Weiner, Ventura Coastkeeper to Jeffrey Shu, SWRCB. Aug. 30, 2010. Public Solicitation of Water Quality Data and Information for 2012 Integrated Report.

Attachment 4

CALIFORNIA COASTKEEPER. ALLIANCE

Heal the Bay

Surfrider Foundation.

SIERRA CLUB CALIFORNIA

PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS
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ENDANGERED SPECIES COALITION

COASTAL ENVIRONMENTAL RIGHTS FOUNDATION

ENVIRONMENTAL HEALTH COALITION
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Coalición de Salud Ambiental

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BEC
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california water impact network

California Sportfishing Protection Alliance
"An Advocate for Fisheries, Habitat and Water Quality"

AQUALLIANCE
DEFENDING NORTHERN CALIFORNIA WATERS

RRWPC
Russian River Watershed Protection Committee

August 30, 2010

Jeffrey Shu, State Water Resources Control Board
Division of Water Quality
P.O. Box 100
Sacramento, CA 95812-0100

VIA ELECTRONIC AND U.S. MAIL: jshu@waterboards.ca.gov

RE: **Notice of Public Solicitation of Water Quality Data and Information for 2012 California Integrated Report [Clean Water Act Sections 305(b) and 303(d)]**

Dear Mr. Shu:

The undersigned organizations have been active for many years on programs and issues affecting the quality and flow of the waters of the State. Our organizations have performed water monitoring and watershed surveys, and conducted outreach among a diverse group of citizens around California, to determine the most pressing issues for state waterway health. We welcome the opportunity to submit these comments in light of these significant and ongoing efforts.

We present in this letter two general themes of proposed listings. First, we highlight some examples of traditional "pollutant"-based "Category 5"[1] listings that are being proposed to you separately. This Category of listings has been the focus of the State Water Resources Control Board's (State Board) 303(d) list to date. We urge the State Board's careful attention to these and the other Category 5 listings proposed by the identified commenters as well as the undersigned organizations and others. The adoption of such proposed listings will help ensure clean, healthy waterways throughout the State.

Second, we highlight additional groups of listings that also identify impaired and threatened waters that should be listed under Category 4 (particularly 4C) or Category 5. Our analysis reveals three such groups that regularly impair designated beneficial uses but that have received inadequate attention in the state's 303(d) process to date. These are: altered natural flows in surface waters, groundwater contamination and excessive groundwater withdrawals that impact surface water health, and anthropogenic climate change-caused impacts to surface waters. Impaired and threatened waterways from these groups of listings must be included in the 2012 303(d) list to ensure compliance with the Clean Water Act, and to achieve full restoration of the health of the waters of the state.

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[1] Category references from U.S. EPA, "Guidance for 2006 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d), 305(b) and 314 of the Clean Water Act" (July 29, 2005), available at: http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-report.pdf (2006 Guidance), and SWRCB, "Staff Report: 2010 Integrated Report Clean Water Act Sections 303(d) and 305(b)" (April 19, 2010) (2010 Integrated Report Staff Report), available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/2010ir0419.pdf.

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I. FEDERAL AND STATE MANDATES REQUIRE 303(D) LIST IDENTIFICATION OF ALL IMPAIRED AND THREATENED CALIFORNIA WATER BODIES.

A. Impaired or Threatened Water Bodies Must Be Identified on the 303(d) List Regardless of Whether Impacted by "Pollutants" or "Pollution."

Section 303(d) of the Federal Clean Water Act represents the Act's "safety net."[2] It is the bedrock component of the Clean Water Act, the backstop to ensure that the goals of the Act can be achieved when initial efforts fail. At the advent of implementation of Section 303(d) in the late 1990s, U.S. EPA Assistant Administrator for Water Robert Perciasepe called the TMDL program "crucial to success because it brings rigor, accountability, and statutory authority to the process."[3]

Section 303(d) requires states to address comprehensively all human activities that affect the chemical, physical, and biological integrity of the nation's waters.[4] Section 303(d) is widely recognized as an essential means to achieving the Clean Water Act's goal of restoring waters so that they are safe for swimming, fishing, drinking, and other "beneficial uses" that citizens enjoy, or used to be able to enjoy.[5]

Section 303(d) first requires the State Water Board to identify waters that do not meet, or are not expected to meet by the next listing cycle, water quality standards after the application of certain technology-based controls. Specifically, Section 303(d)(1)(A) states as follows:

> Each State shall identify those waters within its boundaries for which the effluent limitations required by section 1311(b)(1)(A) and section 1311(b)(1)(B) of this title are not stringent enough to implement any water quality standard applicable to such waters. The State shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters.

In other words**,** if a water body's standards are not being met in the water body, then it *must* be listed under the state's Section 303(d) list. This is a separate and distinct task from the effort of determining whether or not total maximum daily loads (TMDLs) are required, as discussed in CWA Section 303(d)(1)(C):

> Each State shall establish for the waters identified in paragraph (1)(A) of this subsection, and in accordance with the priority ranking, the total maximum daily load, for those

[2] Houck, Oliver A., *The Clean Water Act TMDL Program* 49 (Envtl. Law Inst. 1999).
[3] Memorandum from Robert Perciasepe, Assistant Administrator for Water, U.S. EPA, to Regional Administrators and Regional Water Division Administrators, U.S. EPA, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)" (August 8, 1997).
[4] *See* 33 U.S.C. §§ 1251 *et seq.* and 33 U.S.C. § 1313(d).
[5] 33 U.S.C. § 1313(d)(1) and (2); *see also* 40 C.F.R. § 130.7(b)(1). California law defines an existing use as one that has occurred since 1975 and recognizes 23 designated or beneficial uses for water bodies, including uses such as freshwater replenishment, and migration of aquatic organisms. (2002 California 305(b) Report on Water Quality, Appendix A, State Water Resources Control Board, August, 2003. Available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/305b.shtml.

> pollutants which the Administrator identifies under section 1314(a)(2) of this title as suitable for such calculation. Such load shall be established at a level necessary to implement the applicable water quality standards with seasonal variations and a margin of safety which takes into account any lack of knowledge concerning the relationship between effluent limitations and water quality.

This means that a water body is listed on the 303(d) list if beneficial uses are being impaired, and a TMDL is developed if they are being impaired by a "pollutant" (including a combination of pollutants and pollution).

"Pollutant" is defined in CWA Section 502(6).[6] Courts have interpreted the definition of "pollutant" expansively, stating that it "encompass[es] substances not specifically enumerated but subsumed under the broad generic terms" listed in Section 502(6).[7] Similarly, courts have stated that the definition of pollutant is "meant to leave out very little."[8]

"Pollution" is also defined in CWA Section 502, as "the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water." U.S. EPA has found that "pollution" must result in a 303(d) listing if it results in impairment, and will result in a TMDL if pollutants are also present:

> In some cases, the pollution is caused by the presence of a pollutant and a TMDL is required. In other cases, pollution does not result from a pollutant and a TMDL is not required. States should schedule these segments for monitoring to confirm that there continues to be no pollutant associated with the failure to meet the water quality standard and to support water quality management actions necessary to address the cause(s) of the impairment.[9]

The mandate to list impaired waterways under Section 303(d)(1)(A) regardless of the cause of impairment is consistent with the reasoning of *Pronsolino v. Nastri*.[10] The Ninth Circuit Court of Appeals found that the source of the impairment at issue is irrelevant to listing, and that decisionmakers may consider only the issue of whether the water body is impaired in determining whether to list it. This position is also supported by the National Research Council (NRC), which found that the TMDL program "should encompass all stressors, <u>both pollutants</u>

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[6] The definition of "pollutant" in Section 502(6) includes: "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water." Several other items are specifically excluded; flow alteration is not one of those items.

[7] *U.S. PIRG v. Atlantic Salmon of Maine* (U.S. Dist. Ct. Maine, Aug. 2001), available at http://www.med.uscourts.gov/Site/opinions/kravchuk/2001/MJK_08282001_1-00cv150_USPIRG_v_Heritage.pdf, citing *United States v. Hamel*, 551 F.2d 107 (6th Cir. 1977).

[8] *Id.*, citing *Sierra Club, Lone Star Chapter v. Cedar Point Oil Co.*, 73 F.3d 546, 566-568 (5th Cir. 1996), *cert. denied*, 519 U.S. 811 (1996).

[9] 2006 Guidance at 56.

[10] *Pronsolino v. Nastri*, 291 F.3d 1123, 1137-38 (9th Cir. 2002), cert. denied, 123 S. Ct. 2573 (2003) ("Water quality standards reflect a state's designated *uses* for a water body and do not depend in any way upon the source of pollution").

and pollution, that determine the condition of the waterbody."[11] The NRC found this step to be important in part because "activities that can overcome the effects of 'pollution' and bring about water body restoration – such as habitat restoration and channel modification – should not be excluded from consideration during TMDL plan implementation."[12]

In its 2006 Guidance informing states on how to prepare their biennial report on water quality (the states' "305(b)/303(d) Integrated Report"), U.S. EPA recommended a division of impaired water body segments into Categories as follows:[13]

- Category 4: Available data and/or information indicate that at least one designated use is not being supported or is threatened, but a TMDL is not needed;
- Category 5: Available data and/or information indicate that at least one designated use is not being supported or is threatened, and a TMDL is needed.

California adopted the following, similar state categories for impaired waterways:[14]

- Category 4a: A water segment for which ALL its 303(d) listings are being addressed; and 2) at least one of those listings is being addressed by a USEPA approved TMDL.
- Category 4b: A water segment for which ALL its 303(d) listings are being addressed by action(s) other than TMDL(s).
- Category 4c: A water segment that is impaired or affected by non-pollutant related [*i.e.*, "pollution"] cause(s).
- Category 5: A water segment where standards are not being met and a TMDL is required but not yet completed for at least one of the pollutants being listed for this segment.

Categories "4" and "5" together represent the state's "303(d) List," as *both* categories encompass the total of the state's impaired or threatened waterways under Section 303(d)(1)(A). Category 5 waters require a TMDL. This Category includes waters impaired only by pollutants and those impaired both by pollutants and "pollution" (in which case consideration of the "pollution" would be given in the TMDL development for the waterway). Category 4 also includes impaired waters, but categorizes them as not requiring development of a TMDL,[15] though other actions may be taken to improve their health, as noted below.

California's 2008/2010 303(d) list of impaired waters, adopted by the State Water Board on August 4, 2010, contains Category 4A, 4B, and Category 5 waters. However, **the state's 2008/2010 303(d) list fails to include *any* Category 4C waters**, a glaring omission given the numerous pollution-related impairments facing many of the state's threatened and impaired waterways. The State Board must rectify this oversight in the state's 2012 303(d) list.

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[11] National Research Council, "Assessing the TMDL Approach to Water Quality Management," p. 4 (Nat'l Academy Press, Wash. D.C., 2001) (emphasis added).
[12] *Id.*
[13] 2006 Guidance at pp. 46 *et seq.* (emphasis added).
[14] *See* 2010 Integrated Report Staff Report at 20 (emphasis added).
[15] As noted below, we would argue that flow alterations can and should require development of a TMDL even if present without pollutants; there is precedent for this position in California.

In sum, the 2012 303(d) list must identify *all* impaired and threatened waters, whether impaired by pollutants and/or pollution – not only so that they may be addressed as required by the TMDL process,[16] but also so they may be restored to health as well through other programs and policies. For example, California's Porter-Cologne Water Quality Control Act requires that Basin Plans include a program of implementation that describes how water quality standards will be attained.[17] Where standards are not being attained – such as where flow alterations have been identified as impairing waterway beneficial uses – these implementation plans must incorporate strategies for achieving waterway health. Implementation of this state mandate, along with the TMDL program mandates where applicable, will ensure that water bodies whose health is threatened and impaired – in Categories 4(a)-(c) *and* Category 5 – are restored to health.

B. The State Must Use and Consider All Readily Available Information

The body of regulations and guidance that bear on 303(d) listing are unambiguous about the information that should be considered in making listing decisions: *all of it*. Federal regulations state clearly that "[e]ach State shall assemble and evaluate all existing and readily available water quality-related data and information to develop the [303(d)] list."[18] The regulations further mandate that local, state and federal agencies, members of the public, and academic institutions "should be *actively* solicited for research they may be conducting or reporting."[19] Furthermore, EPA's 2006 Guidance explicitly states that U.S. EPA's review of California's list will include an "assess[ment of] whether the state conducted an adequate review of all existing and readily available water quality-related information."[20] To that end, the 2006 Guidance also requires states to provide "[r]ationales for any decision to not use any existing and readily available data and information."[21]

Accordingly, and the State Board's data solicitation notice notwithstanding,[22] any and all existing and readily available data and information must be considered to determine the health of the state's increasingly-degraded water bodies.

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[16] *See supra* n. 15 regarding TMDLs for flow-related impairments in California, and *see infra* regarding requirements to develop TMDLs that consider flows when waterways are also listed due to pollutant impairments. *See also* SWRCB, "A Process for Addressing Impaired Waters in California" (July 2005), available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/iw_guidance.pdf.

[17] Water Code Section 13241 reads: "Each regional board shall establish such water quality objectives in water quality control plans as in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance…." Section 13242 follows that: "The program of implementation for achieving water quality objectives shall include, but not be limited to:

(a) A description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private.

(b) A time schedule for the actions to be taken.

(c) A description of surveillance to be undertaken to determine compliance with objectives."

It is both the law and good public policy for the state to take action to ensure that waterways identified as impaired, including those impaired by pollution, are restored to health.

[18] 40 C.F.R. § 130.7(b)(5).

[19] 40 C.F.R. § 130.7(b)(5)(iii) (emphasis added).

[20] 2006 Guidance at 29.

[21] *Id.* at 18.

[22] SWRCB, "Notice of Public Solicitation of Water Quality Data and Information for 2012 California Integrated Report – Surface Water Quality Assessment and List of Impaired Waters" (Jan. 10, 2010; updated May 24, 2010), http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/data_solicitation_ir2012v2.pdf.

II. THE UNDERSIGNED ORGANIZATIONS URGE THE STATE WATER BOARD TO LIST ALL WATERWAYS IMPAIRED BY "POLLUTANTS."

The 2008/2010 303(d) list adopted by the State Board on August 4, 2010 shows a 64% increase from the number of listings in 2006. This number likely reflects both a growing number of severely polluted waterways in California and an improvement in the Board's ability to assess a larger number of waterways and pollutants. We applaud the State Water Board for its efforts to assess a larger number of waterways and sources and causes of impairments and expect to see the 2012 303(d) list capture an even larger number of impairments.

The 2012 list can improve upon the 2008/2010 list by including additional new listings as needed, and in particular those waterways impaired by trash and bacteria. In order to rectify this, the State Water Board must ensure that the 2012 List reflects water quality data and information submitted by Waterkeeper and other groups monitoring local water quality. We bring to the Board's attention just some of the numerous water quality issues in watersheds from the Oregon border to San Diego that have yet to be addressed by the State Board's 303(d) List, and incorporate by reference the related data submissions by local Waterkeepers and the undersigned organizations. This information is by no means comprehensive, but provides the Water Board with examples of additional listings that should be carefully reviewed for inclusion in the 2012 303(d) list.

North Coast

Humboldt Baykeeper's Citizen Monitoring Program has collected water quality data from sites throughout the Humboldt Bay, Mad River, and Little River watersheds since 2005. Numerous waterbodies in the Humboldt Bay, Mad River, and Little River watersheds have quite high levels of fecal coliform (*E. coli*), particularly after major rain events. High fecal coliform levels have resulted in posted closures of several local beaches by the Ocean Monitoring Program of the Humboldt County Division of Environmental Health.[23] These beaches include Moonstone Beach County Park (at the outlet of Little River), and Mad River Mouth North (at the outlet of Widow White Creek and Mad River). The County has sampled ocean waters since 2003, and has documented exceedences of fecal coliform and/or Enterococcus at both Moonstone Beach County Park and Mad River Mouth North.[24] Moonstone Beach County Park is on the 303(d) list for indicator bacteria, but Humboldt Baykeeper's Citizen Monitoring Program is the only source of water quality data upstream from these beaches were water pollution due to indicator bacteria is of concern. This water quality data warrants several additional listings, as described in Humboldt Baykeeper's 303(d) comment letter.

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[23] http://co.humboldt.ca.us/hhs/phb/environmentalhealth/oceanmonitoringprogram/.
[24] http://co.humboldt.ca.us/hhs/phb/environmentalhealth/oceanmonitoringprogram/waterqualitytestresults-archive.asp .

Central Coast

From July 2008 to March 2010 San Francisco Baykeeper conducted *Enterococcus* monitoring near storm drains in San Francisco Bay's Oakland Inner Harbor.[25] The data collected reflected exceedences of Basin Plan water quality standards for *Enterococcus*,[26] and showed that contact recreation in the vicinity of these storm drains poses serious risks.[27] Accordingly, Oakland Inner Harbor should be designated as impaired for Indicator Bacteria. In addition, polybrominated diphenyl ethers (PBDEs) are present in Bay sediments, are accumulating in Bay organisms, and are known to negatively impact aquatic life. For these and other reasons, Baykeeper found that the Regional Board should consider a PBDE listing for San Francisco Bay in this 2012 listing cycle. Please refer to San Francisco Baykeeper's independent letter in response to the State Board's data solicitation for further information regarding Indicator Bacteria concentrations and PBDE toxicity in San Francisco Bay.

Despite Santa Barbara Channelkeeper's (SB Channelkeeper) submission of data and photographic evidence reflecting a serious trash problem in San Pedro Creek, the Creek was not listed for trash on the 2010 303(d) List. SB Channelkeeper's data for 2012, which was collected in compliance with the State Water Board's SWAMP guidance on rapid trash assessments, confirms that trash impairs over half the streams monitored in the Santa Barbara and Goleta Area.[28] The State Water Board should review this carefully, and consider other data submitted on trash listings so that another listing cycle does not go by without action to address this important water quality issue.

Ventura Coastkeeper (VCK) conducted water quality monitoring throughout the Santa Clara River, Ormond Beach, Calleguas Creek, and Nicholas Canyon Creek watersheds from June 2009 to August 2010. VCK found based on this information that trash listings for Nicholas Canyon Creek, San Jon Barranca, the Ormond Beach Lagoon, the Santa Clara River Estuary, and Santa Clara River Reaches 1, 3, 4a, and 5 are warranted. Additionally, VCK found the following exceedences that warrant listing on the 2012 303(d) list: Santa Clara River Estuary for flow, dissolved oxygen, pH, phosphate, and nitrate; Santa Clara River Reach 3 for *E. coli*; Ormond Beach wetlands for pH, nitrate, and *E. coli*; San Jon Barranca for *E. coli*; and Santa Clara River Reaches 1 and 2 for flow.

[25] Under this standard, only two stations satisfied the geometric mean objective during the summer and none satisfied the objective during the winter. In addition, none of the stations achieved compliance with the "no sample greater than 104 MPN/100ml" objective within a given 30-day sampling period during either the summer or winter monitoring seasons.
[26] Pursuant to the San Francisco Bay Basin Plan, the *Enterococcus* objectives include a geometric mean of less than 35 MPN/100 ml and states that no sample should exceed 104 MPN/100 ml.
[27] San Francisco Bay is only subject to bacteriological monitoring at designated beaches, although contact recreation occurs routinely throughout the Bay, including Oakland Inner Harbor.
[28] Atascadero, Bell, Cieneguitas, Maria Ygnacio, Phelps Ditch (El Encanto Creek), San Jose, and San Pedro Creeks. *See* Santa Barbara Channelkeeper's 2012 303(d) Comment Letter responding to the State Water Board's request for data.

South Coast

From July of 2007 through February of 2010 Orange County Coastkeeper (OCCK) conducted water monitoring at a total of seven sites on San Juan, San Mateo and Cristianitios Creeks in Orange and San Diego County. All of these Creeks are under the authority of the San Diego Regional Water board. After analyzing the data from this monitoring in accordance with the current state guidelines for developing 303d listings, OCCK found that there are sufficient exceedences of basin plan objectives for ammonia, nitrate, phosphate, and cadmium to warrant additional impairment listings on the 2012 impaired waters list.

The Inland Empire Waterkeeper sampled 10 sites on a weekly basis from July 2008 through November 2009 under contract with the Santa Ana Regional Water Quality Control Board. The project included four locations on San Timoteo Creek (one site perpetually dry), four locations on Warm (Twin) Creek and two locations on City Creek; all of which drain to Reach 4 of the Santa Ana River.[29] The primary focus was *E. coli* bacteria indicators, but samples were also taken for pH, conductivity, dissolved oxygen, flow rate, temperature, metals, minerals, nutrients, PCBs, organochlorine pesticides, TDS, hardness, and COD. Five sites contained *E. coli* bacteria levels during the warm season or cool season (or both) that exceed the proposed geo-mean basin plan objective. All nine sites had a minimum of two exceedences; ranging from the most natural mountain stream, up to as many as twelve in a highly urban concrete channel.

San Diego Coastkeeper is submitting information about trash collected at beach cleanups to seek the listing of all 21 San Diego County beaches. Volunteer data shows the annual removal of more than 200 pounds of trash from 9 out of 21 beaches from Oceanside to Imperial Beach. Data indicates pervasive and widespread debris impairment along the San Diego shoreline as well as nearby watersheds which drain into coastal waters.[30] San Diego Coastkeeper is also submitting ambient water quality data for nine of the eleven watersheds in San Diego County. San Diego has collected data on conventional constituents (pH, DO, temperature) as well as other key water quality indicators (including, but not limited to, nitrogen, phosphorus, toxicity, *E. coli*, *Enterococcus*) for over three dozen sites across San Diego County each month. Data indicate that exceedences of objectives are widespread and require management action.

III. THE STATE MUST IDENTIFY AND LIST ALL WATER BODIES THREATENED OR IMPAIRED BY ALTERATIONS IN NATURAL FLOW.

U.S. EPA requires waterways with flow-related impairments to be listed on the state's 303(d) list, typically (though not exclusively) in Category 4C ("water segment that is impaired or affected by non-pollutant related cause(s)"). If pollutants are also present, the waterway must be listed in Category 5. As discussed further below, we contend that despite U.S. EPA inclination to assess flow alterations as "pollution" to be listed in Category 4C (which should *at a minimum* be populated with flow listings for California in the 2012 list), there is also support for listing such impairments in Category 5 and preparing TMDLs to address them.

[29] *See* final report at: http://www.iewaterkeeper.org/iewaterkeeper/work/projects/UpperSARWaterQuality/.
[30] Please refer to San Diego Coastkeeper's 2012 303(d) Letter to the SWRCB on trash impairments.

A. The State Water Board Must Address Impacts to Beneficial Uses of Water Bodies Caused By Alterations in Natural Flows.

The health of rivers, streams, creeks and other waterways is inextricably linked to the volume, frequency, magnitude, timing, and duration of flows.[31] "[W]ater quantity is closely related to water quality; a sufficient lowering of the water quantity in a body of water could destroy all of its designated uses, be it for drinking water, recreation, navigation, or . . . a fishery."[32] As the U.S. Supreme Court has held,

> there is recognition in the Clean Water Act itself that reduced stream flow, *i.e.,* diminishment of water quantity, can constitute water pollution. First, the Act's definition of pollution . . . encompasses the effects of reduced water quantity. *33 U.S.C. 1362(19).* This broad conception of pollution – one which expressly evinces Congress' concern with the physical and biological integrity of water – refutes petitioners' assertion that the Act draws a sharp distinction between the regulation of water 'quantity' and water 'quality.'[33]

The state's ability to ensure healthy waterways hinges in part on its ability to identify waterways impaired or threatened by altered natural flow, and to take targeted action to restore and maintain necessary flow regimes.

Water quality standards encompass both the designated uses of a water body and the water quality criteria established to protect those uses, as well as antidegradation requirements. Altered natural flows (usually reduced flows) may impact a water body's beneficial uses in a number of ways, causing a violation of standards that prompts 303(d) listing. For example, if a river is designated for use as a coldwater fishery, but reduced flows have resulted in increased temperatures and lowered water depths such that the river can no longer support fish, low flows clearly have impacted the water body's designated use.[34] Where low flows in rivers, creeks, and stream have impaired a beneficial use, the water quality standards have been violated, and the water body segment must be listed under Section 303(d).[35]

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[31] MacDonnell, Lawrence J., "Return to the River: Environmental Flow Policy in the United States and Canada. Journal of the American Water Resources Association" 45(5):1087-1099 (2009), DOI: 10.1111/j.1752-1688.2009.00361 *citing* Poff, N.L., *et al.*,"The Natural Flow Regime: A Paradigm for River Conservation and Restoration," *BioScience* 47:769-784 (1997); Poff, N.L., "Managing for Variation to Sustain Freshwater Ecosystems," *Journal of Water Resources Planning and Management* 135:1-4 (2009).

[32] *PUD No.1 v. Washington Department of Ecology*, 511 U.S. 700, 719 (May 31, 1994).

[33] *Id. See also* U.S. EPA, **"**Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act" (July 21, 2003) ("2004 Guidance"), available at: http://www.epa.gov/owow/tmdl/tmdl0103/2004rpt_guidance.pdf *(2004 (*"Low flow can be a man-induced condition of a water (i.e., a reduced volume of water) which fits the definition of pollution. Lack of flow sometimes leads to the increase of the concentration of a pollutant (e.g., sediment) in a water.")

[34] For example, adult coho salmon migrate at water temperatures of 45 to 59ºF, a minimum water depth of approximately seven inches, and streamflow velocities less than eight ft/sec. National Marine Fisheries Service, "Magnuson-Stevens Reauthorization Act Klamath River Coho Salmon Recovery Plan," p. 4 (July 2007), available at: http://www.swr.noaa.gov/salmon/MSRA_RecoveryPlan_FINAL.pdf. Research has demonstrated that upstream migration of Klamath River Chinook salmon is suppressed at mean daily water temperatures above 23.5°C if temperatures are falling.

[35] Attachment 2 provides photos and other information of waterways in California so impacted, such as the Scott River.

For example, in the Russian River Watershed, excessive water diversions have turned fish-bearing creeks such as Mark West Creek and Macaama Creek into dry stream beds.[36] In the Klamath River Watershed, high diversion rates from agricultural developments limit flow levels in river mainstems and tributaries, which raise water temperatures and lower water quality, making segments of the Scott and Shasta Rivers unsuitable for rearing juvenile coho salmon.[37]

In addition, excessive withdrawals, water diversions and dams can concentrate pollutant loadings, resulting in higher in-stream concentrations and impacts. For example, rivers in the Klamath watershed are impaired by toxic algae, temperature, and nutrient pollution caused by dams, cattle grazing and irrigated agriculture.[38] All of these problems are made significantly worse by reduced natural flows. In 2006, U.S. EPA formally recognized that dam impacts to flow caused the impairment of the Klamath River by toxic blue green algae *Microcystis aeruginosa*, a liver toxin and known tumor promoter.[39]

1. <u>Altered Flows Must Be Identified as *Causes* of Impairment, Not Solely *Sources* of Impairment</u>

The State Water Board has identified altered natural flows in its just-adopted 303(d) list as a potential *source* of impairment of dozens of water body-segment pollutant combinations. However, California generally has avoided its responsibility to recognize reduced natural flows, streamflow alterations, water diversions, or similar flow issues as *independent causes* of impairment that require listing of the waterway for "flow alterations" under Category 4C *at a minimum*, or Category 5 where appropriate.[40] This failure to address flow alterations directly is a serious omission by the State Water Board and must be addressed in the 2012 303(d) List.

The *source* of impairment provides available information tied to the impaired segment that generally describes the type of *activity* that has resulted in the impairment. Typical examples in California's 303(d) list include, but are not limited, to the following: range grazing, silviculture, agriculture, construction/land development, urban runoff/storm sewers, mine tailings, onsite wastewater systems (septic tanks), and marinas and boating. This information is generally used to help sort out which parties will be allocated responsibility for addressing the contamination at issue.

By contrast, altered natural flows can be the *cause* of impairment of a water body – just as altered concentrations of various contaminants (dissolved oxygen, mercury, temperature, etc.)

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[36] *See* Appendix A and A-1 for more information.
[37] NMFS, "Magnuson-Stevens Reauthorization Act Klamath River Coho Salmon Recovery Plan Prepared by The National Marine Fisheries Service Southwest Region," p. 32 (July 10, 2007), available at: http://www.swr.noaa.gov/salmon/MSRA_RecoveryPlan_FINAL.pdf.
[38] *See* SWRCB, "2010 California 303(d) List of Water Quality Limited Segments: Category 5," North Coast RWQCB, available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml.
[39] http://www.klamathriver.org/media/pressreleases/Press-Release-032008.html.
[40] Exceptions include Regional Water Quality Control Board 4's listing of Ballona Creek Wetlands as impaired by "Hydromodification" and "Reduced Tidal Flushing," and applicable segments of the Ventura River as impaired by "Pumping" and "Water Diversion." *See infra* n. 48.

similarly *cause* impairment. The *sources* of the listings for "altered natural flows" would then be activities such as agriculture, mining, construction, grazing, etc. The parties undertaking these activities would then be contacted to take action to reduce the impacts of their various operations on waterway flow.

This distinction is important if the actual impairment of a water body is to be properly addressed. For example, if natural flows in a creek that has been designated as "cold freshwater habitat" have been diverted to the point that the shallow water becomes too warm to be adequate fish habitat, the water body should be listed as impaired in Category 5 because of *both* low natural flow *and* elevated temperature, rather than improperly listed only for elevated temperature, with flow alteration as a mere "source" of impairment. If the creek is solely listed as impaired because of elevated temperature, the mitigating action could be (for example) solely planting trees along the banks to create shade. If a creek is listed because of both flow and temperature impairments, responsive actions are much more likely to include increased flows as well as increased shade, which would provide for a healthier outcome for the stream and its inhabitants overall.[41]

EPA's 2006 Guidance specifically describes "lack of adequate flow" as a *cause* for listing an impaired or threatened segment on the 303(d) list,[42] distinguishing it from listings of *sources* contained in separate summary tables.[43] A number of states accordingly include flow alterations as a cause of impairment in their 303(d) lists. Specifically, **U.S. EPA has compiled nationwide data submitted by states showing that 56,981 miles of rivers and streams, 517,857 acres of lakes, reservoirs and ponds, 299 square miles of bays and estuaries, and 33,054 acres of wetlands nationwide have been listed on states' 303(d) lists as impaired by "Flow Alterations."**[44] This corresponds to listings for over 100 water bodies nationwide in the District of Columbia, Idaho,[45] Michigan, Wyoming, Ohio and California.[46]

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[41] Of course, the listing should also ideally include the "sources" of both the temperature and low flows impairments, such as agriculture or other activities.

[42] "Examples of circumstances where an impaired segment may be placed in Category 4c include segments impaired solely due to lack of adequate flow or to stream channelization." 2006 Guidance at 56.

[43] *See* U.S. EPA, "National Causes of Impairment" versus "National Probable Sources Contributing to Impairment," available at: http://iaspub.epa.gov/waters10/attains_nation_cy.control#causes.

[44] *See* U.S. EPA, "Specific State Causes of Impairment That Make Up the National Flow Alteration(s) Cause of Impairment Group," available at: http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.cause_detail?p_cause_group_name=FLOW%20ALTERATION%28S%29. *See also* details of flow impairment listings at U.S. EPA, "Impaired Waters , Cause of Impairment Group: Flow Alteration(s)," available at: http://iaspub.epa.gov/tmdl_waters10/attains_impaired_waters.control?p_cause_group_id=545. For information on the status of data collection by state for these tables, *see* U,S, EPA, "Status of Available Data Used in This Report," available at: http://iaspub.epa.gov/waters10/attains_nation_cy.control?p_report_type=T#status_of_data.

[45] Idaho's 2008 Integrated Report shows more than 100 waterbody-pollutant segment listings for low flow alterations and other flow regime alterations under its "Section 4C Waters Impaired by Non-Pollutants." Idaho 2008 Integrated Report: "Section 4c Waters Impaired by Non-Pollutants," http://www.deq.state.*Id*.us/water/data_reports/surface_water/monitoring/integrated_report_2008_final_sec4c.pdf.

[46] *See* U.S. EPA, "Watershed Assessment, Tracking and Environmental Results: Specific State Causes of Impairment That Make Up the National Flow Alteration(s) Cause of Impairment Group," (last updated August 12, 2010), available at: http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.cause_detail_303d?p_cause_group_id=545. Conversation with Douglas Norton, U.S. EPA Headquarters (August 9, 2010).

2. Waterways Impaired by Altered Flows Must at a Minimum Be Listed in Category 4C of the 303(d) List, and Also May Be Listed in Category 5

As discussed above, U.S. EPA's and California's Category 4C *must* be populated with all waterways that are impaired or threatened solely due to the presence of non-pollutants. At a minimum, then, *all* flow-related impairments in California *must* be included in the Category 4C portion of the 2012 303(d) list. We would argue as well, however, that many if not all of these impairments could be included in Category 5.[47]

In California, "Pumping" and "Water Diversion" are listed as the sole causes of impairment for the water body segment Ventura River Reach 4.[48] This water body segment is listed specifically in Category 5 and requires a TMDL by 2019, even though Pumping and Water Diversion are the *only* causes of impairment. Water Diversion is specifically identified as a "Pollutant" in the Fact Sheet[49] describing this listing, as is the case with Pumping.[50]

California's choice to list, and most recently uphold the listing of, flow-caused impairments as a "pollutant" under Category 5 is not prohibited by the definition of "pollutant" or by U.S. EPA guidance. First, courts have interpreted the definition of "pollutant" broadly, as noted above, stating that it is "meant to leave out very little."[51] Second, U.S. EPA Guidance, while favoring a position that flow-related impairments are "pollution," does so in a less than

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[47] Idaho, which deferred to EPA's preference that flows be included in Category 4C, tried to provide a rationale for EPA's preference on flows as follows: "A pollutant is a substance, such as bacteria or sediment, that is identifiable and in some way quantifiable. Some unnatural conditions that impair water quality, such as flow alteration, human-caused lack of flow, and habitat alteration, are considered pollution, but are not caused by quantifiable pollutants. Temperature, while not a substance, is considered a pollutant, as changes in water temperature are quantifiable." Idaho DEQ, "Surface Water: Water Quality Improvement Plans (TMDLs), available at: http://www.deq.state.Id.us/water/data_reports/surface_water/tmdls/overview.cfm#Pollution. This loyal though somewhat strained reasoning ignores the fact that flow itself, as well as its impacts, is most certainly quantifiable – as are Pumping and Water Diversion, for which California waters have been listed in Category 5 as discussed below.

[48] SWRCB, "2010 California 303(d) List of Water Quality Limited Segments: Category 5," "Ventura River Reach 4 (Coyote Creek to Camino Cielo Road)," available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml?wbid=CAR4022002119990203090836. Ventura River Reach 3 had an identical listing in 2006, also with a 2019 TMDL, though Indicator Bacteria was added as a cause of impairment in the 2010 list update. SWRCB, "2006 CWA Section 303(D) List of Water Quality Limited Segments Requiring TMDLS," Region 4: "Ventura River Reach 3 (Weldon Canyon to Confl. w/ Coyote Cr)," available at: http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/r4_06_303d_reqtmdls.pdf.

[49] Supporting Information, 2010 Integrated Report, Ventura River Reach 4: Water Diversion, http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/01015.shtml#7310.

[50] Supporting Information, 2010 Integrated Report, Ventura River Reach 4: Pumping, http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/01015.shtml#7308.

[51] *See supra* n. 8. The definition of "pollutant" in Section 502(6) includes: "dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water." Several other items are specifically excluded; flow alteration is not one of those items. Arguably, the actions taken by industrial, municipal and agricultural operations (*i.e.* essentially all activities that could impact flow) could be viewed as the discharge of "waste," which is undefined in Section 502 but which could readily be interpreted as the by-product of "operations"*; i.e*. changes in the health of the waterway to its detriment.

definitive manner and without analysis, leaving room for California to make its own determination. For example, the 2004 Guidance states simply that "EPA does not *believe* that flow, or lack of flow, is a pollutant as defined by CWA Section 502(6)."[52] The 2006 Guidance similarly simply asserts without further support or discussion that "[e]xamples of circumstances where an impaired segment may be placed in Category 4c include segments impaired solely due to lack of adequate flow or to stream channelization."[53]

In sum, California can and should protect its waterways as fully as possible, including through the complete identification and listing of waterways impaired by the *cause* of natural flow alterations. Other states have shown leadership in this regard, and California's waters are no less precious or threatened.

Moreover, to ensure full protection and restoration of the waterways' beneficial uses, the identified waters should be placed on the 303(d) list under Category 5 (most certainly if there are additional pollutant impairments), and at a minimum in Category 4C. Section 510 of the Clean Water Act sets a floor but no ceiling for state action to protect and enhance the health of waters of the United States. California should make full use of this provision, and should leverage its prior flow-related listings in Category 5 into a comprehensive effort to address *all* flow-related impairments under the federal Section 303(d) listing and TMDL program, as well as under state law and other programs.

B. The State Must Use and Consider All Readily Available Information Related to Identifying Natural Flow-Related Impairments.

Under federal law[54] and the California Listing Policy, the State and Regional Water Boards must "actively solicit, assemble, and consider <u>all</u> readily available data and information,"[55] including from local, state and federal agencies, for purposes of developing the 303(d) list. This includes but is not limited to: reports of fish kills; dilution calculations; and "<u>predictive models for assessing the physical, chemical, or biological condition</u> of streams, rivers, lakes, reservoirs, estuaries, coastal lagoons, or the ocean."[56]

Accordingly, the State Water Board must examine and consider all readily available information that could inform 303(d) decisions related to alterations in natural flow. This includes but is not limited to the following:

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[52] U.S. EPA, "Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act," p. 8 (July 21, 2003) (emphasis added), available at: http://www.epa.gov/owow/tmdl/tmdl0103/2004rpt_guidance.pdf. It also states, as quoted above, that reduced water volume "fits the definition of pollution" – which could be the case for essentially any water impairment, including more traditional "pollutants."

[53] 2006 Guidance, *supra* n. 1, at 56.

[54] 40 CFR 130.7.(b)(5), see http://law.justia.com/us/cfr/title40/40-21.0.1.1.17.0.16.8.html.

[55] SWRCB, *Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List* (Listing Policy) (Sept. 2004), Section 6.1.1" Definition of Readily Available Data and Information (emphasis in original), available at http://www.waterboards.ca.gov/water_issues/programs/tmdl/docs/ffed_303d_listingpolicy093004.pdf.

[56] *Id.* (emphasis added).

- Data collected through the Department of Fish and Game's Instream Flow Program[57]
- Information compiled pursuant to programs and funding by the Ocean Protection Council[58]
- The findings of the recently-adopted State Water Board report on Delta flow criteria requirements (attached)[59]
- All comments, information and associated data sets submitted to the State Water Board during the development of its AB 2121 "Policy for Maintaining Instream Flows in Northern California Coastal Streams"[60]
- Flow data released by the California Department of Water Resources,[61] including data from the Water Data Library[62] generally and the Interagency Ecological Program[63] in particular, as well as and outside compilations of DWR data organized by waterbody segments[64]
- Data in the Klamath Resource Information System (KRIS);[65]
- Information and datasets presented at "My Water Quality" meetings,[66] including data from the Department of Natural Resources presented at the August 11, 2010 meeting
- Data contained in CalFish, the California Cooperative Anadromous Fish and Habitat Data Program,[67] especially the Passage Assessment Database.[68]

Note that Federal agencies, such as the U.S. Fish and Wildlife Service,[69] Federal Energy Regulatory Commission,[70] NOAA (particularly the National Marine Fisheries Service[71] and

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[57] *See* DFG Instream Flow Program, http://www.dfg.ca.gov/water/instream_flow_docs.html. *See also* DFG Water Rights Program, http://www.dfg.ca.gov/water/water_rights_docs.html.
[58] This includes but is not limited to Instream Flow Analysis – Santa Maria River, http://www.opc.ca.gov/2009/05/instream-flow-analysis-santa-maria-river/, Instream Flow Analysis – Big Sur River, http://www.opc.ca.gov/2009/05/instream-flow-analysis-big-sur-river/, and Instream Flow Analysis – Shasta River, http://www.opc.ca.gov/2009/05/instream-flow-analysis-shasta-river/.
[59] SWRCB, "Final Report on Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" (Aug. 3, 2010) (Delta Flow Report), available at: http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/final_rpt.shtml.
[60] As required by California Water Code § 1259.4 (AB 2121), available at http://www.waterboards.ca.gov/waterrights/water_issues/programs/instream_flows/.
[61] DWR, California Data Exchange Center, http://cdec.water.ca.gov/.
[62] DWR, Water Data Library, http://www.water.ca.gov/waterdatalibrary/.
[63] Interagency Ecological Program, http://www.water.ca.gov/iep/.
[64] "CA DWR CDEC Interface," a compilation of data from DWR's California Data Exchange Center, available at: http://acme.com/jef/flow/cdec.html.
[65] http://www.krisweb.com/index.htm.
[66] http://www.waterboards.ca.gov/mywaterquality/monitoring_council/meetings/index.shtml.
[67] www.calfish.org;
[68] http://www.calfish.org/portals/0/Programs/CalFishPrograms/FishPassageAssessment/tabid/83/Default.aspx. This letter incorporates by reference the comments of Heal the Bay with respect to required 303(d) listings needed for beneficial uses impaired by fish passage barriers. The same legal and policy requirements that call for 303(d) listing of water bodies impaired by altered natural flows also apply to listings for water bodies impaired by fish barriers. The Water Board should review the Passage Assessment Database, which has extensive information on barriers, to ensure that all impaired waterways are properly included on the Section 30(d) list. *See also* CCKA's compilation of fish barriers impacting the RARE beneficial use at: http://www.cacoastkeeper.org/programs/mapping-initiative/fish-barriers.
[69] *See, e.g.*, U.S. FWS, Water and Fishery Resources Program, http://www.fws.gov/cno/fisheries/.
[70] *See* http://elibrary.ferc.gov/idmws/search/fercgensearch.asp to search for details of California hydropower projects, which would provide further information on flows.
[71] California is in the Fisheries Service's Southwest Region; *see* http://swfsc.noaa.gov/ for data and publications.

analyses such as the Magnuson-Stevens Reauthorization Act Klamath River Coho Salmon Recovery Plan[72]), USGS[73] and U.S. EPA, must also be "*actively*" solicited for data and information.[74]

This and other flow information can provide invaluable insight into the "physical, chemical, or biological condition" of the state's waterways as required by federal law and state Policy. It should be considered carefully in developing a comprehensive Category 4C list as well as Category 5 listings that appropriately include impairments caused by altered natural flows, and combinations of altered natural flows and pollutants.

C. Specific Listing Proposals for Impairments Caused by Reduced Natural Flows

Numerous beneficial uses are impaired by the altered flows, including but not limited to GWR (groundwater recharge discussed separately below), COLD (cold freshwater habitat), MIGR (fish migration), SPWN (fish spawning) and RARE (preservation of rare and endangered species). In addition to the data described elsewhere in this letter and other readily available data sources, data and information for a number of many flow-impaired waterways can be found through KRIS.[75] This letter also includes and incorporates by reference the flow-related listing proposals provided in the detailed comments submitted by Heal the Bay,[76] the Natural Resources Defense Council (NRDC),[77] and Ventura County Coastkeeper.[78]

Please note that the waterways described below, in addition to the flow-related listing proposals incorporated by reference, are just *some* of the numerous flow-impaired waterways throughout the state. This list is by no means a comprehensive assessment. The final 2012 303(d) list should include *all* of the waterways that "readily available" data indicate are threatened or impaired due to alterations in natural flow.

1. Rivers, Creeks and Streams

Carmel River and San Clemente Creek

As documented in a white paper prepared for the Carmel River Steelhead Association, significantly reduced flows in the Carmel River and its tributaries, particularly San Clemente

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[72] National Marine Fisheries Service, "Magnuson-Stevens Reauthorization Act Klamath River Coho Salmon Recovery Plan" (July 2007), available at: http://www.swr.noaa.gov/salmon/MSRA_RecoveryPlan_FINAL.pdf.
[73] *See* USGS, "What kinds of water data does the U.S. Geological Survey gather?" available at: http://www.usgs.gov/faq/index.php?action=artikel&cat=102&id=1148&artlang=en.
[74] Listing Policy, Section 6.1.1: Definition of Readily Available Data and Information (emphasis added).
[75] Klamath Resource Information System, http://www.krisweb.com/index.htm.
[76] Letter from W. Susie Santilena, Heal the Bay to Jeffrey Shu, SWRCB, Public Solicitation of Water Quality Data and Information for 2012 Integrated Report (Aug. 20, 2010).
[77] Letter from Doug Obegi, NRDC, to Jeffrey Shu, SWRCB, Public Solicitation of Water Quality Data and Information for 2012 Integrated Report (Aug. 27, 2010).
[78] Letter from Jason Weiner, Ventura County Coastkeeper, to Jeffrey Shu, SWRCB, Public Solicitation of Water Quality Data and Information for 2012 Integrated Report (Aug. 30, 2010) (incorporated herein by reference).

Creek, are placing serious stress on native steelhead populations.[79] This white paper, which includes a comprehensive bibliography of information, should be considered along with DFG data in assessing the Carmel River and San Clemente Creek for listing as impaired by water diversions/flow alterations.

Eel River

A comprehensive assessment of Eel River conditions shows significant impairment as a result of low flows.[80] The report found that:

> low flows . . . often produce temperatures lethal to listed fish species in the Eel River and beneficial to predatory pikeminnow, resulting in a compounding adverse effect on salmonids. Based on available science, increasing flows in the Eel River to 68-265 cfs in the summer will produce corresponding temperature benefits for salmonids that will likely support survival of the species. Bradbury et al (1995) point out that <u>Pacific salmon cannot be recovered without having access to habitat similar to that with which they co-evolved</u>; therefore, to ensure longer term salmonid recovery, access to refugia above the PVP must be provided.[81]

The report recommended that "[i]If summer flow levels were maintained at the 76 to 166 cfs . . . surface water temperatures would drop due to effects described above, increased volume and decreased transit time and steelhead could successfully rear . . . in the mainstem."[82] The flow conditions in the Eel have clearly impaired the health of the river and its associated beneficial uses, and accordingly the waterway must be listed.

Gualala River

The "National Marine Fisheries Service (NMFS, 2001), the California Department of Fish and Game (CDFG, 2002) and Brown et al. (1994) have found that coho salmon are at risk of extinction throughout Mendocino and Sonoma County."[83] With native species facing extinction, healthy water flows should be of paramount importance. However, "CDFG 2001 habitat typing surveys [citation] found that extensive reaches of the Gualala River and its tributaries lacked surface flows."[84] As in the Russian River, water diversions continue despite the serious and

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[79] *See* Appendix A.

[80] Patrick Higgins, Consulting Fisheries Biologist, "Evaluation of the Effectiveness of Potter Valley Project National Marine Fisheries Service Reasonable and Prudent Alternative (RPA): Implications for the Survival and Recovery of Eel River Coho Salmon, Chinook Salmon, and Steelhead Trout" (Feb. 2010) (included in Appendix A under "Eel River").

[81] *Id.* at p. 39 (emphasis added).

[82] *Id.*

[83] Letter from Patrick Higgins, Consulting Fisheries Biologist to Allen Robertson, California Department of Forestry and Fire Protection, "Negative Declaration for Sugarloaf Farming Corporation dba Peter Michael Winery" (Dec. 12, 2003)

[84] *Id*. at p. 10.

significant impairments in the Gualala, prompting a recent public trust lawsuit.[85] Significant data and information on the Gualala River is provided in Appendix A.

Mark West Creek

Ten years ago all 28 miles of Mark West Creek had water in the summer. Today, because of increased diversions, only 3½ miles have water. DFG flow records of Mark West Creek dating back to the 1960s show that the lowest summer stream flow has historically been 2 cfs, and Summer 2010 is measuring on average at approximately that level. The Russian Riverkeeper[86] has photo-documented this decline. Data and information on the serious and escalating impairments to this creek are provided in Appendix A-1[87] and on the Friends of the Mark West Watershed website.[88]

Mattole River

A detailed study of the Mattole River Basin found that:

> Lack of adequate late summer and early fall streamflow is recognized as one of the most important limitations on salmonid habitat in the Mattole River basin (NCWAP, 2000). In recent years, juvenile salmonids have become stranded in pools due to excessively low flows, causing mortality and necessitating fish rescue operations.[89]

Additional support for a flow-related listing of the Mattole River is found in Appendix A.

Napa River

Studies referenced in AB 2121 comments illustrate the significantly degraded habitat of the Napa River, which can only be restored with a focus on reversing severely reduced natural flows.[90] Research shows that "even in good years. . . 80% of tributary habitat surveyed was marginally functional or non-functional."[91] The Napa River "was formerly a very important nursery area for older age juvenile steelhead (Anderson 1969) . . . and that habitat is now completely non-functional for rearing. Therefore, all indications are that lack of older age steelhead rearing habitat is limiting the population."[92] Moreover, low water years (which are to

[85] Center for Biological Diversity, "Lawsuit Imminent over Water Diversions Killing Salmon and Steelhead in Russian and Gualala Rivers," (Nov. 17, 2009), available at: http://www.biologicaldiversity.org/news/press_releases/2009/russian-river-11-17-2009.html.
[86] www.russianriverkeeper.org.
[87] Appended separately from Appendix A due solely to formatting requirements.
[88] http://www.markwestwatershed.org/Cornell_Winery_PrimerDocsDirectory.html.
[89] Randy D. Klein, Hydrologist, "Hydrologic Assessment of Low Flows in the Mattole River Basin 2004-2006," p. 1 (March 2007), *see* Appendix A.
[90] Letter from Patrick Higgins, Consulting Fisheries Biologist to SWRCB, "Comments on *Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams*" (April 2, 2008), pp. 13-15 (in Appendix A).
[91] Letter from Patrick Higgins, Consulting Fisheries Biologist to Thomas Lippe, Living Rivers Council (Aug. 17, 2010), p. 5 (included in Appendix A under "Napa River").
[92] *Id.*

be expected and built into water planning) are “depressing smolt production” due to a continued lack of attention to sufficient flows.[93]

Navarro River

As described in more detail in Appendix A, “diversions from the Navarro River and its tributaries, primarily for agricultural purposes, have significantly impaired instream fish and wildlife beneficial uses, to the point where the river was literally pumped dry” on past occasions.[94] Numerous data sets indicate growing impacts from cumulatively increasing water diversions in this already heavily-drained area.

Redwood and Maacama Creeks

As described in detail in Appendix A, in Maacama Creek “[s]tanding crops of fall fish show a major reduction in many years, suggesting that low flow conditions are limiting, and these low flow conditions are likely linked to agricultural water use.”[95] “[A]lmost 70% of habitats in Redwood Creek [are] dry (Figure 12) and all other streams showed signs of dewatering related to diversion of surface water and likely contributed to by over-use of groundwater.”[96] Additional assessments have found that

> in undisturbed Pacific Northwest streams, pool frequencies range from 37% to greater than 80% (Murphy et al. 1984 and Grette 1985) and CDFG (2004) rates frequencies greater than 40% as functioning for salmon and steelhead. Figure 12 shows that pool frequencies were under 10% on Redwood and Foote Creeks in some reaches and only about 25% of most Maacama Creek reaches. Pool depths are similarly compromised (Figure 13) with none over three feet deep in Foote Creek and the majority on Redwood Creek as well.[97]

This report concludes that “Coho salmon are at very high risk of extinction in the Russian River basin, yet NMFS (2008) considers their gene resources to be of extremely high importance for rebuilding of the entire CCC ESU. Expensive recovery efforts to restore Russian River coho salmon using captive broodstock from Green Valley Creek is failing to re-establish breeding populations in any Russian River tributary (NMFS 2008).”[98] Because “the biggest problem is over-consumption of water,”[99] listing of these waterways as impaired by natural flow alterations/water diversions is an important step in ensuring their return to good health.

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[93] *Id.*

[94] Letter from Patrick Higgins, Consulting Fisheries Biologist to SWRCB, “Comments on *Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams*,” p. 15 (April 2, 2008).

[95] Letter from Patrick Higgins, Consulting Fisheries Biologist to Traci Tesconi, County of Sonoma, “Pelton House Winery Application #PLP05-0010,” (Dec. 29, 2008), p. 12 (included in Appendix A).

[96] *Id.* at p. 13.

[97] *Id*. at pp. 12-13.

[98] *Id*. at p. 19.

[99] *Id*. at p. 20.

Russian River

As illustrated in documents attached as Appendix A[100] and elsewhere, [101] the Russian River is increasingly impaired due to flow alterations. Numerous technical analyses have found that "[l]egal and illegal diversions pose significant risk to the last streams where coho still persist in the Russian River."[102]

Salinas River

As described in more detail in Appendix A, "channel alteration and changes in flow regime have caused a virtual loss of the anadromous life history of three steelhead [distinct population segments] in the Salinas River."[103] More generally, "flows in lower reaches for adult and juvenile steelhead passage are often lacking,"[104] with "[g]roundwater pumping related to agricultural activities . . . caus[ing] the loss of surface flow in winter and spring."[105] This detailed analysis concluded that "unless the Salinas River channel and flow move back towards their more normal range of variability steelhead cannot be restored."[106]

Santa Clara River

As described in more detail in the comments submitted by Ventura Coastkeeper,[107] which are incorporated here by reference, USGS, county and local agency data show that enough water is diverted at the Vern Freeman Diversion Dam for agricultural usage, groundwater recharge, and other uses to deprive migrating steelhead of sufficient flows and juvenile steelhead of healthy estuary rearing grounds. These activities impact the beneficial uses for this river as habitat for fish, necessitating a listing caused by water diversion. Moreover, as discussed in the Ventura Coastkeeper letter, the river is also impaired for fish passage since the United Conservation Water District put in an impassable fish barrier.

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[100] *See* Letter from Patrick Higgins, Consulting Fisheries Biologist to SWRCB, "Comments on *Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams"* (April 2, 2008), pp. 16-20 (included in Appendix A under "Navarro River"). *See also* Merenlender, Adina et al, "Decision support tool seeks to aid stream-flow recovery and enhance water security," 62 *California Agriculture* 148 (Oct.-Dec. 2008), *available at*: http://ucanr.org/repository/cao/landingpage.cfm?article=ca.v062n04p148&fulltext=yes.

[101] *See supra* n. 85, "Lawsuit Imminent Over Water Diversions Killing Salmon and Steelhead in Russian and Gualala Rivers" (data associated with filing should be closely examined).

[102] Higgins, *supra* n. 100 at p. 16.

[103] Letter from Patrick Higgins, Consulting Fisheries Biologist to Curtis Weeks, Monterey County Resources Agency, Comments on Salinas River Channel Maintenance Project (CMP) 404 Permit Application and Mitigated Negative Declaration, p. 4 (Aug. 6, 2009).

[104] *Id.* at p. 5; *see also* Letter from Patrick Higgins, Consulting Fisheries Biologist to SWRCB, "Comments on *Draft Policy for Maintaining Instream Flows in Northern California Coastal Streams"* (April 2, 2008).

[105] *Id.*

[106] *Id.* at p. 17.

[107] Letter from Jason Weiner, Ventura Coastkeeper to Jeffrey Shu, SWRCB, Public Solicitation of Water Quality Data and Information for 2012 Integrated Report (Aug. 30, 2010).

Scott River and Shasta River

In summer 2009, agricultural irrigation and dewatering caused record low flows in the Scott and Shasta River watersheds, flows that will continue to impair these waterways because they are associated with increased usage for agriculture and other, non-situational sources.[108] Extensive photo documentation of the activities producing this flow impairment and its impact on fish habitat was collected by Klamath Riverkeeper and others.[109] The Pacific Coast Federation of Fishermen's Associations and Environmental Law Foundation have already brought a public trust action[110] against the State Water Board and Siskiyou County regarding flows in the Scott River. Information associated with that lawsuit should be considered in the determination that the river is and will continue to be impaired due to low flows associated with withdrawals. Additional instream flow analyses are being conducted by Humboldt State University under the oversight of the California Ocean Protection Council.[111]

Documentation of the impacts of low flows in these waterways is extensive and included in Appendix A and other readily available data sources. For example, the Scott River Sediment and Temperature TMDL process several years ago produced substantial evidence of impaired beneficial uses resulting from low flows, including reaches that now regularly go dry, placing the Scott River salmon and steelhead stocks at "high risk of extinction"[112] Similarly, the recent Shasta River Watershed Dissolved Oxygen and Temperature process produced information supporting the conclusion that "[t]he need for a baseline minimum flow with most reaches of the Shasta River, and the importance to salmon . . . of maintaining minimum flows even during low water years, cannot be over-stated."[113] Properly listing these water bodies as impaired by flows, in addition to the other listed causes for their impairment, will ensure the appropriate attention is paid to addressing alterations in natural flow that are devastating the rivers' beneficial uses.

2. The Sacramento-San Joaquin Delta

Finally, *all* of the Delta waterways examined in the State Water Board's recently-adopted "Final Report on Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem" should be considered for flow impairments. This Report concluded unequivocally

[108] See attached documentation in Appendix A.
[109] Klamath Riverkeeper, "Scott and Shasta Rivers 2009 Flow Emergency," available at: http://picasaweb.google.com/klamathriverkeeper/ScottAndShastaRivers2009FlowEmergency#.
[110] "Fishing and Conservation Groups Sue over Poor Water Management on Northern California's Scott River" (June 24, 2010) (press release), available at: http://www.envirolaw.org/documents/ScottRiverPTDSuitPressRelease062410.pdf; *see also* Petition for Writ of Mandamus and Complaint for Declaratory and Injunctive Relief (Sup. Ct. Sacramento, June 23, 2010), at: http://www.envirolaw.org/documents/WRITPETITIONCOMPLAINT.pdf.
[111] CA Ocean Protection Council, "Instream Flow Analysis – Shasta River," available at http://www.opc.ca.gov/2009/05/instream-flow-analysis-shasta-river/.
[112] Letter from PCFFA *et al* to Tam Doduc, SWRCB, "Joint Comments on the Proposed Action Plan for the Scott River Watershed Sediment and Temperature TMDL," Attachment A - Scott TMDL Related Data, Photos and Maps Regarding Flow and Temperature Problems (June 12, 2006) (included in Appendix A).
[113] Letter from Pacific Coast Federation of Fishermen's Associations and the Institute for Fisheries Resources to SWRCB, "Comment Letter - Shasta River Watershed DO and Temperature TMDLs," p. 4 (Oct. 29, 2006) (included in Appendix A).

that **"[r]ecent Delta flows are insufficient to support native Delta fishes for today's habitats."**[114] More specifically, the Report found that:

> In order to preserve the attributes of a natural variable system to which native fish species are adapted, many of the criteria developed by the State Water Board are crafted as percentages of natural or unimpaired flows. These criteria include:
>
> - 75% of unimpaired Delta outflow from January through June;
> - 75% of unimpaired Sacramento River inflow from November through June; and
> - 60% of unimpaired San Joaquin River inflow from February through June.
>
> It is not the State Water Board's intent that these criteria be interpreted as precise flow requirements for fish under current conditions, but rather they reflect the general timing and magnitude of flows under the narrow circumstances analyzed in this report. In comparison, historic flows over the last 18 to 22 years have been:
>
> - approximately 30% in drier years to almost 100% of unimpaired flows in wetter years for Delta outflows;
> - about 50% on average from April through June for Sacramento River inflows; and
> - approximately 20% in drier years to almost 50% in wetter years for San Joaquin River inflows.[115]

In other words: (a) the Delta is always impaired for flow in drier years and potentially impaired seasonally in wetter years, (b) the Sacramento River is regularly flow impaired, and (c) the San Joaquin River is always flow impaired. Note that this comparison is based on averages over the past two decades; flow data from more recent years (available from the citations above and other readily available sources) would likely skew these results towards more, not less, impairment, as noted in the Report quote above.

Accordingly, *all* Delta waterways for which the Report has found flow-related impairments of beneficial uses should be listed in the 2012 303(d) list as impaired by water diversion, flow alteration, and/or other appropriate cause, with the specific sources (agriculture, etc.) clearly delineated.

D. The State Must Specifically Identify and List All Surface Waters That Can No Longer Provide the Beneficial Use of "Groundwater Recharge" Due to Reduced Flows

"Groundwater recharge" is defined as the use of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers. "Groundwater recharge" is listed as a beneficial use for 2,167 hydrologic units/areas in eight out of nine of the Regional Basin Plans for surface waters around the state: North Coast: 109, San Francisco Bay: 23, Central Coast: 396, Los

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[114] Delta Flow Report, *supr*a n. 59, at p. 5 (emphasis added).
[115] *Id*.

Angeles: 222, Central Valley: 0,[116] Lahontan: 1009, Colorado River: 93, Santa Ana: 98, San Diego: 217.[117] Despite the widespread recognition of "groundwater recharge" as a beneficial use by Regional Water Boards, the protection of this use has been rarely acknowledge or addressed by the 303(d) listing process. This must be rectified in the 2012 list.

The State Water Board's map of high-use groundwater basins and hydrogeological areas depicts vulnerable groundwater recharge basins in every region of California.[118] In many of California's river basins, agricultural and other users divert surface stream flows to the extent their actions impair the groundwater recharge beneficial use. Similarly, in river basins with a hydrologically connected groundwater aquifer that is being pumped, large scale groundwater pumping depletes the connected surface waterway, further diverting percolation from the stream into the aquifer and impairing the "groundwater recharge" beneficial use of impacted surface water.[119] The State can and should incorporate such listings in the 2012 list, *i.e.* where readily available data provides the information needed to identify water bodies for which designated "groundwater recharge" uses are threatened or impaired.

IV. THE STATE WATER BOARD MUST COMPREHENSIVELY ADDRESS GROUNDWATER CONTAMINATION AND WITHDRAWALS THAT IMPAIR OR THREATEN SURFACE WATERS.

The State's 303(d) list must reflect instances where contaminated groundwater discharges to rivers, estuaries and other surface waters is the cause or source of surface water impairment. California's Section 303(d) list must also reflect instances where excessive withdrawals and pumping of groundwater impairs and threatens surface waters, including rivers, creeks, estuaries, and wetlands, such as through reduced flows.[120]

Actions to address groundwater sources of surface water impairment with specificity are feasible and have been undertaken by California and other states during the course of 303(d) listing and TMDL development. California and other states have shown that it is feasible—and often necessary—to identify and address groundwater sources of surface water impairment with high levels of specificity during the development of a TMDL. The State Water Board should require Regional Water Boards to identify the name of groundwater sources of surface water impairment, including the name of groundwater basins, point source discharges from cleanup and dewatering operations, and other relevant sources; assess and measure groundwater loading

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[116] The Central Valley Regional Water Quality Control Board explains that there are surface waters that have the beneficial use of Groundwater Recharge, but that they have not yet been identified: "NOTE: Surface waters with the beneficial uses of Groundwater Recharge (GWR),Freshwater Replenishment (FRSH), and Preservation of Rare and Endangered Species (RARE) have not been identified in this plan. Surface waters of the Sacramento and San Joaquin River Basins falling within these beneficial use categories will be identified in the future as part of the continuous planning process to be conducted by the State Water Resources Control Board." *See* http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr.

[117] *See* Chapter 2 of Basin Plans for Regions 1-9 at http://www.waterplan.water.ca.gov/waterquality/basin_plan.cfm.

[118] http://www.waterboards.ca.gov/water_issues/programs/gama/docs/hydro_areas.pdf.

[119] J. Daubert, R. Young, *Managing an Interrelated Stream-Aquifer System, Economics, Institutions, Hydrology*, Colorado Water Resources Research Institute, Technical Report #47, p. 1 (April 1985). Available at: http://www.cde.state.co.us/artemis/ucsu6/UCSU6141347INTERNET.pdf.

[120] A detailed discussion of flow impacts to water quality can be found in Section III.

to surface waters during the development of TMDLs; and assign wasteload allocations to groundwater sources of impairment to surface waters, to the extent possible. Please refer to Appendix B for a synopsis of TMDLs in California and elsewhere that address how to manage groundwater loadings with specificity.

A. The State Water Board Has a Duty to Address Groundwater-Related Sources of Impairment to Surface Waters under Section 303(d) of the Clean Water Act.

1. The hydrological connectivity of surface waters and groundwater triggers the Board's legal mandate under Section 303(d) of the Clean Water Act.

Because of the pervasive hydrological connectivity of surface waters and groundwater, polluted groundwater can substantially impact the quality of surface waters.[121] Streamflow may recharge alluvial aquifers, and groundwater conversely can provide substantial amounts of flows into lakes, streams, and rivers.[122] The hydrological connectivity is widely interpreted—by U.S. EPA, courts, and several states, including California—as triggering a regulatory duty under the Clean Water Act.

For example, U.S. EPA has stated that "in general, collected or channeled pollutants conveyed to surface water via groundwater can constitute a discharge subject to the Clean Water Act."[123] The determination of whether a discharge to ground water can be subject to regulation under the Clean Water Act is a determination that involves an ecological "judgment about the relationship between surface waters and groundwaters."[124]

Courts have also found that hydrologically connected groundwater and surface waters can trigger regulatory duties with respect to contaminated groundwater under the federal Clean Water Act.[125] In 2006, U.S. Supreme Court Justice Kennedy wrote in his concurring and oft-cited *Rapanos* opinion that water bodies will "come within the statutory phrase 'navigable

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[121] United States Geological Survey, Ground Water and Surface Water: A Single Resource, Circular 1139, available at: http://pubs.usgs.gov/circ/circ1139/ ("*USGS: Single Resource*"). *See also* R. Thomas, *Comment: The European Directive on the Protection of Groundwater, A Model for the United States*, 26 Pace Envtl. L. Rev. 259, 264 (Winter 2009) ("*Groundwater Protection Model*") ("… groundwater does not exist in isolation from other bodies of water; it is an integral part of the hydrological cycle and discharges into lakes and streams. Such "tributary" groundwater is vital for maintaining surface water supplies and sustaining surface ecosystems"); William M. Alley, "Tracking U.S. Groundwater: Reserves for the Future," *Environment*, pp. 10, 15 (Apr. 2006); *see also* William M. Alley *et al.*, "Flow and Storage in Groundwater Systems," 296 *Sci*. 1985, 1990 (2002).

[122] *See* Aiken, J. David, The Western Common Law of Tributary Groundwater: Implications for Nebraska. (2004) at p. 545, available at http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1032&context=ageconfacpub. *See also USGS: Single Resource*: USGS finds that groundwater contribution to surface waters has been shown to range from 10% to over 90% across the U.S., with an estimated average of over 40%.

[123] EPA, *National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitations Guidelines and Standards for Concentrated Animal Feeding Operations* 66 Fed. Reg. 2960, 3017 (Jan. 12, 2001).

[124] 66 Fed. Reg. at 3018 (emphasis added.)

[125] *See e.g. Greater Yellowstone Coalition v. Larson,* 641 F. Supp. 2d 1120, 1138 (D. Idaho 2009) ("[t]here is little dispute that if the ground water is hydrologically connected to surface water it can be subject to 401 certification."); *Coldani v. Hamm*, 2007 WL 2345016, at 9 (E.D. Cal. Aug. 16, 2007) ("the court finds that because Coldani has alleged that Lima Ranch polluted groundwater that is hydrologically connected to surface waters that constitute navigable waters, he has sufficiently alleged a claim within the purview of the CWA [citations]")

waters,'" and thereby fall under the Clean Water Act, if they "significantly affect the chemical, physical, and biological integrity of other covered waters more readily understood as 'navigable.'"[126]

The Ninth Circuit Court of Appeals has also repeatedly interpreted the Clean Water Act to include regulation of groundwater hydrologically connected to surface waters.[127] In *Northern Plains Resource Council v. Fidelity Exploration* the Ninth Circuit found that even the discharge of "unaltered" groundwater into a river could be considered a pollutant and subject to water quality standards where the company's discharge altered the river's water quality.[128] The *Northern Plains Resource Council* opinion went on to explain that:

> Were we to conclude otherwise, and hold that the massive pumping of salty, industrial waste water into protected waters does not involve discharge of a "pollutant," even though it would degrade the receiving waters to the detriment of farmers and ranchers, we would improperly "undermine the integrity of [the CWA's] prohibitions."[129]

Section 303(d) of the Clean Water Act, in particular, has been recognized by U.S. EPA and several states as a proper tool for addressing groundwater contaminant loading to surface waters and other groundwater-related sources of impairment. EPA has identified four potential sources of groundwater-related impairment of surface water for states' 303(d) Lists (though others are possible): "Groundwater Loadings," "Groundwater Withdrawals," "Contaminated Groundwater," and "Saltwater Intrusion."[130] EPA records reflect that several states, including California, have adopted 303(d) lists that include groundwater loadings or withdrawals as a source of impairment: **to date, 181 miles of rivers and streams, 158 square miles of bays and estuaries, 3,045 acres of wetlands, and 98,009 acres of lakes, reservoirs and ponds have been listed nationally as impaired in part due to groundwater sources of impairment.**[131]

2. <u>Public policy concerns of efficiency and public health weigh heavily in favor of proactively addressing groundwater contamination of surface waters through the 303(d) process</u>.

[126] *Rapanos v. United States*, 547 U.S. 715, 779-780 (2006) (Kennedy, J., concurring).
[127] *N. Cal. River Watch v. City of Healdsburg*, 496 F.3d 993, 1000 (9th Cir. 2007) (court found that water that seeped into the river through both the surface wetlands and the underground aquifer and had significant effect on "the chemical, physical, and biological integrity" of the Russian River sufficient to confer jurisdiction under the Act pursuant to Justice Kennedy's substantial nexus test.); *Northern Plains Resource Council v. Fidelity Exploration and Dev. Co*., 325 F.3d 1155, 1162 (9th Cir. 2003).
[128] *Northern Plains Resource Council v. Fidelity Exploration and Dev. Co*., 325 F.3d 1155 (9th Cir. 2003).
[129] *Id.*, citing *APHETI*, 299 F.3d at 1016.
[130] *See* U.S. EPA, "National Summary of State Information: National Probable Sources Contributing to Impairments," available at: http://iaspub.epa.gov/waters10/attains_nation_cy.control#causes, and U.S. EPA, "Specific State Probable Sources That Make Up the National Groundwater Loadings/Withdrawals Probable Source Group," available at: http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.source_detail?p_source_group_name=GROUNDWATER%20LOADINGS/WITHDRAWALS.
[131] *Id.* California has also recognized groundwater sources of impairment on its 303(d) List. The most recent 2010 303(d) List contains 27 waterbody-segment pollutant combinations that identify groundwater loadings as potential sources of impairment.

There are considerable practical reasons to address groundwater loadings with as much specificity as possible. For example, rapid mixing, dilution, and dispersal of pollutants, which are factors that often mitigate surface water contamination, do not occur with polluted groundwater,[132] resulting in much lengthier persistence of pollutants and their harmful effects. Moreover, the costs, difficulties, and uncertain benefits of remediation weigh strongly in favor of efficient agency action to address groundwater pollution.[133]

Additionally, addressing groundwater contamination of surface waters is necessary to protect public health.[134] Discharges from septic systems and agricultural runoff can cause waterborne diseases and chemicals found in groundwater, including pesticides, gasoline additives such as MTBE, arsenic, and other hazardous wastes, present significant threats.[135]

The state's pending public health crisis fueled by nitrate-polluted groundwater provides a particularly compelling example. Nitrate, the most common groundwater contaminant in California in drinking water can cause "blue baby syndrome," lead to miscarriages and death in infants, and may cause certain types of cancers. A recent California Watch report found that the number of California wells that exceeded the health limit for nitrates jumped from nine in 1980 to 648 in 2007. To date, the State Board has not been able to effectively regulate and ensure the cleanup of nitrates. The 303(d) process was designed to do just that and should be applied to address nitrate and other pervasive groundwater contaminants that impact surface waters. Such efforts will at the same time help establish much-needed improvements in groundwater quality itself.

B. The State Must Use All Readily Available Data to Specifically Identify Surface Waters Impaired by Contaminated Groundwater Loadings.

As discussed above, under federal law[136] and the California Listing Policy, the State and Regional Water Boards must "actively solicit, assemble, and consider all readily available data and information, including drinking water source assessments and existing and readily available water quality data and information reported by local and state agencies."[137] Information regarding groundwater impairments that contaminate surface waters, groundwater hydrological connections with surface waters, and groundwater withdrawals that impact surface waters is essential in the compilation of a complete 303(d) list that correctly identifies pollutants and sources that can then be effectively prioritized.[138] Further, groundwater data can provide valuable clues to uncover the existence of hydrologically-connected, impaired surface water bodies that the state may otherwise have missed.

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132 2006 Guidance.
133 *Id.*
134 *See* Harter, T. & Rollins, L., *Watersheds, Groundwater and Drinking Water: A Practical Guide*, University of California, Agriculture and Natural Resources, Publication 3497 (2008).
135 *Supra* n. 121, *Groundwater Protection Model* at 263.
136 40 CFR 130.7(b)(5), see http://law.justia.com/us/cfr/title40/40-21.0.1.1.17.0.16.8.html
137 *See* CA Listing Policy, Section 6.1.1 Definition of Readily Available Data and Information
138 40 CFR 130.7(b)(4).

The State's own 2002 305(b) Report contains an extensive catalog of efforts and available data to monitor groundwater quality in California."[139] It is worth noting that the most recent groundwater quality assessment included in the State's 305(b) Report will be a *decade* old in 2012. By contrast, EPA's 2006 Guidance contemplates the completion of such assessments every two years:

> by April 1 of all even numbered years, a description of the water quality of all waters of the state (including, rivers/stream, lakes, estuaries/oceans and wetlands). States may also include in their section 305(b) submittal a description of the nature and extent of ground water pollution and recommendations of state plans or programs needed to maintain or improve ground water quality.[140]

Updated monitoring and assessment of groundwater quality is highly relevant to the state's proper assessment of the overall health of its waterways as called for by the federal Clean Water Act. These and other readily available sources of information and data on groundwater contamination and withdrawals must be integrated into the State Water Board's analysis of impairment sources of surface waters in its biennial Integrated Report (303(d) list and 305(b) report).[141] A brief discussion of data that should be incorporated immediately in the current data scoping for the 2012 303(d) List is provided below.

First, the State Water Board should assess its own data from its Groundwater Ambient Monitoring and Assessment (GAMA) Program and Underground Storage Tank, Land Disposal, and Spills, Leaks, Investigations, and Cleanup Programs in its biennial 303(d) analysis. The GeoTracker GAMA Groundwater Database contains groundwater data searchable by chemical and is readily available, highly relevant and compatible to specify groundwater loadings to listed surface waters. Additionally, the California Water Quality Monitoring Council, which is co-chaired by Cal-EPA and the Natural Resources Agency and managed by the State Water Board, is very close to completing an interactive suite of databases to be released shortly on groundwater quality. This portal of information compiles existing groundwater quality data from USGS and others that similarly should be examined for 303(d) listing implications.

The State Water Board should also closely collaborate with and solicit groundwater quality data held by other state agencies, most notably the Department of Pesticide Regulation (DPR) and California Department of Public Health (DPH). DPR's Ground Water Protection Program[142] maintains a well inventory program that contains information about the collection and analysis of data on wells sampled for pesticides by state and local agencies, as well as DPR's own monitoring of pesticides that have the potential to pollute groundwaters.[143] Under the Safe Drinking Water Act, each state is required to assess drinking water sources, including

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[139] SWRCB, 2002 Integrated Report, Chapter IV: Groundwater Quality Assessment, available at: http://www.swrcb.ca.gov/water_issues/programs/tmdl/305b.shtml.

[140] 2006 Guidance at 9.

[141] *See* 2006 Guidance for details on U.S. EPA requirements for the inclusion of updated groundwater data in the state's biennial Integrated Report (http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/2006IRG_index.cfm).

[142] *See* California Department of Pesticide Regulation, Groundwater Protection Programs website at http://www.cdpr.ca.gov/docs/emon/grndwtr/index.htm.

[143] Well Inventory Reports on Ground Water Testing for Pesticides from 1986-2008, and other data and information is available at http://www.cdpr.ca.gov/docs/emon/grndwtr/wellinv/wirmain.htm.

groundwater wells. California DPH is currently implementing these requirements as part of the Drinking Water Source Assessment and Protection Program (DWSAP), which includes an assessment of 14,326 groundwater sources.[144] Several other state agencies implement groundwater-related monitoring and assessment programs, such as the Department of Water Resources (DWR) and Department of Toxic Substances Control (DTSC); these must be solicited for data as well.

Local groundwater management districts and banks also must be solicited for information on the contamination and overuse of groundwater basins and aquifers that are hydrologically connected to impaired surface waters. The Santa Clara Valley Water District, for example, monitors groundwater quality for common inorganic constituents and identifies which contaminants exceed Regional Water Quality Control Board agricultural water quality objectives.[145] There are also nine local groundwater management districts[146] in California that maintain groundwater data, as well as watermasters[147] and other local entities that maintain data and information about groundwater water quality.

Additionally, federal agencies that implement groundwater-related monitoring and assessment programs, such as U.S. EPA and the United States Geological Survey (USGS),[148] must be "actively solicited" for information. In 2007, USGS conducted an analysis of California's well water quality that examined the presence of 11 contaminants in groundwaters including arsenic, atrazine, benzene, nitrate, radon, and uranium.[149] California Coastkeeper Alliance created two interactive maps depicting groundwater polluted by nitrates and arsenic, primarily relying on these USGS data.[150] Other independent researchers have developed excellent maps of nitrate and other incidences of groundwater pollution that may impact surface waters.[151] This and related information should be carefully scanned for related impacts to hydrologically-connected surface water bodies.

Finally, data on groundwater withdrawals and pumping that impairs or threatens surface water beneficial uses similarly must be solicited and considered. The State Water Board's Water Rights division has such data, which could be cross-referenced with streamflow and other data from numerous other sources.[152] The Santa Clara Valley Water District monitors groundwater elevation and maintains a database of elevation data, searchable by location or well number.[153]

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[144] *See* California Department of Health, Drinking Water Source Assessment and Protection Program, January 1999. Available at http://www.cdph.ca.gov/certlic/drinkingwater/Documents/DWSAPGuidance/DWSAP_document.pdf.
[145] Table 3-3a, Santa Clara Valley Water District, 2008 Groundwater Quality Report.
[146] A list of groundwater management district can be found at DWR, Water Facts: Groundwater Management Districts or Agencies in California, available at http://www.dpla2.water.ca.gov/publications/waterfacts/water_facts_4.pdf.
[147] *See* Chino Basin Watermaster Engineering Reports: http://www.cbwm.org/rep_engineering.htm.
[148] *See, e.g.*, USGS Groundwater Information Pages, http://water.usgs.gov/ogw/ and information on what type of data USGS collects at http://www.usgs.gov/faq/index.php?action=artikel&cat=102&id=1148&artlang=en.
[149] Excerpt of California data available at http://www.cacoastkeeper.org/document/ca-domestic-well-water-quality.pdf.
[150] *See* http://www.cacoastkeeper.org/programs/mapping-initiative/nitrates-in-groundwater-maps and http://www.cacoastkeeper.org/programs/mapping-initiative/arsenic-in-groundwater-maps.
[151] *See* California Watch Report, *Nitrate Contamination Spreading in California Communities* (May 13, 2010), available at: http://www.californiawatch.org/nitrate-contamination-spreading-california-communities.
[152] *See* Section III. above for additional sources of flow- and pumping-related data. Future data collected pursuant to SB X7 6 (2009), which establishes collaborations to collect groundwater elevations statewide, will provide

If the State Water Board declines to use such readily available data and information related to groundwater loadings that threaten or impair surface waters, the Board *must* submit a formal "rationale" for the decision in its Assessment Methodology.[154] EPA requires that states' submissions of 303(d) Lists include an Assessment Methodologies section, which includes a "rationale for any decision to not use any existing and readily available data and information."[155] We urge the Water Board, however, to fully exercise its authority and mandate to comprehensively assess and report on the health of all waterways in the state, as required by the 2006 Guidance and Clean Water Act Sections 303(d) and 305(b).

C. The State Water Board Must Ensure that Groundwater Sources of Surface Water Impairment Are Specifically Identified in All Affected Regions of California.

The State Water Board has made progress in identifying groundwater "sources" of surface water impairment in its 303(d) assessment and listing process.[156] Whereas the 2006 303(d) List contained only two references to groundwater as a source of impairment,[157] the 2010 303(d) List contains 27 water body-pollutant segments which identify groundwater as a source of impairment. This type of information is extremely useful in prioritizing waters for action and setting appropriate loads.

Despite the Board's progress, though, groundwater sources of contamination are not identified consistently throughout California's nine regions, nor is there enough information included about groundwater loadings on the List as with other listed sources of impairment. The majority of groundwater-related listings in the 2010 303(d) List are limited to Regions 3 and 4, with only one listing each in Regions 5, 6, and 8. Further, where the Board has identified groundwater contamination as a source of impairment, the groundwater basins and the extent of contaminant loading has not been identified specifically.

The problem of contaminated groundwater loadings to surface waters is not limited to 27 waterbody-pollutant segments, nor is it limited to Regions 3 and 4; it is a pervasive issue that must be proactively addressed throughout the State's 303(d) Listing Process. There are myriad examples spanning the entire state of contaminated groundwater impacts to surface waters. For example, researchers working in San Francisco Bay found that excess levels of certain dissolved

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additional information (DWR is in the process of launching the California Statewide Groundwater Elevation program).

[153] Santa Clara Valley Water District Online Groundwater Elevation Query, available at: https://gis.valleywater.org/GroundwaterElevations/index.asp.

[154] 40 CFR 130.7(b)(6)(iii); U.S. EPA 2006 Guidance, Section C.2, p. 18 ("The assessment methodology should be consistent with the state's WQSs and include a description of the following as part of their section 303(d) list submissions … Rationales for any decision to not use any existing and readily available data and information."). Note that EPA's subsequent Guidance documents for 2008 and 2010 incorporate the 2006 Integrated Reporting Guidance.

[155] 2006 Guidance at 18.

[156] *See* discussion of Source versus Cause in Section III. above.

[157] "Groundwater withdrawal" was listed as a source of impairment of a surface water in only one listing in 2006 (Mendota Pool in Region 5). Lake Tahoe listed "groundwater loadings" as a source of impairment. See www.waterboards.ca.gov/water_issues/programs/tmdl/docs/303dlists2006/epa/state_06_303d_reqtmdls.pdf.

metals in the Bay resulted in large part from groundwater seepage.[158] Similarly, nitrate contamination of groundwaters in California Central Coast valleys, such as Salinas, has become a national example of how fertilizers can impact public health and water quality.[159] For example, the Salinas River is severely impaired by nutrients and nitrates, flows of which often originate from groundwater tainted by irrigation releases.[160] In 2007, the Central Coast Regional Quality Control Board staff investigated reports of heavily nutrient-contaminated discharges from greenhouses near the City of Carpinteria, finding that such discharges of groundwater contribute to existing nutrient impairments in the Carpinteria Salt Marsh and its tributary streams.[161]

Data from the Malibu Watershed,[162] Los Osos,[163] and San Francisco Bay Area[164] demonstrate another pervasive form of surface water pollution caused by groundwater: septic tank releases that reach coastal waters, estuaries and other surface waters. For example, a recent Stanford study found that contaminated groundwater discharging from a small stretch of Stinson Beach was contributing as much nutrient flux to nearshore coastal waters as *all* local creeks and streams in the Bolinas Lagoon drainage.[165]

Southern California surface waters are particularly impacted by contaminated groundwater and excessive withdrawals and pumping. In particular, a number of Orange

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[158] Spinelli, G.A. *et al*., "Groundwater seepage into northern San Francisco Bay: Implications for dissolved metals budgets," *Water Resources Research*, 38(10.1029/2001WR000827) (2002). The researchers sought to quantify groundwater seepage and bioirrigation rates in the area to determine their roles in transporting dissolved metals from benthic sediments to surface waters. After applying their groundwater flow seepage model to northern San Francisco Bay, the researchers found that "benthic fluxes of dissolved metals to the surface waters could account for a relatively large amount (<60%) of the unknown sources of dissolved cobalt and a relatively small amount (<4%) of the unknown sources of dissolved silver, cadmium, copper, nickel, and zinc." *Id.* at 1 (Abstract).

[159] Robert E. Criss "Fertilizers, water quality, and human health," *Environmental Health Perspectives*. FindArticles.com. Aug 23, 2010. http://findarticles.com/p/articles/mi_m0CYP/is_10_112/ai_n15688580/.

[160] *See* USGS, J. Kulongoski, K. Belitz, *Ground-Water Quality Data in the Monterey Bay and Salinas Valley Basins, California, 2005—Results from the California GAMA Programs*, Data Series 258, available at: http://pubs.usgs.gov/ds/2007/258/pdf/DS_258.pdf.

[161] Staff concluded that the discharges were either the result of sump pumping activities conducted by greenhouse operators or groundwater leaching into the storm drain system and then Arroyo Paradon creek. These discharges of groundwater contribute to existing nutrient impairments in the Carpinteria Salt Marsh and its tributary streams. Data and information on file with Santa Barbara Channelkeeper.

[162] Santa Monica Bay Restoration Commission, "Risk assessment of septic systems in lower Malibu Creek watershed" (2001) (Characterizes vulnerability of Malibu Creek and Lagoon and Surfrider Beach to contamination from on-site septic systems in the Malibu Civic Center).

[163] Central Coast Regional Water Quality Control Board, "Los Osos Water Quality Project and Status of Sewer Project" (October 2005), available at: http://www.swrcb.ca.gov/rwqcb3/water_issues/programs/los_osos/docs/master_docs/2005_10_los_osos_water_quality_impacts_and_status_of_sewer_project.pdf ("Los Osos septic tanks are causing severe environmental problems in Morro Bay and surrounding areas. This is a surface water (Morro Bay National Estuary) problem in addition to a groundwater problem").

[160] Alexandria B. Boehm, Gregory G. Shellenbarger, Adina Paytan, "Groundwater Discharge: Potential Association with Fecal Indicator Bacteria in the Surf Zone" *Environmental Science & Technology* 38 (13), 3558-3566 (2004) (this work establishes a mechanism for the subterranean delivery of fecal indicator bacteria pollution to the surf zone from the surficial aquifer and presents evidence that supports an association between groundwater discharge and FIB). See http://www.stanford.edu/~aboehm/research.htm for this and additional information.

[165] N. de Sieyes, *et al*., "Submarine Groundwater Discharge to a High-Energy Surf Zone at Stinson Beach, California, Estimated Using Radium Isotopes," *Estuaries and Coasts*, DOI 10.1007/s12237-010-9305-2 (Apr. 2010).

County's coastal creeks and waterways receive significant amounts of groundwater and have been seriously impacted by contamination.[166] The Chino Basin, one of the largest groundwater basins in Southern California,[167] contains a high concentration of dairies that contribute high concentrations of salts and nitrates that degrade the water quality of Orange County's groundwater basin, and ultimately, the Santa Ana River, resulting in significant water treatment costs for residents.[168]

The State Water Board's "Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List" makes clear that for each water body-pollutant combination proposed for the 303(d) list, the Regional Water Quality Control Board must prepare fact sheets. These fact sheets must identify a pollutant's potential source, and "the source category should be identified as specifically as possible."[169] As Regional Water Boards increasingly identify groundwater loadings as a source of surface water impairments, the State Water Board should encourage this progress and work to ensure that the Regional Boards specify the name, location, size, and other identifying data for the groundwater basins at issue as much as possible in the proposed 2012 303(d) list. This information is necessary in order to identify, analyze, and clean up ground water sources of surface water impairment.

This progression in increasing specificity of information is contemplated by U.S. EPA, which recommends in its 2006 Integrated Report Guidance that states use a combination of monitoring and assessment techniques to "increase the percentage and types of waters assessed,"[170] waters that "may include, but are not limited to . . . *ground water*."[171]

As described in Appendix B, there is significant precedent around the country for actively using groundwater data to ensure the proper identification of the extent and sources of surface water impairments, and cleaning up all of those sources (including the groundwater), with the goal of ensuring healthy waterways. The state can and should follow this path to healthy waterways. To do this, the state *must* update its 2002 Groundwater Quality Assessment[172] in the 2012 Integrated Report. Further, the State Water Board, in close collaboration with Regional Water Boards, must go beyond recognizing where groundwater contamination is a possible source of impairment. The State and Regional Water Boards should proactively identify, analyze, and clean up groundwater sources of surface water impairment to ensure the full health of both its groundwater and surface water bodies.

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[166] *See* "Orange County Water District adopts resolution targeted at dairies in Chino Basin" *U.S. Water News Online* (December 1999), available at http://www.uswaternews.com/archives/arcpolicy/9oracou12.html.
[167] The Chino Basin contains approximately 5,000,000 acre-feet of water. *See* Chino Basin Watermaster Overview http://www.cbwm.org/overview.htm.
[168] *Supra* note 166.
[169] 2006 Guidance at p. 19 (Section 6.1.2.2(K)).
[170] *Supra* n. 1, 2006 Guidance, at Appendix: Data Elements for 2006 Integrated Water Quality Monitoring and Assessment Report and Documentation for Defining and Linking Segments to the National Hydrography Dataset, p. A-8, available at: http://www.epa.gov/owow/tmdl/2006IRG/report/2006irg-appendix.pdf.
[171] *Id.*at A-1 (emphasis added).
[172] http://www.swrcb.ca.gov/water_issues/programs/tmdl/305b.shtml.

D. The State Must Specifically Identify Surface Waters Impaired by Excessive Groundwater Withdrawals and Pumping.

As described in detail in Section III. above, Clean Water Act Section 303(d) lists must also reflect instances where excessive withdrawals and pumping of groundwater impair and threaten surface waters, particularly through flow alterations. Large-scale pumping and withdrawals of groundwater for agricultural irrigation threaten entire hydrological systems in many areas of California and reduce surface water flows to the detriment of a waterway's beneficial uses.[173]

For example, Northern California's Scott River is so dependent on groundwater that the Legislature amended the California Water Code to formally declare that "by reason of the geology and hydrology of the Scott River, it is necessary to include interconnected ground waters in any determination of the rights to the water of the Scott River as a foundation for a fair and effective judgment of such rights."[174] The State Water Board's assessment of groundwater withdrawal impacts on surface water quality is equally necessary.

The expansion of groundwater-fed agriculture in the Scott Valley is draining the connected, once-mighty Scott River dry. Decreased base flow during summer months increases water temperature and decreases surface water depth, velocity, connectivity which prevents the necessary pollutant load reductions from being realized.[175] Severely reduced flows in the Scott River from groundwater pumping recently prompted legal action by the Pacific Coast Federation of Fisherman's Association and Environmental Law Foundation.[176] In summer 2009, reduced flows in the Scott Valley caused the salmon population to drop down to 81 adults, down from many tens of thousands decades earlier.[177] The groups filed suit against the State Water Board and Siskiyou County for violating the public trust doctrine by allowing unchecked groundwater use to the detriment of the Scott River and several dependent special status fish and wildlife. In addition to having a public trust duty, the State has a legal duty under Section 303(d) of the Clean Water Act to address all sources of surface water impairment.

The lesson of the Scott River and other affected surface waters is that when excessive groundwater withdrawals outpace water recharge, groundwater overdraft occurs, which can directly impact surface waters by diminishing the amount of groundwater that flows into surface waters.[178] Pumping groundwater without regard to streamflow can "turn gaining streams into

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[173] Macdonnel, *supra* n. 31 at 1090, citing Glennon, R., *infra* n. 179.

[174] Cal. Water Code Section 2500.5(b) (2005).

[175] *See* para. 21-22, Pet. for Writ of Mandamus and Complaint for Declaratory and Injunctive Relief filed on June 23, 2010 by Environmental Law Foundation, Pacific Coast Federation of Fisherman's Association, Institute of Fisheries Resources ("PCFFA Scott River Petition") available at http://www.envirolaw.org/documents/WRITPETITIONCOMPLAINT.pdf.

[176] *Id.*

[177] *See* entire PCFFA Scott River Petition, *supra* n. 110. *See also* text and photo accompanying "A Watery Balancing Act" http://www.sfgate.com/cgi-bin/blogs/lsheehan/detail?entry_id=66993.

[178] *See* Glennon, R., *Water Follies: Groundwater Pumping and the Fate of America's Freshwaters*, p. 32 (Island Press, Washington, D.C 2004) ("Along coastal areas, overdrafting may cause the intrusion of salt water into the aquifer, rendering the water no longer potable. This problem is quite serious in California, Florida, and South Carolina."). *See also* Howard J., Merrifield M., *Mapping Groundwater Dependent Ecosystems in California* (2010)

losing streams, and perennial streams into intermittent streams."[179] This alteration to a water body's natural flow creates a cascade of negative impacts on aquatic life and ecosystems, and can destroy a water body's beneficial uses.

Nationally, by far the largest number of groundwater-related impairments of surface waters occurs as a result of groundwater withdrawals, including 97,546 acres of lakes, reservoirs, and ponds, and 3,456 acres of wetlands.[180] As described in Appendix B, other states are taking action to protect surface waters from harmful groundwater withdrawals. For example, in 2000, the Washington Supreme Court upheld the state Department of Ecology's denial of applications for new groundwater withdrawals that would diminish protected stream flows in *Postema v. Pollution Control Hearings Board*.[181] The Michigan Legislature is currently considering a bill that would codify the applicability of the public trust doctrine to groundwater[182] to protect water supplies and connected surface waters from excessive groundwater withdrawals.[183]

Despite a growing movement nationwide to address groundwater withdrawals that affect the health of surface waters, "Groundwater withdrawal" is listed as a source of impairment of a surface water body in only two listings in the State Water Board's 2010 List (Blosser Channel in Region 3 and Mendota Pool in Region 5).[184] Belying these limited listings, satellite-based findings show that large-scale groundwater withdrawals in California[185] are draining surface waters around the state. California's annual statewide overdraft is estimated by the Department of Water Resources to be approximately 1.4 million acre-feet on average, with the majority of overdraft occurring in the San Joaquin Valley and Central Coast.[186] Since October 2003, the aquifers that supply Central Valley and the Sierra Nevada have lost nearly enough water combined to fill Lake Mead.[187] More than 75 percent of this is due to groundwater pumping in the southern Central Valley, primarily to irrigate crops.[188]

PLoS ONE 5(6): e11249. doi:10.1371/journal.pone.0011249, available at: http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0011249.

[179] *Supra* note 122, Aiken at 546.

[180] U.S. EPA, "Specific State Probable Sources that make up the National Groundwater Loadings/Withdrawals Probable Source Group," available at: http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.source_detail?p_source_group_name=GROUNDWATER%20LOADINGS/WITHDRAWALS.

[181] *Postema v. Pollution Control Hearings Board*, 11 P.3d 726 (Wash. 2000).

[182] Michigan law already recognizes the doctrine's applicability to surface waters. *See e.g.*, Article IX, Sec. 40 of the Michigan Constitution of 1963; MCL 324.30111; 324.32502; 324.32505, etc.). The Great Lakes - St. Lawrence River Basin Water Resources Compact (codified at MCL 324.34201) also explicitly recognizes that "the Waters of the Basin are precious natural resources shared and held in trust by the states."

[183] Proposed House Bill No. 5319, available at http://www.legislature.mi.gov/documents/2009-2010/billintroduced/House/pdf/2009-HIB-5319.pdf.

[184] "Domestic ground water" use is also listed twice; *see* http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010state_ir_reports/category5_report.shtml.

[185] University of California – Irvine, "California's troubled waters: Satellite-based findings reveal significant groundwater loss in Central Valley," *Science Daily* (Dec. 15, 2009), retrieved August 2, 2010, from http://www.sciencedaily.com/releases/2009/12/091214152022.htm.

[186] California Department of Water Resources, "California's Ground Water," Bulletin 118, Update 2003, Sacramento, CA (2003).

[187] *Id.*

[188] *Id.*

The State Water Board can and must ensure full compliance with Sections 303(d) and 305(b), and the 2006 Guidance, by listing these and other surface waters impaired by low flow caused by excessive groundwater withdrawals and pumping.[189]

V. THE STATE WATER BOARD MUST INCLUDE IN ITS 2012 303(D) LIST ANTHROPOGENIC CLIMATE CHANGE-DRIVEN SOURCES AND IMPAIRMENTS OF CALIFORNIA WATERWAYS.

Global climate change is altering the biological, chemical, and physical properties of California waterways. Projected impacts in California provide an added impetus for the State Water Board to take swift action on flows and groundwater, as described above. For example, California's total water demand is projected to increase by up to 12% or more between 2000 and 2050, and the impacts of climate change will greatly increase the number of areas where water demands will exceed supplies.[190]

Climate change will not only increase the number and severity of existing waterway impairments, it will also drive new sources and causes of impairments. Data and information in the California Climate Change Adaptation Strategy[191] and other analyses generated by the state[192] strongly suggest that climate change will have demonstrable impacts on beneficial uses of California waterways. The most immediate impairments, and those with the strongest causal connection to global climate change, are driven by four principal dynamics: oceanic and estuarine carbon absorption, sea level rise, air and water temperatures increases, and shifting precipitation patterns.

We respectfully request that the State Water Board ensure that the 303(d) list identifies climate change driven-impairments to waterway health, and consider including reference data and information contained herein in your pending "Guidance Document on Climate Change."[193] An initial identification of climate change-driven impairments is provided below as a starting point for the State Water Board's analysis of surface waters that should be included on the 2012 303(d) List as either threatened or impaired:

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[189] Excessive groundwater withdrawals can also cause groundwater levels to decline below sea level, causing seawater to intrude into fresh water aquifers. Saltwater intrusion into groundwater aquifers is likely to become a pressing threat in many watersheds as sea level rises. (*See* AMEC Earth & Environmental (2005) Santa Clara River Enhancement and Management Plan. 260 p. Prepared for the Ventura County Watershed Protection District and Los Angeles Department of Public Works, Santa Barbara, Riverside, San Diego, California.) This threat is described in more detail in the climate change section below.

[190] Natural Resources Defense Council, *Water Facts: Climate Change, Water, and Risk: Current Water Demands Are Not Sustainable*, p. 2 (July 2010) ("NRDC Climate & Water Risk"). Available at http://www.nrdc.org/global-Warming/watersustainability/.

[191] The California Climate Adaptation Strategy, released in December 2009, summarizes the best known science on climate change impacts in California and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. California Natural Resources Agency, "2009 California Climate Adaptation Strategy: A Report to the Governor of the State of California in Response to Executive Order S-13-2006," (CA Climate Adaptation Strategy), available at www.climatechange.ca.gov/adaptation.

[192] *See* documents referenced in Section IV.A.

[193] *See* http://www.waterboards.ca.gov/water_issues/programs/climate/index.shtml#.

Ocean Acidification:
- decreased pH of oceanic and estuarine waters
- acidification impacts to nearshore coastal waters, bays and estuaries

Sea level rise:
- salinity intrusion into groundwaters hydrologically connected to surface waters
- salinity intrusion into estuaries, bays, and coastal rivers
- increased contaminant flows in waterways surrounding wastewater treatment plants and sewer outfalls
- habitat alterations

Air and water temperature increases:
- rivers, streams, and creeks: climate change-driven temperature listings
- decrease in dissolved oxygen
- loss of temperature-dependant beneficial uses (*e.g.* cold freshwater habitat)

Shifting precipitation patterns:
- decreased reservoir levels and spring-fall flows (increased water temperature, decreased dilution of pollutants)
- increase in winter flows, flooding, and runoff (increase in sedimentation and pollutant runoff)

These and other climate change-driven impacts are discussed in more detail below.

A. The State Must Use All Readily Available Data to Identify Climate Change-Driven Sources and Causes of Surface Waters Impairment.

As noted above, the State and Regional Water Boards must "actively solicit, assemble, and consider all readily available data and information," including information reported by local, state, and federal agencies.[194] Given the global and quickly-evolving nature of climate change, the State Water Board should also consider information from international bodies, such as the Water Quality Section of the Intergovernmental Panel on Climate Change's Assessment Report, which provides a useful overview of projected and already-occurring impacts to water quality. Additionally, local, state, and federal agencies have amassed a tremendous amount of regionally-scaled studies and analyses regarding climate change impacts to California water quality that have not yet been integrated into the State's biennial 303(d) (or 305(b)) data collection. In particular, there is a significant amount of modeling and data on how climate change will impact the water quality and water supply of the San Francisco-San Joaquin Delta that should be considered.

More specifically, the State Water Board must examine and consider all readily available information that could inform 303(d) decisions related to climate change-driven impacts to California waterways, including but by no means limited to the following:

- Pertinent reports from the Department of Water Resources' (DWR) Integrated Regional Water Management Climate Change Document Clearinghouse.[195] This Clearinghouse

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[194] *See* CA Listing Policy, Section 6.1.1 Definition of Readily Available Data and Information.

[195] A complete list of climate change publications written by DWR is available at http://www.water.ca.gov/climatechange/articles.cfm.

references dozens of pertinent reports that detail projected climate impacts to water quality, flow and species, including several recent DWR reports on how impaired water bodies and water quality will be impacted by climate change, including sea level rise;

- Analysis in the *California Water Plan Update 2009*[196] on how impaired water bodies and water quality will be impacted by climate change;
- Information from DWR's *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water*[197] on waterways hydrologically connected to groundwater basins and on waterways vulnerable to sea level rise;
- Data and information in the Public Policy Institute of California's *Adapting Water Management to Climate Change*[198] on sea level rise and temperature impairments, as well as information on changes in the timing and amount of precipitation;
- Information regarding impairments stemming from salinity intrusion, inundation of wastewater treatment plants, and other impairments stemming from sea level rise in the Pacific Institute's *The Impacts of Sea-Level Rise on the California Coast*;[199]
- Ocean carbon data from NOAA's Pacific Marine Environmental Laboratory[200] and the U.S. Department of Energy's Carbon Dioxide Information Analysis Center;[201] and
- Data on changes in precipitation and temperature in the California Climate Tracker,[202] which is maintained by the Western Regional Climate Center, which would be extremely useful to identify related climate change-driven impairments as described below.

Information specific to the San Francisco-San Joaquin Delta includes, but is not limited to:

- Water quality monitoring data in the Central Valley Watershed Monitoring Directory, a joint effort by the San Francisco Estuary Institute (SFEI), the Central Valley Regional Water Quality Control Board Surface Water Ambient Monitoring Program (SWAMP) and the U.S. EPA;[203]
- Water quality and water supply studies from the CALFED Bay-Delta Program;[204] including the Delta Regional Ecosystem Restoration Implementation Plan models;[205]
- Reports and resources from the Water Quality, Supply and Reliability Workgroup of the California Partnership for the San Joaquin Valley;[206]

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[196] California Department of Water Resources (DWR), *California Water Plan Update 2009* (October 2009), available at http://www.waterplan.water.ca.gov/cwpu2009/index.cfm.
[197] DWR, *Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water* (October 2008), available at http://www.water.ca.gov/climatechange/docs/ClimateChangeWhitePaper.pdf.
[198] Public Policy Institute of California, *Adapting Water Management to Climate Change* (November 2008), available at http://www.ppic.org/content/pubs/report/R_1108JLR.pdf.
[199] California Climate Change Center, The Impacts of Sea-Level Rise on the California Coast ("Impacts of Sea Level Rise on CA"), May 2009, available at www.pacinst.org/reports/sea_level_rise/report.pdf.
[200] *See* Pacific Marine Environmental Laboratory homepage at http://www.pmel.noaa.gov/co2/OA/.
[201] Global Ocean Data Analysis Project, http://cdiac.ornl.gov/oceans/.
[202] *See* California Climate Tracker at http://www.wrcc.dri.edu/monitor/cal-mon/. Abatzoglou, J.T., K.T. Redmond, L.M. Edwards, "Classification of Regional Climate Variability in the State of California," *Journal of Applied Meteorology and Climatology*, 48, 1527-1541 (2009).
[203] Central Valley Watershed Monitoring Directory: http://www.centralvalleymonitoring.org/.
[204] CALFED Bay-Delta Program: http://www.science.calwater.ca.gov/science_index.html.
[205] Delta Regional Ecosystem Restoration Implementation Plan at http://www.science.calwater.ca.gov/drerip/drerip_index.html.
[206] California Partnership for the San Joaquin Valley Water Quality, Supply and Reliability Document Library http://www.sjvpartnership.org/wg_doc_lib.php?wg_id=10.

- The SWRCB's Final Report on Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem and studies supporting the recently-adopted Delta flow criteria;[207] and
- DFG biological opinions on Delta smelt and other endangered species.

The State Water Board should solicit, assemble and consider all readily available data relating to climate change-driven impairments for the 2012 303(d) List, with a particular focus on developing appropriate 303(d) listings for which a large amount of data currently exists, such as for ocean acidification impairments and climate change-driven Delta waterway impairments. The Board should also use and consider data regarding potential sources and causes of impairment cased by climate change-driven sea level rise, warming and shifting precipitation. Finally, the Board should augment its "Climate Change and Water Resources" website with data and information regarding the aforementioned climate change-driven impairments.[208]

B. The State Water Board Must Take Immediate Action to Ensure That the 2012 303(d) List Reflects Data on Climate Change-Driven Impairments Related to Ocean Acidification.

There is a significant amount of data and information currently available with requisite specificity for assessing which waterways are impaired by ocean acidification for the 2012 303(d) List. The State must collect data regarding the pH of bays, estuaries, the ocean, near-coastal areas, and coastal shorelines, and list waterways impaired or threatened by ocean acidification. The State Board must take action to ensure that the 2012 303(d) List contains pertinent data and lists impaired waterways as appropriate. If the State declines to do so, it must submit a "rationale" for not doing so, as required by the Clean Water Act, though we urge the State to implement its responsibilities and authorities fully in ensuring comprehensive listings.

Ocean acidification, a decrease in ocean pH fueled by the ocean's absorption of carbon dioxide, threatens the seawater quality of California's bays and estuaries. The ocean absorbs about half of all anthropogenic carbon dioxide emissions, an estimated 22 million tons of carbon dioxide (CO_2) every day.[209] When CO_2 dissolves in seawater it forms carbonic acid, which decreases ocean pH and causes "ocean acidification."[210] Global average surface pH has already decreased by approximately 0.1 units, and is expected to decrease by another 0.3-0.4 units by the end of the century, depending on future levels of atmospheric carbon dioxide.[211]

The latest science indicates that ocean acidification impacts to the seawater quality of California bays, estuaries and near coastal areas may already be occurring, and are projected to

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[207] http://www.swrcb.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/
[208] *See* http://www.waterboards.ca.gov/water_issues/programs/climate/index.shtml.
[209] Feely, R. A., C. L. Sabine, K. Lee, W. Berelson, J. Kleypas, V. J. Fabry, and F. J. Millero. "Impact of anthropogenic CO2 on the CaCO3 system in the oceans," *Science* 305:362-366 (2004).
[210] Orr, J.C. *et al*. "Research Priorities for Understanding Ocean Acidification," *Oceanography*, 22(4): 182 (2009).
[211] Hauri, Claudine, Gruber, N, Lachkar, Z., Plattner, G. Abstract. "Accelerated acidification in eastern boundary current systems," Goldschmidt Conference Abstracts (2009); citing Orr, J.C., V.J. Fabry, O. Aumont, L. Bopp, S.C. Doney, R.A. Feely, A. Gnanadesikan, N. Gruber, A. Ishida, F. Joos, et al, "Anthropogenic ocean acidification over the twenty-first century and its impact on calcifying organisms," 437 *Nature* 681-86 (2005), http://www.nature.com/nature/journal/v437/n7059/full/nature04095.html.

accelerate.[212] In 2008, scientists discovered high levels of acidified ocean water within 20 miles of the Pacific Coast.[213] Given that atmospheric levels of carbon dioxide have increased drastically in the last half century, and are likely to increase further, such acidification trends are projected to increase, a trend that should be considered in projecting "threatened" waterways in particular.[214] Natural upwelling in nearshore waters, coupled with oceanic uptake of anthropogenic $CO_{2,}$ mean that "ocean acidification has already decreased mean surface water pH in the California Current System to a level that was not expected to happen for open-ocean surface waters for several decades."[215] Projections indicate that the Humboldt Current System, another eastern boundary upwelling system that impacts ocean waters off of California, may be subject to the same conditions.[216]

There is precedent both for listing waterways impaired or threatened by atmospheric sources of pollution and for listing waterways impaired for pH. U.S. EPA maintains a list of waterways impaired for pH under the 303(d) program, with more than 3,500 waterbodies so listed as of May 2010.[217] Section 303(d) of the Clean Water Act also has been interpreted by both U.S. EPA and states to cover waterways impaired by atmospheric sources of pollution (such as carbon deposits). Specifically, in March 2007, EPA issued information on listing waters impaired by mercury from atmospheric sources under Section 303(d) of the Clean Water Act.[218] Subsequent to EPA's action, in October 2007, a group of Northeast states established the Northeast Regional Mercury TMDL, a regional cleanup plan to reduce mercury entering the states' watershed from a range of pollution sources, including atmospheric deposition of mercury.[219]

In response to legal action from the Center for Biological Diversity directly on the issue of climate change, the U.S. EPA solicited public comment on how to address listing of waters as threatened or impaired for ocean acidification under the 303(d) program.[220] California need not wait for EPA's issuance of guidance on listing waters impaired by ocean acidification. The State should immediately assemble and consider all readily available evidence regarding waters impaired by ocean acidification and list waters accordingly.

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[212] Byrne, R. H., S. Mecking, R. A. Feely, and X. Liu (2010), "Direct observations of basin-wide acidification of the North Pacific Ocean," 37 *Geophys. Res. Lett.* (2010), L02601, doi:10.1029/2009GL040999, http://www.agu.org/journals/ABS/2010/2009GL040999.shtml.

[213] Feely, R. A., C. L. Sabine, J. M. Hernandez-Ayon, D. Ianson, and B. Hales, "Evidence for upwelling of corrosive "acidified" water onto the continental shelf," *Science* 320:1490-1492 (2008), http://www.sciencemag.org/cgi/content/abstract/sci;320/5882/1490. *See also* Hauri *et al*. at p. 66.

[214] *Id. See also* http://www.sciencedaily.com/releases/2008/05/080522181511.htm.

[215] Hauri *et al*. at p. 69.

[216] *Id.*

[217] *See* Environmental Protection Agency Watershed Assessment, Tracking & Environmental Results webpage, Specific State Causes of Impairment That Make up the National pH/Acidity/Caustic Conditions Cause of Impairment, available at: http://iaspub.epa.gov/tmdl_waters10/attains_nation_cy.cause_detail_303d?p_cause_group_id=1188.

[218] Hooks, Craig, EPA Office of Wetlands, Oceans, and Watersheds, "Memorandum: Listing Waters Impaired by Atmospheric Mercury Under Clean Water Act Section 303(d): Voluntary Subcategory 5m for States with Comprehensive Reduction Programs" (March 8, 2007).

[219] New England Interstate Water Pollution Control Commission, "Northeast Regional Mercury Total Maximum Daily Load," p. 32 (October 24, 2007), available at http://www.neiwpcc.org/mercury/mercurytmdl.asp.

[220] *See* EPA's Federal Register Notice at http://www.epa.gov/owowwtr1/tmdl/oceanfrMarch_2010/.

C. The State Water Board Must Use and Consider Data on Sea Level Rise, Warming, and Precipitation Changes That Cause or Are Potential Sources of Impairments.

Projections of climate change-driven sea level rise, increased temperature, and shifting precipitation patterns will continue to have a major impact on California's water quality. The water quality impacts of climate change-driven sea level rise will be felt throughout California. In particular, a change in sea level will substantially alter San Francisco Bay-Delta conditions, where water surface elevations and associated fluctuations drive Bay-Delta hydrodynamics, which in turn dictate the location and nature of physical habitat and the quantity and quality of water.[221] Even under modest sea level rise and climate warming projections, an increase in the frequency, duration, and magnitude of water level extremes is expected in the Delta, to the detriment of numerous waterway beneficial uses.[222]

As for ocean acidification, we respectfully request that the State Water Board review and assess whether water bodies are impaired or threatened by climate change and also to list climate change as a potential source of impairment, where appropriate, on the 2012 303(d) List.[223] As outlined at the beginning of this section, we bring the following impairments to the Board's attention, although review of climate change impairments should by no means be limited to the impairments described below.

1. <u>Sea Level Rise</u>

Climate change is projected to result in sea level rise in California of 16 inches by 2050 and 55 inches by the end of the century.[224] In the Bay Area, 180,000 acres of shoreline are vulnerable to flooding by 2050, putting 21 wastewater treatment plants at risk of inundation.[225] Sea level rise also will substantially impair California's waterways by causing saltwater intrusion into estuaries and hydrologically connected groundwaters, inundating or eroding habitats, altering species composition, changing freshwater inflow, and impairing water quality.

a. Saltwater intrusion of hydrologically connected groundwaters.

Saltwater intrusion into aquifers is a man-made problem in many places in California, resulting from over-pumping and excessive withdrawals from groundwater aquifers.[226] Pumping coastal aquifers in excess of natural recharge rates draws down the surface of the aquifer, allowing surface water to move inland into a freshwater aquifer and contaminate it with salts.[227] When the ocean has a higher water elevation, it causes the saltwater wedge to intrude further

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[221] CALFED Bay-Delta Program Independent Science Board, Memorandum: *Sea Level Rise and Delta Planning* (September 6, 2007).
[222] *Id*. at 2.
[223] *See* discussion in Section III. above regarding "causes" versus "sources" of impairment.
[224] California Climate Change Center, "Climate Change Scenarios and Sea Level Rise Estimates for the California 2008 Climate Change Scenarios Assessment (Draft Paper)," available at www.energy.ca.gov/2009publications/CEC-500-2009-014/CEC-500-2009-014-D.PDF.
[225] *Id*.
[226] *Impacts of Sea Level Rise on CA* at 80.
[227] *Id*.

inland.[228] Seawater intrusion is already problematic in California's coastal aquifers throughout Central and Southern California, including the Pajaro and Salinas Valleys and aquifers in Orange and Los Angeles Counties. Groundwater supplies in the Santa Clara Subbasin are also vulnerable to salinity intrusion.[229]

Overdraft and saltwater intrusion into groundwater aquifers will be accelerated and made worse by sea level rise. Where these groundwater aquifers are hydrologically connected to surface waters, and thus affect the water quality of those surface waters, the State Water Board should list climate change/sea level rise as a source or cause of impairment so that appropriate remedial action can be taken.

b. Salinity intrusion into estuaries

Sea-level rise and changes in the intensity of storm events will impact low-lying coastal areas and result in the loss or inundation of coastal wetlands and dune habitat, resulting in salt water intrusion and loss of freshwater habitat for fish and wildlife.[230] Changes in salinity from reduced freshwater inflow will affect fish, wildlife and other aquatic organisms in intertidal and subtidal habitats. Increasing rates of saltwater intrusion into groundwater that impacts the beneficial uses of connected surface waters will need to be addressed in water quality management decisions, including the 303(d) List.[231]

c. Increased contamination from inundation of wastewater treatment facilities and sewer outfalls.

A recent Pacific Institute study found that a 1.4 meter sea level rise makes 28 wastewater treatment plants vulnerable to inundation: 21 plants around the San Francisco Bay and 7 other plants on the Pacific coast.[232] The combined capacity of these plants is 530 million gallons per day.[233] Some wastewater treatment plants are preparing for projected inundation,[234] but many more are not taking any action. Inundation from sea level rise, as well as an increased number of extreme weather events, could damage pumps and other treatment plant equipment and interfere with discharges from outfalls sited on coast and bay shorelines.[235] This will lead to an increased

[228] *Id.*
[229] Santa Clara Valley Water District, "Groundwater Quality Report," p. 19 (2008) ("Saltwater intrusion of the Santa Clara Subbasin shallow aquifer zone adjacent to the southern shore of the San Francisco Bay has been studied and monitored for many years by the District. Although the contamination has been somewhat widespread in the shallow aquifer zone, fortunately, the lower aquifer has not been affected significantly.")
[230] *CA Climate Adaptation Strategy* at 73.
[231] *Id.* at 70.
[232] *Impacts of Sea Level Rise on CA* at 62-63, *see* Figure 24: Wastewater treatment plants on the Pacific coast vulnerable to a 100-year flood with a 1.4m sea-level rise.
[233] *Id.* at 63.
[234] In 2009, the City of Morro Bay commissioned a *Wastewater Treatment Plant Flood Hazard Analysis* and concluded that the existing wastewater treatment plant (WWTP) was subject to inundation from the Morro Creek watershed. The City recommended that the new site for a WWTP be developed with the placement of engineered fill to raise the new site above the 100-year flood elevation. *See* City of Morro Bay and Cayucos Sanitary District Wastewater Treatment Plant Upgrade Project, Facility Master Plan Draft Amendment No. 2, p. 12 (July 2010).
[235] *Id.* at 63.

number of untreated and partially treated sewage discharges and increased contamination and impairment of proximate waterways.

Discharges from sewage treatment plants already impair waterbodies throughout California. Pathogen impairments, which are linked to discharges from wastewater treatment plants among other sources, represent the second highest number of impairments for California waterways.[236] High concentrations of bacteria such as fecal coliform and E. coli raise the risk of waterborne diseases and starve fish of the oxygen they require, destroying several beneficial uses for affected waterbodies.

d. Sea level rise-caused habitat alterations

EPA records show 699 waterbody-segments listed nationwide as impaired due to "habitat alteration." This habitat alteration impairment group captures numerous impacts to waterways, including but not limited to alterations to wetland habitats, habitat barriers, degraded habitat and other forms of habitat alterations. Projected sea level rise similarly could result in a large number of habitat alteration impairments, both directly from sea level rise alteration to coastal wetland and other habitats, and indirectly by prompting construction of hard structures on the coastline such as seawalls and levees.

For example, according to the report *Impacts of Sea Level Rise on the California Coast* rising seas threaten to substantially modify or destroy wetland habitats.[237] More specifically:

> Vast areas of wetlands and other natural ecosystems are vulnerable to sea level rise. An estimated 550 square miles, or 350,000 acres, of wetlands exist along the California coast, but additional work is needed to evaluate the extent to which these wetlands would be destroyed, degraded, or modified over time. A sea level rise of 1.4 m would flood approximately 150 square miles of land immediately adjacent to current wetlands, potentially creating new wetland habitat if those lands are protected from further development."[238]

2. Air and water temperature increases

a. Warming of streams and rivers

New research shows that water temperatures are increasing in many streams and rivers throughout the United States,[239] with less water available for ecosystem flow and temperature needs in spring and summer.[240] In many low- and middle-elevation streams today, summer temperatures often approach the upper tolerance limits for salmon and trout; higher air and water

[236] http://iaspub.epa.gov/waters10/state_rept.control?p_state=CA&p_cycle=.
[237] *Impacts of Sea Level Rise on CA* at 27.
[238] *Id.* at 17.
[239] Kaushal et al., "Rising stream and river temperatures in the United States," *Frontiers in Ecology and the Environment*, 2010; 100323112848094 DOI: 10.1890/090037; University of Maryland Center for Environmental Science, "Rising water temperatures found in US streams and rivers" (April 7, 2010), available at: http://www.sciencedaily.com/releases/2010/04/100406101444.htm.
[240] *CA Climate Adaptation Strategy* at 80.

temperatures will exacerbate this problem.[241] Thus, climate change might require dedication of more water, especially cold water stored behind reservoirs, to simply maintain existing fish habitat.[242] The 303(d) List should reflect instances where scientific evidence suggests that climate change is a cause or source of temperature impairments. Doing so would ensure that appropriate mitigating and prevention measures can be taken.

b. Decrease in dissolved oxygen

An inverse correlation between water temperature and the amount of dissolved oxygen in a waterbody is well-known and understood by water quality managers. Many California waterbodies that are impaired for temperature are also impaired because of low dissolved oxygen. Where waterbodies experience unnaturally high temperatures, the amount of dissolved oxygen can drop to levels that negatively impact water quality and aquatic species. Studies suggest that climate change-driven warming of streams, rivers, and other waterways could similarly decrease dissolved oxygen levels.[243] This is a phenomena the State Water Board must track and address in its 303(d) list, as appropriate.

3. <u>Shifting precipitation patterns</u>

Observational records and climate projections provide abundant evidence that freshwater resources are vulnerable and have the potential to be strongly impacted by climate change.[244] The decrease in precipitation and increase in potential evapotranspiration will have a significant affect on California's "available precipitation," which means water falling as rain or snow.[245] Projections suggest that precipitation will decline five inches per year by 2050 in California.[246] The Department of Water Resources projects that the Sierra Nevada snowpack may be reduced from its mid-20th century average by 25 to 40 percent by 2050.[247]

a. Longer low flow conditions

Climate change should be specifically identified as the source of low flow conditions where data so indicate. For example, projected declines in summer stream flows may impair Delta waterways through low-flow conditions and higher stream water temperatures.[248] As freshwater inputs decrease, Delta water quality may also be degraded as saltwater intrudes further upstream from the Pacific Ocean.[249] Salinity intrusion, low-flow conditions and higher

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241 *Id.*
242 *Id.*
243 *See* IPCC Assessment Report, Working Group II: "Impacts, Adaptation and Vulnerability," Section 4.3.10 available at http://www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=173.; B. A. Cox and P. G. Whitehead, "Impacts of climate change scenarios on dissolved oxygen in the River Thames, UK, Hydrology Research," 40(2-3): 138–152 © IWA Publishing 2009 doi:10.2166/nh.2009.096.
244 Climate Change and Water: Intergovernmental Panel on Climate Change Technical Report VI – June 2008, available at: http://www.ipcc.ch/publications_and_data/publications_and_data_technical_papers_climate_change_and_water.htm.
245 *NRDC Climate & Water Risk* at 2.
246 *Id.*
247 CA Climate Adaptation Strategy at 82.
248 *Id.* at 86.
249 *Id.*

stream water temperatures are all sources and causes of waterway impairment that could and should be addressed under the State Water Board's 2012 303(d) process.

The California Natural Resources Agency made an initial determination that mitigating these impacts requires more freshwater releases from upstream reservoirs.[250] The State Water Board should work with the Central Valley Regional Water Quality Control Board to examine data on climate change-driven impairments of Delta waterways and tributaries so that impaired waterways can be correctly identified and appropriate mitigating actions can be implemented to restore waterway health.

b. Increased contamination from stormwater runoff

Many models project higher contaminant concentrations in waterways as less frequent but more intense rainfall patterns change water quality.[251] An increased number and severity of extreme weather events and storm surges are also predicted. These climate change-driven phenomena will increase runoff and flooding, thus exacerbating levels of storm water pollution and sediment runoff.

* * *

Thank you for the opportunity to provide this information in support of a comprehensive 2012 Section 303(d) list that meets the mandates of the Clean Water Act. California's 303(s) list cannot be limited to "traditional" Category 5 listings. To comply with the Act, and to help lead the state to achieving its goals of clean waters with healthy flows and biodiverse aquatic ecosystem, the 2012 303(d) list must also include waterways impaired or threatened by: altered natural flows in surface waters, groundwater contamination and excessive groundwater withdrawals that impact surface water health, and anthropogenic climate change-caused impacts to surface waters. The data and information contained and referenced in this letter, as well as extensive other databases and peer-reviewed reports that are readily available to the State and Regional Water Boards, should provide more than adequate support for the listing of numerous waterways that are impaired and threatened and that therefore require the state's attention under the Clean Water Act and Porter-Cologne.

If you have any questions, please do not hesitate to contact us.

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[250] *Id.*
[251] *CA Climate Adaptation Strategy* at 82.

Sincerely,

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March 13, 2017

Submitted via email: rlooker@waterboards.ca.gov

Richard Looker
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: Solicitation of Comments on the Proposed 303(d) Listings for the San Francisco Bay Region

Dear Mr. Looker:

The San Francisco Public Utilities Commission (SFPUC) appreciates the opportunity to comment on the proposed changes to the Clean Water Act 303(d) listings. Our comments and recommendations are based on our responsibilities for managing wastewater for the City and County of San Francisco and for serving safe and reliable drinking water to approximately 2.6 million residential, commercial, and industrial customers in the Bay Area.

In the attachment to this letter, we have included specific comments regarding both delistings and new listings proposed by the Regional Board. We hope these recommendations are useful as you prepare the final Regional list for submittal to the State Water Board.

Please contact me if you have any questions or would like additional information. In addition, Laura Pagano, (415) 554-3109, is available to discuss wastewater related issues and Ellen Natesan, (415) 554-1556, is available for drinking water issues.

Sincerely,

for Michael Carlin
Deputy General Manager.
San Francisco Public Utilities Commission

Attachment: SFPUC Comments on Proposed 303(d) List for San Francisco Bay Region

SFPUC Comments on Proposed 303(d) List for San Francisco Bay Region

Delistings

- **Pacific Ocean at Baker Beach**

  Comment: SFPUC supports this delisting. The January 2005 to August 2010 monitoring dataset does not support the listing as stated in the Fact Sheet (ID 34385). We also note that the reference to Horseshoe Cove in the current listing for Baker Beach is incorrect.[1]

Additional delisting proposed by SFPUC

- **Lake Merced**

  Comment: Lake Merced in San Francisco is listed for low dissolved oxygen (DO) and for pH excursions outside the range specified in the Basin Plan. However, the variations in DO and pH values are characteristic of similar waterbodies subject to periodic stratification due to natural processes. The listing was made by EPA and the TMDL is targeted for completion in 2019. The current Triennial Review Process updates the listing with additional data points, but recommends no changes due to DO and pH impairment based on current interpretation and application of the Basin Plan Objectives. The SFPUC and its partners have and will continue to work with Board staff to revisit and update the major assumptions associated with this listing decision prior to the next listing cycle currently scheduled for 2022.

Proposed new listings - Reservoirs

- **Lower Crystal Springs Reservoir – Mercury** (Fact Sheet)
- **Pilarcitos Lake – Mercury** (Fact Sheet)

  Background: Both reservoirs are located on the Peninsula Watershed. Fishing is explicitly not allowed and public access is restricted. Because fishing is not allowed, the fish grow to a large size and thus can accumulate more mercury than they would otherwise. Mercury in fish tissue was elevated in the single set of samples collected in 2007 when compared to consumption guidelines prepared by the Office of Environmental Health Hazard Assessment [OEHHA]. However, drinking water in these reservoirs is routinely sampled for mercury and remains below the SWRCB Division of Drinking Water Title 22 standards.

  Comment: This proposed listing is inappropriate for the following reasons:

  1. **The source of mercury cannot be "*reasonably controlled*" and therefore mercury should not be listed**

     The water quality objective/criterion referenced in the proposed listing is from the Basin Plan:

     3.3.2 BIOACCUMULATION

[1] Horseshoe Cove is the location of Fort Baker in Marin; *Fort Baker, Horseshoe Cove* is a proposed new listing.

> Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered. [*emphasis added*]

The plan also defines "controllable":

> Controllable water quality factors are those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the state and that may be reasonably controlled.

For Crystal Springs and Pilarcitos the likely potential source—precipitation—cannot be reasonably controlled.

The source of elevated mercury levels in precipitation can be attributed to:[2]

1) Rising Hg emissions from emerging economies,
2) Increasing oceanic, soil, and biomass burning emissions of Hg due to warming temperatures, and
3) Greater oxidation of gaseous elemental Hg due to increasing levels of atmospheric oxidants.

In some locations in the state, previous resource extraction activities or high levels in background soils are the main source of the elevated mercury. However, for Lower Crystal Springs and Pilarcitos Reservoirs, the main contribution is atmospheric deposition. The levels in rainfall are substantial as shown in the following table showing data from the National Atmospheric Deposition Program which collects rainfall and deposition data from around the country.[3]

Mercury in Precipitation (ng/L)

Site ID	Site Name	Monitoring Start Date	N obs (w)	PWM [Hg] *ng L^{-1}*	Mean weekly Hg deposition *ng m^{-2} w^{-1}*	Mean weekly precipitation *mm*
CA20	Yurok Tribe-Requa	8/18/2006	226	**4.0**	122	30.5
CA75	Sequoia Nat. Park-Giant Forest	7/22/2003	240	**5.6**	93	16.2
CA94	Converse Flats (San Bernardino Mts)	4/20/2006	149	**8.8**	76	8.4

PWM refers to Precipitation Weighted Mean; N obs refers to the number of weekly samples.

[2] P. Weiss-Penzias, et al., *Trends in mercury wet deposition and mercury air concentrations across the U.S. and Canada*, 2016, available here.

[3] National Atmospheric Deposition Program, Supporting Information for "Trends in Mercury Wet Deposition and Mercury Air Concentrations across the U.S. and Canada", Weiss-Penzias et al., Table S-1.; posted here.

Additional Data for the sites:

Site ID	Site Name	Region ID	Latitude	Longitude	Elevation
CA20	Yurok Tribe-Requa	PC	41.5588	-124.092	110
CA75	Sequoia National Park-Giant Forest	CA	36.5661	-118.778	1921
CA94	Converse Flats	CA	34.1938	-116.913	1724

Region IDs are CA = California, PC = Pacific Coast

The Precipitation Weighted Mean results are higher than the concentrations proposed by the Mercury Provisions[4] for the acceptable water column concentrations protective of beneficial uses including subsistence fishing and commercial and recreational fishing. Thus, rainfall alone can contribute the significant portion of the mercury.[5]

Because the mercury water quality objectives are fish tissue based and not water column based, the Mercury Provisions converted the objectives to water column values (denoted as "C"). These values will be used for reasonable potential analysis and development of effluent limitations. In other words, they function the same as water quality standards. They also effectively translate narrative water quality criteria in the Basin Plan into numeric criteria and potentially will be used as targets for the reservoir TMDLs.

Water Column Concentrations Translated from Fish Tissue Standards (ng/L)

Beneficial Use	Water body type	Water Column "C" values - total Hg
COMM, CUL, WILD, MAR, RARE	Flowing	**12**
	Slow moving	**4**
COMM, CUL, WILD, MAR, RARE, T-SUB	Lakes and reservoirs	Case-by-case
T-SUB	Flowing	**4**
	Slow moving	**1**
SUB	Any	Case-by-case

Tribal Tradition and Culture (CUL), Tribal Subsistence Fishing (T-SUB), Subsistence Fishing (SUB), Commercial and Sport Fishing (COMM), Wildlife Habitat (WILD), Marine Habitat (MAR), Preservation of Rare and Endangered Species (RARE)

For comparison, the existing criterion in the California Toxic Rule is 50 ng/L and is based on human consumption of fish and drinking water. Most of the "C" values shown above are exceeded by typical rainfall concentrations as indicated in the previous table. In California, the

[4] Proposed Statewide Mercury Provisions, available here.

[5] The previous decreasing trend for mercury in rainfall (1998-2007) has shifted to a flat slope for the recent period (2008-2013).

source of the mercury in rainfall is Asia.[6] This loading can be substantial, even in rivers. For example, the Sacramento-San Joaquin Delta Estuary Mercury TMDL staff report[7] states:

> *However, a rough estimate of the annual contribution of total mercury from atmospheric wet deposition in the tributary watersheds for water year 2001 indicated that wet deposition could account for 23 to 69% of the total incoming total mercury load to the Delta (Foe, 2003).*

The Statewide Mercury Control Program for Reservoirs acknowledges[8] the uncontrollable nature of the atmospheric deposition:

> *Potential source controls include cleanup of legacy mercury, gold and silver mines upstream of reservoirs. However, atmospheric deposition from uncontrollable global mercury sources may continue to add significant amounts of mercury to many reservoirs.*

For the reservoirs, upstream mines are not a factor. It is clear that the water quality factors affecting the mercury in the reservoirs and in the fish cannot be *reasonably controlled*, and certainly not by the SFPUC. Consequently, it is inappropriate to use the criterion for bioaccumulation in fish and other aquatic organisms for listing because the criterion is predicated on *controllable water quality factors* as specified in the Basin Plan.

2. Limited dataset

Lower Crystal Springs and Pilarcitos data for this assessment was collected by one monitoring project on a single day in 2007. The dataset is outdated, limited, and does not appear to meet the requirements of the State 303(d) Listing Policy (2015):[9]

6.1.5.3 Temporal Representation

> *Samples should be representative of the critical timing that the pollutant is expected to impact the water body. Samples used in the assessment must be temporally independent. If the <u>majority of samples were collected on a single day</u> or during a single short-term natural event (e.g., a storm, flood, or wildfire), the data shall not be used as the primary data set supporting the listing decision.* [emphasis added]

3. Fishing prohibited

The beneficial use which is the basis for the listing is:

> **3.3.2 BIOACCUMULATION**
> *Many pollutants can accumulate on particles, in sediment, or bioaccumulate in fish and other aquatic organisms. Controllable water quality factors shall not cause a detrimental*

[6] Source of mercury deposition, available here, here and here.
[7] April 2010 Basin Plan Amendment Staff Report, posted here.
[8] Fact Sheet - Statewide Mercury Control Program for Reservoirs, posted here.
[9] State 303(d) Listing Policy, posted here.

increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

The primary threat is to human consumption. However, fishing is explicitly prohibited in both reservoirs and public access is restricted.

Proposed new listing – Fort Funston

- **Pacific Ocean at Fort Funston -** Indicator Bacteria (Fact Sheet)

  Background: This site is located at the south end of Ocean Beach. Access is generally limited to low tide. The Board is proposing to list this area because of exceedances for the enterococcus, total coliform, and fecal coliform objectives in the Ocean Plan. Unlike other beaches in California, no AB 411 sampling is conducted at this remote site, and thus no coherent, consistent year round sampling results exist. The only data for this site is from sampling conducted after a combined sewer discharge (CSD) that occurs during major storms when the City's storage facilities are full and the maximum amount of flow is being pumped to the Oceanside Treatment Plant and to the Southwest Ocean Outfall (SWOO). For CSD purposes, the site is monitored in the surf, opposite the Lake Merced Overflow Discharge Structure. This occurs only during large storm events that normally only take place 6 or 7 times per year. Sampling continues until the bacteria counts are below the relevant levels, which usually occurs very quickly. The Fort Funston location is not one of the six regular - permit required - weekly sampling locations on the Westside because recreational uses are nonexistent or very limited.

  Comment: To-date data collected on the shoreline at Fort Funston is not representative of this location. As is stated above, the Fort Funston site is not subject to the routine AB 411 sampling that occurs on other California beaches; rather, the surf zone is only sampled as soon as possible after a CSD begins. For the Fort Funston site, sampling is only linked to major storms and the resulting CSDs. The Listing Policy (6.1.5.3 Temporal Representation) guidance indicates that if samples are collected during a short term natural event such as a storm, the data cannot be used as the primary data set for listing. In this case, all data is collected during and immediately after major storms.

  Because the dataset does not comply with the provisions in the Listing Policy, Fort Funston should not be listed.

March 13, 2017

Mr. Richard Looker
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Proposed Revisions to the Clean Water Act Section 303(d) List of Impaired Water Bodies in the San Francisco Bay Basin

Dear Mr. Looker:

This letter is submitted on behalf of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP) regarding the *Clean Water Act Sections 303(d) and 305(b) 2016 Integrated Report for the San Francisco Bay Region* (Integrated Report). SCVURPPP is an association of 13 cities and towns[1] in the Santa Clara Valley, unincorporated Santa Clara County and the Santa Clara Valley Water District. Along with other San Francisco Bay Area public agencies, SCVURPPP participants share a common National Pollutant Discharge Elimination System (NPDES) permit to discharge municipal stormwater to receiving water bodies in the San Francisco Bay Area. Since its inception, SCVURPPP has been a recognized leader in stormwater management and monitoring in the San Francisco Bay region, and continues to be dedicated to protecting and improving the quality of our water bodies.

SCVURPPP appreciates the opportunity to submit comments regarding the proposed 2016 revisions to the 303(d) list for the San Francisco Bay Region. Our general comments are related to the data evaluation process used by the State Water Resources Control Board (State Water Board) and the San Francisco Bay Regional Water Quality Control Board (SF Bay Water Board) to derive the proposed 2016 listings. More specific comments are related to the proposed impairment listings of San Francisco Bay segments, Coyote Creek, and Guadalupe Slough for toxicity.

GENERAL COMMENTS

1. Out of date water quality data was used, resulting in incorrect listings

In reading the SF Bay Regional Water Board's staff report on the 2016 Integrated Report dated February 2017 (Staff Report), it appears that all water quality data before 2010 that are currently housed in the State's data management system (i.e., CEDEN) were evaluated during the 2016 review and used to support 303(d) listings. Some of the data points used by the State to support impairment listings, however, were collected over <u>20 years ago</u>. There are several issues with relying on data from prior decades. An important consideration should be whether water quality control programs that directly address pollutants of concern were initiated after the water quality data were collected. Specifically, water and sediment toxicity

[1] Campbell, Cupertino, Los Altos, Los Altos Hills, Los Gatos, Milpitas, Monte Sereno, Mountain View, Palo Alto, San Jose, Santa Clara, Saratoga and Sunnyvale.

data collected prior to the initiation of the pesticide control program mandated by the SF Bay Regional Water Board's Water Quality Attainment Strategy (WQAS) for Pesticide-Related Toxicity for Urban Creeks and implemented under the Municipal Regional Stormwater NPDES Permit (i.e., NPDES Permit No. CAS612008) should not be considered representative of current water quality conditions in Coyote Creek or the San Francisco Bay. The control programs associated with the WQAS and MRP have been in place since the mid-2000s and continue to address water quality standards associated with pesticides and have had an important effect on pesticide-related toxicity in these water bodies. For example, in creek monitoring data from the Santa Clara Valley, we have seen a drop in the concentrations of certain pyrethroid pesticides in local creeks over time.

Recommendation Regional or State Water Board staff should remove outdated data from the water quality analysis that was used to derive the proposed 303(d) listings, such as toxicity data collected in the late 1990s that were collected prior to the implementation of significant control programs (e.g., WQAS and associated requirements included in NPDES permits since the mid-2000s).

2. **Not all NPDES permit-required water quality data were evaluated as stated in Staff Report**

The Staff Report states that all data collected through 2010 were assessed as part of the 2016 303(d) listing process. However, our review of the dataset indicates that not all receiving water monitoring data that were collected via NPDES permits and submitted to the Regional Board prior to 2010, were incorporated into the data review assessment process. For example, as directed by NPDES permits, water quality data collected from 2002 to 2008 in Santa Clara Valley creeks during implementation of the SCVURPPP *Multi-Year Receiving Waters Monitoring Plan* were submitted to the SF Bay Regional Water Board each year during that timeframe. These data were collected using procedures comparable to the State's Surface Water Ambient Monitoring Program (SWAMP), but were not evaluated by the State during the listing process. The SCVURPPP data include total and dissolved metal concentrations and aquatic and sediment toxicity results from hundreds of water samples taken at roughly 70 creek/river sites in the Santa Clara Valley. Not including data collected via NPDES permits undermines the value of the NPDES permit-required data collection efforts funded through limited local public resources, and potentially contributes to the mischaracterization of water quality conditions in local receiving water bodies.

Recommendation: To ensure that all readily available and high quality water quality data representative of current water quality conditions are evaluated when making water quality impairment determinations, we request that: 1) all SCVURPPP 2002-2008 data previously submitted to the SF Bay Regional Water Board consistent with NPDES requirements be added to the dataset for which the proposed listings are based; 2) the listing recommendations be revised (as needed) based on the inclusion of these data; and 3) the new listing recommendations be revised accordingly and re-released for public comment.

3. **The "black box" approach to listing recommendations used by the State Water Board is short-sighted and misleading, which results in the unnecessary expenditure of public resources**

Determining the water quality conditions of a water body requires a thorough evaluation of all available data, including a review of the monitoring design and techniques employed, the desired objectives of the associated monitoring programs, and the quality of the data obtained. Without conducting such an evaluation and review as part of the 303(d) list data analysis process, a scientifically defensible conclusion regarding water quality conditions and the need for additional control measures cannot be made. Instead of using a robust data analysis process, it appears that data evaluations to support listing recommendations in 2016 have been reduced to simplistic "black box" approaches where all data (in addition to incomplete datasets noted above) that are housed in CEDEN for a specific analyte are considered equal, regardless of the context of when, where, how and for what reason they were collected. Data are run through binomial tests with no interpretation in the context of the receiving water bodies or monitoring program goals and objectives. We have previously cautioned the State Water Board and SF Bay Regional Water Board on use of this simplistic process to determine exceedances of water quality standards. Unfortunately, in the 2016 proposed listings, the use of this approach continues and appears to have resulted in potentially erroneous listings that (if adopted) will require the use of limited public resources to address via the collection of additional data that could be better used on control measure program implementation actions focused on real water quality problems.

Recommendation: Prior to adopting the proposed 303(d) listings, the SF Bay Regional Water Board and State Water Board should conduct a more thorough evaluation of data, including a review of the monitoring design and techniques employed, the desired objectives of the associated monitoring programs, and the quality of the data obtained. Additionally, as discussed in comment #1, the Regional and State Water Boards should limit the timeframe when data are considered to be representative of “current” water quality conditions.

WATERBODY SPECIFIC COMMENTS

1. The proposed toxicity listing for Coyote Creek is premature and based on a very small dataset (3 samples)

The SF Bay Regional Water Board and State Water Board are proposing to place Coyote Creek on the 303(d) list for impairment of the Cold Freshwater Habitat Beneficial Use by toxicity. Based on the information in the Staff Report, the Water Boards used four lines of evidence to assess this potential pollutant (Table 1). Specifically, four of ten sediment samples collected and analyzed between 1997 and 2008 from three locations exceeded the guideline for toxicity described in Section 3.6 of the State’s Listing Policy. As discussed below, some of the data points used by the Water Board for their evaluation were not collected in Coyote Creek.

Table 1. Water Board Lines of Evidence for Proposed 303(d) Listing of Coyote Creek for Toxicity.

Station	Location	Latitude	Longitude	Dates	Number of Samples	Number of Excursions from WQOs
205COY060	Coyote Creek at Montague	37.3954	-121.91485	2008	2	1
205SUP022	Coyote Creek at E. Williams St.	37.336979	-121.86792	2007	1	1
C-3-0*	Coyote Slough	37.46166	-121.97566	1997 - 2002	7	2

* An additional set of 16 water toxicity samples collected at C-3-0 were included in the lines of evidence; however, the single exceedance from the water samples is apparently not used to support the proposed 303(d) listing.

The data points used as lines of evidence for proposing the toxicity listing for Coyote Creek were collected at three stations identified as C-3-0, 205COY060, and 205SUP022 (Figure 1). One of the stations (C-3-0) is a sampling station for the main water mass of San Francisco Bay and is not located within the freshwater channel of Coyote Creek and therefore should not be used to assess impairments to Cold Freshwater Habitat. Station C-3-0 was sampled as part of the *Regional Monitoring Program for Water Quality in San Francisco Bay* (RMP) between 1997 and 2002. The RMP is to monitor contaminant concentrations in water, sediments, and fish and shellfish tissue in the San Francisco Bay (David et al. 2001[2]). Water and sediment monitoring was conducted by the RMP in open bay water during sampling “cruises” using the R/V David Johnston vessel.

Although Station C-3-0 is identified as “Coyote Creek,” it is located well within the tidally-influenced waters and cannot be considered representative of water or sediment quality in the freshwater portions of Coyote Creek with any degree of certainty. While slough waters are directly connected to the Bay, they do not provide Cold Freshwater Habitat at the intersections. Conductivity measurements of water samples collected at C-3-0 ranged from 3,200 to 25,700 µmhos/cm (average 12,816 µmhos/cm) which is significantly higher than freshwater. Furthermore, the toxicity indicator organisms tested in the C-3-0 samples were all marine organisms and the toxicity test protocols are not appropriate for freshwater environments.

Recommendation: For the reasons described above, toxicity results from Station C-3-0 should not be included in the lines of evidence for listing Cold Freshwater Habitat impairments in Coyote Creek. With data from Station C-3-0 eliminated from the lines of evidence used for Coyote Creek, this leaves a very small and insufficient number of data points in the dataset in CEDEN upon which to support a toxicity listing for Coyote Creek. Additionally, if more recent data from Coyote Creek collected through the SWAMP Statewide Stream Pollution Trends (SPoT) Program since 2008 were included in the data evaluation, Coyote Creek would not be included on the 303(d) list, given that these data show very low frequencies of sediment toxicity.

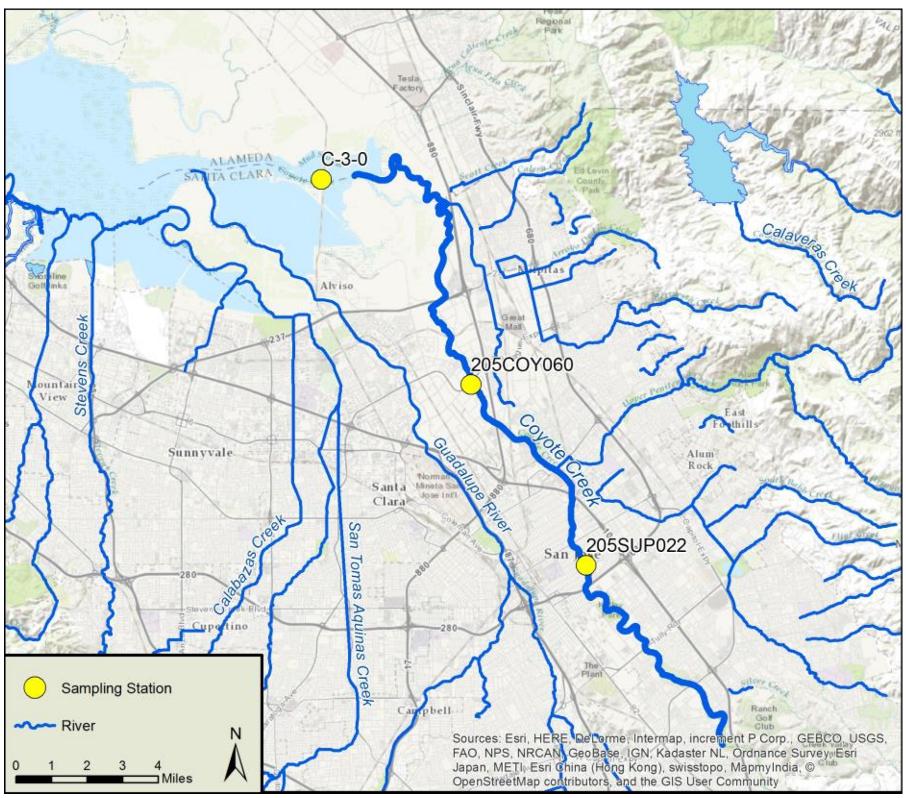

Figure 2. Locations of South San Francisco Bay monitoring station C-3-0 and Coyote Creek stations 205COY060 and 205SUP022.

[2] David, N., Bell, D. and Gold, J. 2001. Field Sampling Manual for the Regional Monitoring Program for Trace Substances. Prepared by San Francisco Estuary Institute and Applied Marine Sciences. February 2001.

2. **The proposed toxicity listings for South San Francisco Bay and Guadalupe Slough should be revised**

The SF Bay Regional Water Board and State Water Board are proposing to place South San Francisco Bay (and other Bay segments) and Guadalupe Slough on the 303(d) list for impairment of Estuarine Habitat Beneficial Uses by toxicity. Water Board staff relied on two lines of evidence (sediment and water toxicity) to assess this potential pollutant (i.e., toxicity). Specifically, 32 of 61 sediment samples collected and analyzed between 1993 and 2008 for the South Bay exceed the guideline for toxicity described in section 3.6 of the State Board's Listing Policy. Sediment samples were collected from 24 stations by the *Regional Monitoring Program for Trace Substances*. Additionally, proposed listings are also based on 12 water samples taken from the South Bay. Two issues are identified below regarding the proposed listing for toxicity.

a. **A distinction should be made between South Bay water toxicity and sediment toxicity**

Two lines of evidence were assessed: sediment (62) and water (12) samples collected between 1993 and 2008, and analyzed for toxicity. Only the sediment toxicity exceedances are referenced in the Fact Sheet as being used to support the proposed listing.

Recommendation: Regional and State Water Board staff must clearly distinguish that the proposed listing is for sediment toxicity rather than water toxicity. There were 32 of 61 sediment samples with excursions, but only 1 of 12 water samples with excursions. The one sample with observed toxicity from the water dataset is not sufficient to support a water toxicity listing. Distinguishing between water and sediment toxicity is important because different pollutants and mechanisms contribute to toxicity in the different matrices. In addition, toxicity control programs would differ depending on which type of matrix is impaired.

b. **A distinction should be made between Guadalupe Slough (RMP local effects monitoring station C-1-3) water toxicity and sediment toxicity**

Two lines of evidence were assessed: sediment (2) and water (16) samples collected between 1994 and 2001, and analyzed for toxicity. Both water and sediment toxicity exceedances appear to be referenced in the Fact Sheet as being used to support the proposed listing. The Sunnyvale East and West drainage channels discharge to Guadalupe Slough as does the Sunnyvale Water Pollution Control Plant (WPCP).

Recommendation: Regional and State Water Board staff must clearly distinguish that the proposed listing is for sediment toxicity rather than water toxicity. There were only 1 of 2 sediment samples with excursions, and only 2 of 15 water samples with excursions. The one sample with observed toxicity from the sediment dataset was collected in August 1998 and the two samples with water column toxicity were collected in January and July 1997. Distinguishing between water and sediment toxicity is important because different pollutants and mechanisms contribute to toxicity in the different matrices. In addition, toxicity control programs would differ depending on which type of matrix is impaired. There have been significant advances in stormwater pollution control activities and WPCP Pretreatment Program and Pollution Prevention Program (PPP) activities since 1997 and 1998. The nearly 20-year old toxicity detections in 1997 and 1998 and not believed representative of current Guadalupe Slough receiving water conditions.

Significant actions have been taken and continue to be implemented regarding pesticide controls via multiple SCVURPPP programs and copper control programs via both SCVURPPP and WPCP PPP activities plus state-wide and national (USEPA) actions of the Brake Pad Partnership and resultant California legislation

(SB 346, September 27, 2010) mandating copper reductions in brake pads to less than 0.5% by 2025. Toxicity Identification Evaluations (TIEs) conducted by the Regional Monitoring Program (RMP) (Attachment A) have been inconclusive. However some results have pointed to “organics” and “divalent cations” as potential sources of toxicity. The programs already in place to reduce pesticides (organics) and copper (divalent cations) are directly reducing the levels of these potential sources of toxicity.

c. Change the listing categories from Category 5 to Category 2 or 4c

The listing categories for the proposed South San Francisco Bay and Guadalupe Slough toxicity listing are Category 5. Category 5 is used when “at least one beneficial use is not supported and a TMDL is needed.” A more appropriate category for the listing would be Category 2 (i.e., evidence is insufficient to make complete use support determinations) or 4c (i.e., the non-attainment of any applicable water quality standard for the waterbody is the result of pollution and is not caused by a pollutant).

Unlike urban freshwater creeks, where it is relatively well established that pesticides are a cause of toxicity, the specific cause(s) of sediment toxicity in the San Francisco Bay and Estuary remain unknown despite the expenditure of hundreds-of-thousands of public agency dollars that have funded many years of focused research and monitoring (Attachment A). The Regional Monitoring Program’s Exposure Effects Work Group (EEWG) has conducted multi-year studies over the last 25 years aiming to determine the cause(s) of toxicity observed in the same dataset assessed by the Water Board staff as part of the proposed 2016 303(d) listing. The EEWG has also coordinated workshops to facilitate the exchange of information between scientists from the EEWG, USEPA, State and Regional Water Boards, University of California, SCCWRP, and private laboratories. Amphipod mortality in the San Francisco Estuary is generally moderate, with more toxicity occurring during winter, and severe toxicity is observed infrequently. Several Toxicity Identification Evaluations (TIEs) have been conducted to determine the cause of toxicity; however, results have been inconclusive (see Attachment A). It has also been proposed that particle shapes and/or the percentage of fine organic matter in San Francisco Estuary sediments may be contributing to artificial toxicity observations.

Recommendation: Given the uncertainty about whether the moderate, episodic sediment toxicity observed in San Francisco Bay is a result of the test method being used or a pollutant**,** we recommend placing the South San Francisco Bay in Category 2 (i.e., evidence is insufficient to make complete use support determinations). Placing the South Bay in this category is consistent with the scientific community’s current understanding of sediment toxicity in the Bay and will allow the Regional Monitoring Program (with active participation from SF Bay Regional Water Board staff) to further evaluate whether a water quality concern associated with toxicity is present prior to moving forward with a TMDL, which will take significant public agency (State and local) resources to develop.

We hope that you seriously consider these comments and suggested improvements to the proposed revision to the 303(d) List. Due to the number of significant changes requested, we request that the SF Bay Regional Water Board’s adoption hearing scheduled for April 12, 2017, be changed to a workshop and the adoption hearing be rescheduled to May 10, 2017 to allow time for the Regional Water Board staff to address the comments included and incorporate the suggested changes into a revised staff report that should be re-noticed for public comment. This is consistent with the approach taken by the Los Angeles Regional Water Board that extended its 303(d) list comment period from March 9, 2017 to March 30, 2017 and its adoption hearing from April 6, 2017 to May 4, 2017. Not doing so will most definitely result in the use of limited public resources on perceived water quality problems that have limited consideration of documented changes of condition and geographical extent.

Please contact me at (510) 832-2852 or Chris Sommers (extension 109) if you have questions regarding the comments or recommendations included within. We look forward to continuing to work with you during the development of the 2016 303(d) list.

Sincerely,

Adam W. Olivieri Dr.PH, P.E.
SCVURPPP Program Manager

cc. SCVURPPP Management Committee
Jill Bicknell and Chris Sommers – EOA Inc.
Tom Mumley and Keith Lichten – SF Bay Regional Water Board

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Santa Clara Valley Water District

March 13, 2017

San Francisco Bay Regional Water Quality Control Board
Attention: Richard Looker
1515 Clay Street, Suite 1400
Oakland, CA 94612

Delivered by email: rlooker@waterboards.ca.gov

SUBJECT: Comment Letter - Proposed Revisions to the Clean Water Act Section 303(d) List of Impaired Water Bodies in the San Francisco Bay Region

Dear Mr. Looker:

Thank you for the opportunity to provide comments on the Proposed Revisions to the Clean Water Act Section 303(d) List of Impaired Water Bodies in the San Francisco Bay Region released for public review on February 10, 2017 (referred to hereinafter as the "303(d) List Revisions").

The Santa Clara Valley Water District (District) is a special district with jurisdiction throughout Santa Clara County. The District is the county's primary water resources agency and acts as the steward for its watersheds, streams, and creeks.

The Water District has the following comments and clarifications to offer:

<u>Toxicity Listing for Guadalupe Slough</u>

This listing is based on samples collected in August 1998, with two of 16 samples exhibiting toxicity. Given that this data is 18 years old and that sediment in an estuarine environment changes over time, this data should no longer be considered indicative of the current situation. In addition, this slough has changed due to the breaching of levees for the saltpond restoration project. The Water District recommends not listing Guadalupe Slough at this time and instead recommend that the SWAMP program conduct a new evaluation.

<u>Mercury Listings for Reservoirs</u>

The timing for listing of reservoirs is unclear with relationship to the Statewide Mercury Control Program for Reservoirs, which has a spreadsheet of future listings that are not consistent with these current listings, leading to confusion over the timing of reservoir listings. The Santa Clara Valley Water District has been at the forefront of collecting data on reservoirs impaired by mercury and has implemented control measures in such reservoirs. The District would like to ensure that such data informs the Statewide Mercury Control Program for Reservoirs, however, it is unclear what the relationship and timing between the proposed 303(d) listing and the Statewide program for reservoirs is. Updating the spreadsheet on the Statewide Mercury Control Program for Reservoirs webpage would assist us in determining the phasing of listings.

In addition, we support and incorporate by reference comments made by the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP). Please feel free to contact Kirsten Struve on my staff at (408) 630-3138, should you have any questions.

Sincerely,

Melanie Richardson

Melanie Richardson, P.E.
Interim Chief Operating Officer, Watersheds

Western States Petroleum Association
Credible Solutions • Responsive Service • Since 1907

Kevin Buchan
Manager, Bay Area Region

March 13, 2017

Richard Looker via email (rlooker@waterboards.ca.gov)
Senior Water Quality Engineer
San Francisco Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

RE: WSPA Comments on the 2017 Proposed 303(d) Listings for San Francisco Bay for Toxicity

The Western States Petroleum Association (WSPA) is a non-profit trade association representing twenty-six companies that explore for, produce, refine, transport and market petroleum, petroleum products, natural gas and other energy supplies in California, Arizona, Nevada, Oregon, Washington and Hawaii.

WSPA submits these comments to the Board for consideration in their proposed 303(d) listing of San Francisco Bay segments for toxicity.

WSPA believes there are insufficient lines of evidence to support the proposed 303(d) listing for toxicity in San Francisco Bay. We outline our rationale below in summary, and provide detailed comments in the attached technical memorandum.

Sediment Sampling Should be Conducted Annually

The sediment samples should be evaluated from an annual perspective rather than using the entire period of 1993–2008. The amphipod survival may be improving in the second part of the period rather than the early period. This trend of improving sediment toxicity would be a substantial reason for not listing the segments of the Bay for toxicity.

The toxicity data are between 9 and 24 years old. Given that conditions within the Bay may be improving over time, and given sediment redistribution and deposition, more recent data should be used to assess whether the water bodies should be 303 (d) listed for toxicity.

This is an important consideration because toxicity testing evaluates surficial sediments from areas experiencing continual additional deposition. Samples collected earlier are more likely to no longer be in the biological active zone. Thus, more recent samples should be used for the consideration of potential toxicity.

The RWQCB should not be evaluating toxicity as one event over the entire sixteen-year period (1993–2008), but rather it should be evaluated from an annual perspective.

Insufficient Sampling, Highly Variable Results, and Confounding Factors

Insufficient samples were evaluated for bivalve or urchin larval development, and the results were too highly variable, to conclusively determine whether these samples were consistently toxic. Confounding factors such as naturally occurring ammonia and hydrogen sulfide concentrations were not evaluated during the toxicity testing, so these results are inconclusive for assessing persistent anthropogenic chemicals.

Due to the variability in responses, we believe that percentage survival is a better indicator of toxicity trends as compared to percentage normal alive.

Amphipod Selection

The amphipod *E. estuarius* is an unsuitable as a test animal for the high-clay concentrations in San Francisco Bay. Because grain size is known to confound toxicity tests performed using this organism, the confounding factor of grain size must be evaluated before listing.

The San Francisco Estuary is dominated by kaolin clay, a fine-grained material. Grain size has been shown to affect survival of marine amphipods such that a decrease in survival with an increase in percentage fine-grained material was observed. U.S. EPA guidance on amphipod toxicity testing recommends that the characteristics of the sediment should be within the tolerance limits of the test organism.

Should future amphipod testing be performed, we recommend that an organism that is more tolerant to changes in grain size should be considered, such as *L. plumulosus*. Because grain-size impacts were not evaluated, samples for this organism should not be used as the basis for listing.

Confounding Factors for Ammonia and Hydrogen Sulfide

Ammonia and sulfides naturally accumulate in marine and estuarine sediments. These can interfere and confound interpretation of toxicity from persistent anthropogenic chemicals in tests with amphipods, bivalves (such as mussels and oysters), and sea urchins.

Estuarine sediments should not be listed for toxicity without measuring and understanding concentrations of ammonia and hydrogen sulfide in the sediment. Amphipods, bivalve larvae, and sea urchins are all very sensitive to these naturally occurring compounds.

Should future testing be performed on these sediments, it is important that the ammonia and hydrogen sulfides be evaluated; should they be elevated (above the action levels), a purging strategy with side-by-side testing such as that used by USACE and EPA should be employed to evaluate potential interferences from these constituents.

Since ammonia and hydrogen sulfide concentrations do not appear to have been measured in the sediment samples, these samples should not be used to list the sediments in San Francisco Bay, Central, San Pablo Bay, and Suisun Bay.

Causality Needs To Be Assessed

As noted in the attached technical memorandum, it has not been established that a pollutant contributes to the observed “toxicity” in the Bay sediment samples. Without information on the cause of toxicity, it will not be possible to develop a TMDL or implement management actions to address the “toxicity” in these water bodies.

We appreciate the opportunity to provide these comments to the RWQCB on the proposed listing. We look forward to your response. Thank you.

Sincerely,

Kevin Buchan

Attachment: Opportunity for Public Comment – Proposed Revisions to 303 (d) list – San Francisco Bay Basin, San Pablo Bay, and Suisun Bay (Exponent)

March 13, 2017

Kevin Buchan
Manager, Bay Area Region
Western States Petroleum Association
1320 Willow Pass Road, Ste. 600
Concord, CA 94520

Subject: **Opportunity for Public Comment:**
Proposed Revisions to 303 (d) list – San Francisco Bay Basin, San Pablo Bay, and Suisun Bay

Dear Mr. Buchan,

The following comments are provided on the proposed 303 (d) listing of toxicity from sediment samples collected from the San Francisco Bay, Central (Decision ID 66543), San Pablo Bay (Decision ID 66787), and Suisun Bay (Decision ID 66672). This pollutant (toxicity) is being considered for placement on the CWA section 303 (d) list under section 3.6 of the Listing Policy, which specifies that a single line of evidence is necessary as the minimum to assess listing status.

Review of data used to support proposed listings

San Francisco Bay, Central

The Regional Water Quality Control Board (RWQCB) reported two lines of evidence in support of Decision ID 66543: toxicity in water (LOE ID 95751) and toxicity in sediment (LOE ID 95805). Zero (0) of 24 water samples in LOE ID 95751 exhibited toxicity, and 29 of the 85 sediment samples in LOE ID 95805 exhibited toxicity, as discussed below. Based on the available data and information, the RWQCB staff recommended placing this water segment-pollutant combination on the CWA section 303 (d) list.

RWQCB staff based their conclusion on the following findings:

- The data used satisfies the data quality requirements of section 6.1.4 of the Listing Policy.
- The data used satisfies the data quantity requirements of section 6.1.5 of the Listing Policy.
- Twenty-nine (29) of the 85 samples exceed the guideline, and this exceeds the allowable frequency listed in Table 3.1 of the Listing Policy.

Pursuant to section 3.11 of the Listing Policy, no additional data and information are available indicating that standards are not met.

The RWQCB Staff Decision Recommendation for Decision ID 66543 states that:

After review of the available data and information, RWQCB staff concludes that the water body-pollutant combination should be placed on the section 303 (d) list because applicable water quality standards are exceeded and a pollutant contributes to or causes the problem.[1]

As noted above, LOE ID 95751 indicates that zero (0) exceedances were observed for the toxicological assessment of 24 water samples for the following test organisms:

- *Thalassiosira pseudonana*, algae, (cell count), 1993
- *Crassostrea gigas*, Pacific oyster, (mean % normal development), 1993
- *Mytilus edulis*, blue mussel, (mean % normal development), 1993–1996
- *Americamysis bahia*, opossum shrimp, formerly *Mysidopsis bahia* (mean % survival), 1994–96, 2002, and 2007.

Water samples collected during the periods listed above were deemed non-toxic.

LOE ID 95805 indicated that 29 of 85 sediment samples exhibited some level of toxicity. The record further reported that a sample may have multiple toxicity test results but was only counted once as being toxic. The following species were evaluated as part of this LOE:

- *Eohaustorius estuaries*, amphipod, (mean % survival), 1993–2008
- *Mytilus edulis*, blue mussel, (mean % normal alive), 1993–1997
- *Mytilus galloprovincialis*, Mediterranean mussel, (mean % normal alive), 1998–2001 and 2005–2008
- *Strongylocentrotus purpuratus*, purple sea urchin, (mean % normal development), 1998.

Although the weblinks provided in the LOE ID 95805, Decision ID 66543 do not provide the results of these toxicity tests (and they should be included as part of the administrative record), we were able to obtain the results using the webtool, CD3 Tool, supported by the San Francisco Estuary Institute (SFEI).[2]

Insufficient samples were evaluated from all sample locations on a consistent basis for the two bivalve species (*M. edulis* and *M. galloprovicialis*) or urchin (*S. purpuratus*) larval development, and the results were too highly variable, to conclusively determine whether these samples were consistently toxic.

Additionally as discussed later in this comment document, bivalves and urchin larval development toxicity tests are very sensitive to naturally occurring ammonia and hydrogen

[1] http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/2016_303d/00006.shtml#66543
[2] http://cd3.sfei.org/

sulfide concentrations. Since no ammonia or hydrogen sulfide concentrations were in the test results downloaded from the CD3 tool, the assessment of toxicity is not possible because these confounding factors could not be assessed.

San Pablo Bay

The RWQCB reported two lines of evidence in support of Decision ID 66787: toxicity in water (LOE ID 95796) and toxicity in sediment (LOE ID 95810). Zero (0) of 25 water samples in LOE ID 95796 exhibited toxicity, and 15 of the 51 sediment samples in LOE ID 95810 exhibited toxicity, as discussed below. Based on the available data and information, RWQCB staff recommended placing this water segment-pollutant combination on the CWA section 303 (d) list.

RWQCB staff based their conclusion on the following findings:

- The data used satisfies the data quality requirements of section 6.1.4 of the Listing Policy.
- The data used satisfies the data quantity requirements of section 6.1.5 of the Listing Policy.
- Fifteen (15) of the 51 samples exceed the guideline, and this exceeds the allowable frequency listed in Table 3.1 of the Listing Policy.

Pursuant to section 3.11 of the Listing Policy, no additional data and information are available indicating that standards are not met.

The RWQCB Staff Decision Recommendation for Decision ID 66787 states that:

> *After review of the available data and information, RWQCB staff concludes that the water body-pollutant combination should be placed on the section 303 (d) list because applicable water quality standards are exceeded and a pollutant contributes to or causes the problem.*[3]

As noted above, LOE ID 95751 indicates that zero (0) exceedances were observed for the toxicological assessment of 24 water samples for the following test organisms:

- *T. pseudonana*, algae, (cell count), 1993
- *C. gigas*, Pacific oyster, (mean % normal development),1993
- *M. edulis*, blue mussel, (mean % normal development), 1993 and 1995–1997
- *A. bahia*, opossum shrimp, formerly *M. bahia* (mean % survival), 1994–2000, 2002, and 2007.

[3]http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/2016_303d/00006.shtml#66787

Water samples collected during the periods listed above were deemed non-toxic.

LOE ID 95810 indicated that 15 of 51 sediment samples exhibited some level of toxicity. The record further reported that a sample may have multiple toxicity test results but was only counted once as being toxic. The following species were evaluated as part of this LOE:

- *E. estuaries,* amphipod, (mean % survival), 1993–2008
- *M. edulis*, blue mussel, (mean % normal alive), 1993–1995, 1997
- *M. galloprovincialis*, Mediterranean mussel, (mean % normal alive), 1998–2001, 2005–2008
- *S. purpuratus*, purple sea urchin, (mean % normal development), 1998.

As with San Francisco Bay, Central, insufficient samples were evaluated from all sample locations on a consistent basis for the two bivalve species (*M edulis* and *M. galloprovicialis*) or urchin (*S. purpuratus*) larval development, and the results were too highly variable, to conclusively determine whether these samples were consistently toxic.

Additionally, bivalves and urchin larval development toxicity tests using water only as the exposure method are very sensitive to naturally occurring ammonia and hydrogen sulfide concentrations. Since ammonia and hydrogen sulfide concentrations were not provided with the toxicity test results, the assessment of toxicity is not possible because these confounding factors could not be assessed.

Suisun Bay

The RWQCB reported two lines of evidence in support of Decision ID 66672: toxicity in water (LOE ID 95797) and toxicity in sediment (LOE ID 95811). One (1) of 24 water samples in LOE ID 95797 exhibited toxicity, and 34 of the 51 sediment samples in LOE ID 95811 exhibited toxicity, as discussed below. Based on the available data and information, RWQCB staff recommended placing this water segment-pollutant combination on the CWA section 303 (d) list.

RWQCB staff based their conclusion on the following findings:

- The data used satisfies the data quality requirements of section 6.1.4 of the Listing Policy.
- The data used satisfies the data quantity requirements of section 6.1.5 of the Listing Policy.
- Thirty-four (34) of the 51 samples exceed the guideline, and this exceeds the allowable frequency listed in Table 3.1 of the Listing Policy.

Pursuant to section 3.11 of the Listing Policy, no additional data and information are available indicating that standards are not met.

The RWQCB Staff Decision Recommendation for Decision ID 66672 states that:

> *After review of the available data and information, RWQCB staff concludes that the water body-pollutant combination should be placed on the section 303 (d) list because applicable water quality standards are exceeded and a pollutant contributes to or causes the problem.*[4]

As noted above, LOE ID 95751 indicates that zero (0) exceedances were observed for the toxicological assessment of 24 water samples for the following test organisms:

- *T. pseudonana*, algae, (cell count), 1993
- *C. gigas*, Pacific oyster, (mean % normal development), 1993
- *M. edulis,* blue mussel, (mean % normal development), 1993, 1996–1997
- *A. bahia*, opossum shrimp, formerly *M. bahia* (mean % survival), 1994–1999, 2001, and 2007.

The sample with observed toxicity was for *A. bahia* collected in July 1996. All other water samples collected during the periods listed above were deemed non-toxic.

LOE ID 95811 indicated that 34 of 51 sediment samples exhibited some level of toxicity. The record further reported that a sample may have multiple toxicity test results but was only counted once as being toxic. The following species were evaluated as part of this LOE:

- *E. estuaries,* amphipod, (mean % survival), 1993–2000, 2002–2008
- *Hyalella azteca (growth), 2002*
- *Ceriodaphnia dubia (mean % survival), 2001*
- *M. edulis,* blue mussel, (mean % normal alive), 1993–1995, 1997
- *M. galloprovincialis,* Mediterranean mussel, (mean % normal alive), 1998–2001 and 2005–2008
- *S. purpuratus*, purple sea urchin, (mean % normal development), 1998.

As with both San Francisco Bay, Central and San Pablo Bay, insufficient samples were evaluated from all sample locations on a consistent basis for the two bivalve species (*M. edulis* and *M. galloprovicialis*) or urchin (*S. purpuratus*) larval development, and the results were too highly variable, to conclusively determine whether these samples were consistently toxic.

[4] http://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/2016_303d/00006.shtml#66672

Additionally, bivalves and urchin larval development toxicity tests using water-only exposures are very sensitive to naturally occurring ammonia and hydrogen sulfide concentrations. Since ammonia and hydrogen sulfide concentrations were not provided with the toxicity test results, the assessment of toxicity is not possible because these confounding factors could not be assessed.

Testing using the freshwater organisms *H. azteca* and *C. dubia* were only performed from 2001 to 2002, with one sample each year only at station BF21, and were inadequate for the assessment of toxicity in this system.

We have reviewed the supporting information for these proposed listings and offer the following comments and observations for San Francisco Bay, Central, San Pablo Bay, and Suisun Bay in the following sections (Section 1–3).

1. Sediment samples used in the proposed listing (LOE ID 95805) from San Francisco Bay, Central were collected between 1993 and 2008 and overestimate the degree of toxicity observed on an annual basis.

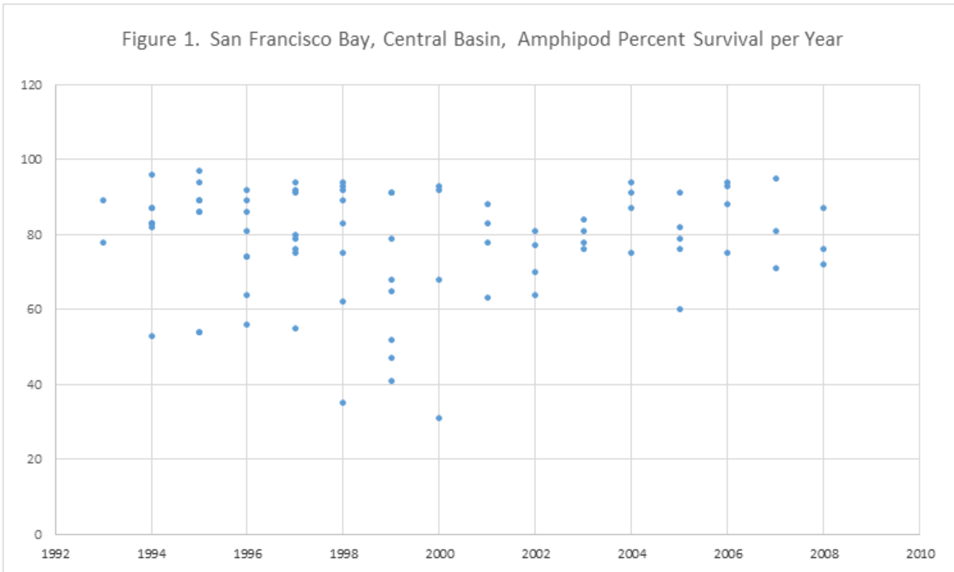
Between 3 and 20 sediment samples were collected each year from the San Francisco Bay, Central water body between 1993 and 2008. Between zero (0) and 5 samples each year were found to be toxic with no clear observable trend regarding increased observed toxicity presented as percentage survival (Table 1).

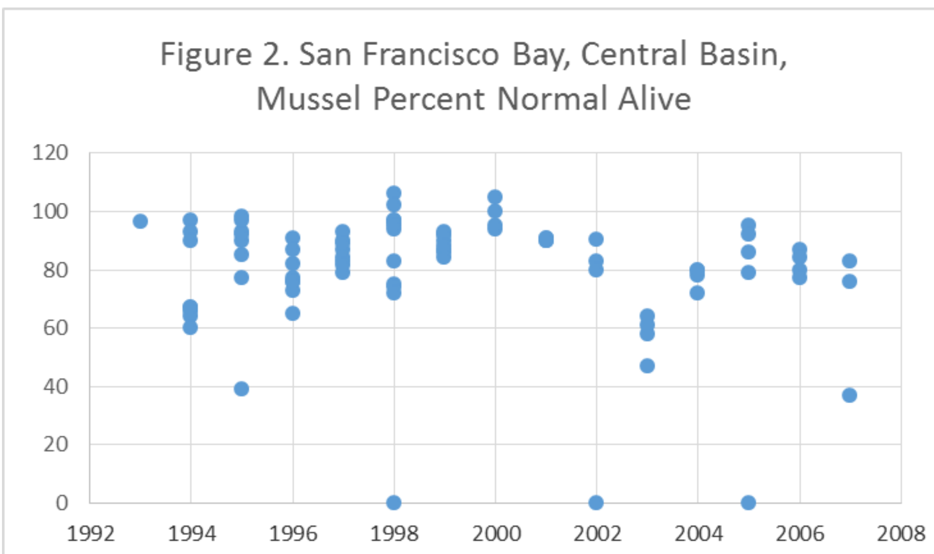
As presented in Table 1 and Figure 1, it appears that toxicity expressed as percentage survival was higher in samples collected in the 2001–2008 period than in the 1994–2000 period. The test endpoint of percentage normal alive was more variable as compared to survival (Table 1 and Figure 2), with three tests having zero (0) percent development (1998, 2002, and 2005).

However, the trend appears to show that toxicity is at least similar on an annual basis from the earlier period to the most recent sampling events (Figure 2). Due to this variability in responses, we believe that percentage survival is a better indicator of toxicity trends as compared to percentage normal alive.

Table 1. Toxicity tests performed from 1993–2008, San Francisco Bay, Central.

Year	Total Samples Evaluated	Toxic Samples	Range of Survival (as percent)	Toxicity Observed Based on Survival	Range of Normal Alive (as percent)	Toxicity Observed Based on Normal Development
1993	3	1	78–89	1	97	-
1994	16	0	53–96	-	60–97	-
1995	16	4	54–97	2	39–97	2
1996	16	2	56–92	2	65–91	-
1997	16	2	55–94	2	79–93	-
1998	20	4	35–94	3	0–106	1
1999	16	3	41–91	3	84-93	-
2000	8	2	31–93	2	94–105	-
2001	8	1	63–88	1	90–91	-
2002	8	3	64–81	2	0–90	1
2003	8	2	76–84	1	47–64	1
2004	8	1	75–94	1	72–80	-
2005	10	5	60–91	3	0–95	2
2006	8	1	75–94	1	77–87	-
2007	6	3	71–95	1	37–83	2
2008	3	1	72–87	1	Not evaluated	-





It is our opinion that the RWQCB should not be evaluating the toxicity as constant over the entire period from 1993–2008, but rather they should evaluate toxicity from an annual perspective.

This is an important consideration because the toxicity testing is evaluating surficial sediments from areas experiencing continual additional deposition, so that samples collected earlier are most likely no longer in the biological active zone. Thus, the most recent samples should be used for the consideration of potential toxicity.

Furthermore, we note that the toxicity data used as the basis for this proposed listing are between 9 and 24 years old. Given that conditions within the Bay may be improving over time, and given that sediment redistribution and deposition are expected over decadal timescales, it would be appropriate to obtain and use more recent data in assessing whether the water bodies should be 303 (d) listed for toxicity.

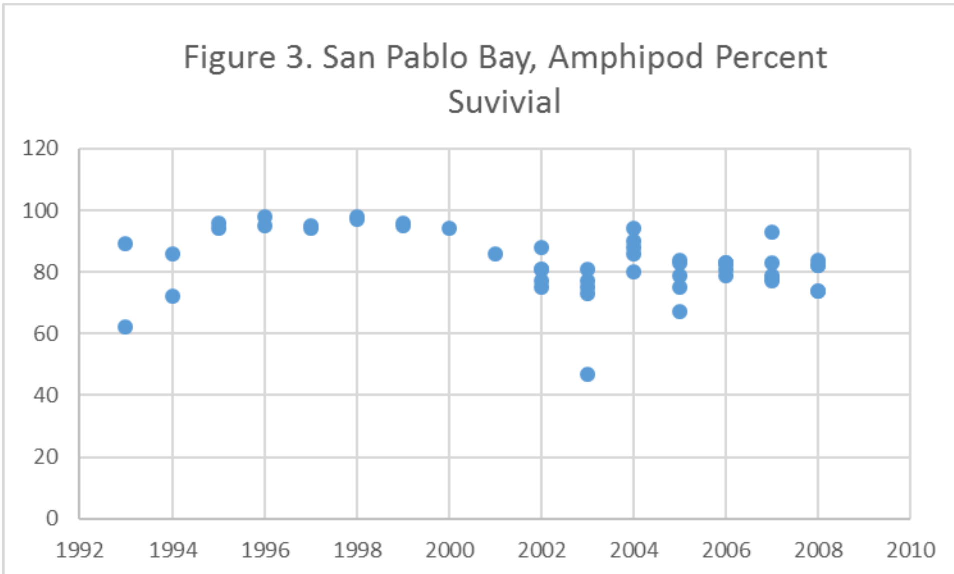
2. Sediment samples used in the proposed listing (LOE ID 95810) for San Pablo Bay were collected between 1993 and 2008 and overestimate the degree of toxicity observed on an annual basis.

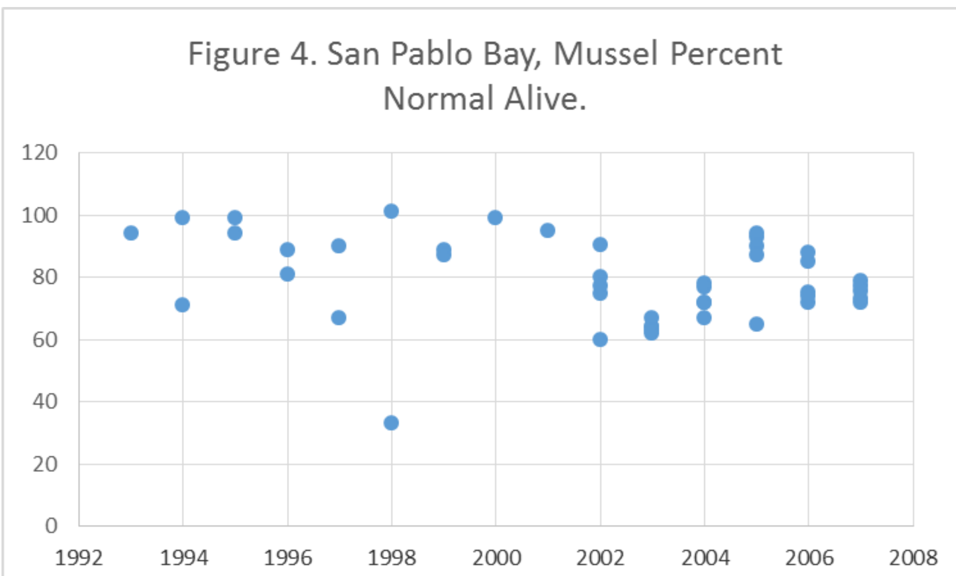
Between 1 and 5 sediment samples were collected each year from the San Pablo Bay between 1993 and 2008. Between zero (0) and 4 samples each year were found to be toxic with no clear observable trend regarding increased observed toxicity presented as percentage survival (Table 2).

As presented in Table 2 and Figure 3, it appears that the percentage survival was similar each year, often at or above the 80% survival level, which is the acceptable control mortality. The test endpoint of percentage normal alive was similar to percentage survival, with only a few samples observed below 65% normal alive for the bivalve larval development test (Table 2 and Figure 4). However, it appears that the toxicity is at least similar on an annual basis from the earlier period to the most recent sampling events (Figures 3 and 4).

Table 2. Toxicity tests performed from 1993–2008, San Pablo Bay

Year	Total Samples Evaluated	Toxic Samples	Range of Survival (as percent)	Toxicity Observed Based on Survival	Range of Normal Alive (as percent)	Toxicity Observed Based on Normal Development
1993	2	1	62–89	1	94	-
1994	2	1	72–86	1	71–99	-
1995	2	-	94–96	-	94–99	-
1996	2	-	95–98	-	81–89	-
1997	2	1	94–95	-	67–90	1
1998	2	1	97–98	-	33–101	1
1999	2	-	95–96	-	87–89	-
2000	1	-	94	-	99	-
2001	1	-	86	-	95	-
2002	5	1	75–88	-	60–90	1
2003	5	1	47–81	1	62–67	-
2004	5	0	80–94	0	67–78	-
2005	5	4	67–84	4	65–94	1
2006	5	-	79–83	-	72–88	-
2007	5	3	77–93	3	72–79	3
2008	5	2	74–84	2	Not evaluated	-





It is our opinion that the RWQCB should not be evaluating the toxicity as one event over the entire sixteen-year period (1993–2008), but rather they should evaluate toxicity from an annual perspective.

This is an important consideration because sediment toxicity testing evaluates surficial sediments from areas likely experiencing continual additional deposition, thus samples collected earlier are most likely no longer in the biological active zone. Thus, the most recent samples should be used for the consideration of potential toxicity.

Furthermore, we note that the toxicity data from 1 to 5 samples collected annually used as the basis for this proposed listing are between 9 and 24 years old.

Given that conditions within the San Pablo Bay may be improving over time, and given that sediment redistribution and deposition are expected over decadal timescales, it would be appropriate to obtain and use more recent data in assessing whether the water bodies should be 303 (d) listed for toxicity.

3. Sediment samples used in the proposed listing (LOE ID 95797) for Suisun Bay were collected between 1993 and 2008 and overestimate the degree of toxicity observed on an annual basis.

Between 1 and 5 sediment samples were collected each year from the San Pablo Bay between 1993 and 2008. Between zero (0) and 5 samples each year were found to be toxic, and with no clear observable trend regarding increased observed toxicity presented as percentage survival (Table 3).

As presented in Table 3 and Figure 5, it appears that the percentage survival was lower in samples collected before 2000 than after 2001. Furthermore, samples collected after 2001 were often at or above the 80% survival level, which is the acceptable control mortality.

The test endpoint of percentage normal alive was often lower than samples from San Francisco Bay or San Pablo Bay, but as discussed earlier, the potential impacts from naturally occurring ammonia or hydrogen sulfide levels cannot be ruled out as a confounding factor because concentrations were not evaluated during the toxicity testing (Table 3 and Figure 6).

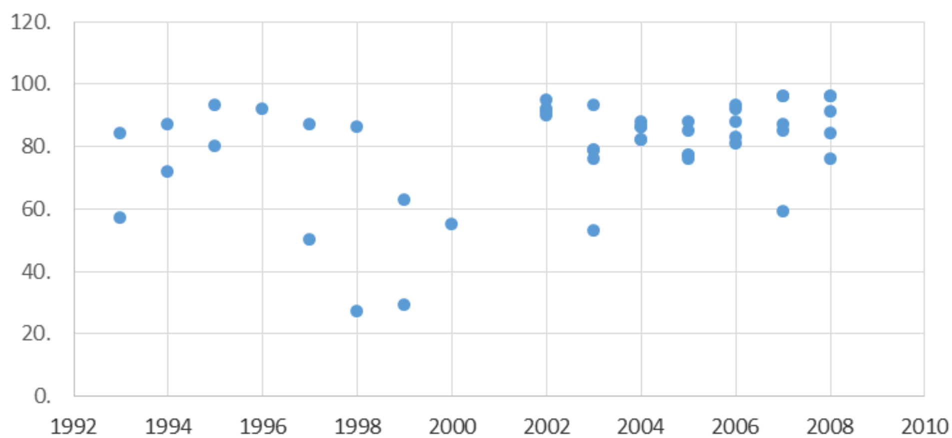
In fact, studies performed by the U.S. Geological Survey in 2009 demonstrated that the sediments in Suisun Bay have been observed to be a source of ammonia, such that there is evidence that ammonia may be a confounding factor in toxicity tests in Suisun Bay.[5]

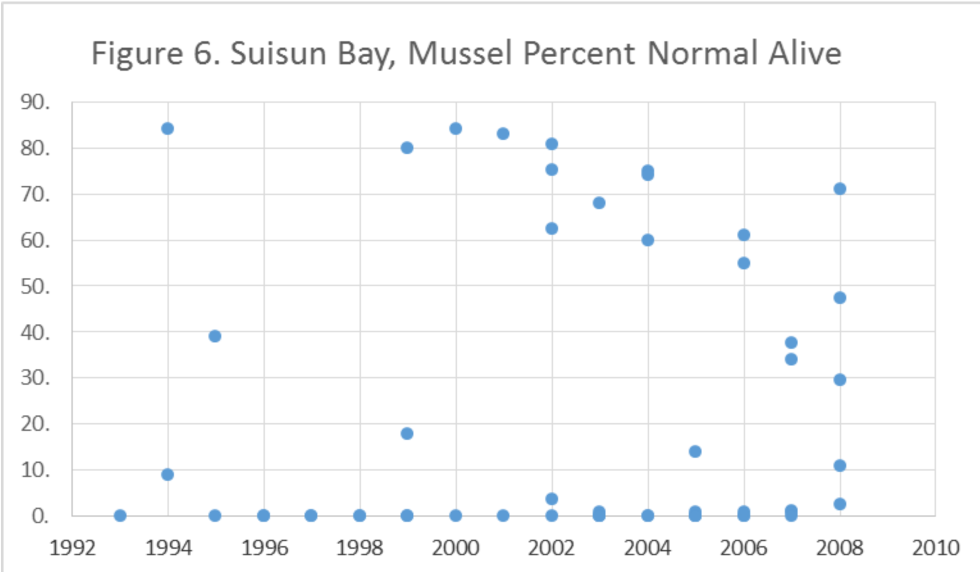
[5] USGS 2009. Benthic Flux of Nutrients and Trace Metals in the Northern Component of San Francisco Bay, California. U.S. Geological Survey. Scientific Investigations Report 2004-5196. Open File Report 2009-1286.

Table 3. Toxicity tests performed from 1993–2008, Suisun Bay

Year	Total Samples Evaluated	Toxic Samples	Range of Survival (as percent)	Toxicity Observed Based on Survival	Range of Normal Alive (as percent)	Toxicity Observed Based on Normal Development
1993	2	1	57–84	1	0	1
1994	2	1	72–87	1	9–84	1
1995	2	2	80–93	-	0–39	2
1996	2	2	58–92	1	0	2
1997	2	2	50–87	1	0	2
1998	2	2	27–86	1	0	2
1999	2	2	29–63	2	18–80	2
2000	1	1	55	1	0–84	1
2001	2	1	Not evaluated	-	0–83	1
2002	4	3	90–95	-	0–81	3
2003	5	4	53–93	1	0–68	4
2004	5	2	82–88	1	0–75	1
2005	5	5	76–88	1	0–14	5
2006	5	5	81–93	-	0–61	5
2007	5	5	59–96	1	1–38	5
2008	5	4	76–96	2	3–71	4

Figure 5. Suisun Bay, Amphipod Percent Survival





Similarly with the San Francisco Bay, Central and San Pablo Bay, it is our opinion that the RWQCB should not be evaluating the toxicity as constant over the entire period from 1993–2008, but rather they should evaluate toxicity from an annual perspective.

This is an important consideration because the toxicity testing is evaluating surficial sediments from areas experiencing continual additional deposition, thus samples collected earlier, most likely, are not in the biological active zone. Thus, the most recent samples should be used for the consideration of potential toxicity.

Additionally, without the concentration of ammonia and hydrogen sulfide evaluated during the toxicity testing, it is not possible to rule out the potential impacts of these confounding factors to the bivalve larval development test results.

Furthermore, we note that the toxicity data from 1 to 5 samples collected annually used as the basis for this proposed listing are between 9 and 24 years old. Given that conditions within the Suisan Bay may be improving over time, and given that sediment redistribution and deposition are expected over decadal timescales, it would be appropriate to obtain and use more recent data in assessing whether the water bodies should be 303 (d) listed for toxicity.

4. Use of "toxicity" as a metric for impairment must consider factors in the sediment that can influence a test organism's performance, such as grain size.

As noted in Decision IDs 66543, 66787, and 66672, the water quality criterion or objective used as the basis for the proposed toxicity listing provides that "All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in, human, plant, animal, or aquatic life (Region 2 Basin Plan)," and the RWQCB's proposed decision notes that "applicable water quality standards are exceeded and a pollutant contributes to or causes the problem." Thus, the proposed listing should not be made unless it can be established that the observed toxicity is due to a pollutant and not other factors.

The San Francisco Estuary is dominated by kaolin clay, a fine-grained material (Anderson et al. 2015).[6] Grain size has been shown to affect survival of marine amphipods such that a decrease in survival with an increase in percentage fine-grained material was observed (DeWitt et al. 1989).[7] U.S. Environmental Protection Agency (EPA) guidance on amphipod toxicity testing recommends that the characteristics of the sediment should be within the tolerance limits of the test organism (U.S. EPA 1994).[8]

The effect of grain size on the organisms that exhibited toxicity (amphipods and mussels; *E. estuarius*, *M. edulis*, and *M. galloprovincialis)* used to establish impairment in LOE 95805, 95810, and 95797 should be evaluated.

For example, impairment in LOE 95805 was based on toxicity observed in 29 out of 85 sediment samples collected from 1993–2008. For each of these 85 samples, two bioassays were performed, one using the amphipod *E. estuarius* and the other using a mussel, either *M. edulis* or *M. galloprovincialis.*

In 19 of the 29 samples that were toxic, toxicity was observed for *E. estuarius* only, and no toxicity was observed for the mussel. Further evaluation should be performed to determine why *E. estuarius* was more sensitive to these sediments than the mussel and to confirm that a "toxic substance" or pollutant was the causative agent for the observed "toxicity."

To assess the influence of grain-size characteristics on the toxicity of *E. estuarius*, a two-part study investigating the effects of kaolin clay on the amphipod was performed (Anderson et al. 2015[6]; Anderson et al. 2017[9]).

A series of laboratory experiments determined the percentage survival as a function of the percentage clay in sediment (0, 10, 30, 50, 70, 90, 100%) for three different size classifications based on weight. No clear dose-response pattern (percentage survival vs. percentage clay) was evident for experiments that tested high levels of clay (>50%).

6 Anderson B, Phillips B, Voorhees J. 2015. The effects of kaolin clay on the amphipod *Eohaustorius estuarius*. SFEI Report No. 755. University of California, Davis.

7 DeWitt TH, Swartz RC, Lamberson JO. 1989. Measuring the acute toxicity of estuarine sediments. Environ Toxicol Chem. 8:1035–1048.

8 U.S. EPA 1994. Methods for assessing the toxicity of sediment-associated contaminants with estuarine and marine amphipods. EPA600/R-94/025 Office of Research and Development Washington, DC.

9 Anderson B, Phillips B, Voorhees J. 2017. The effects of kaolin clay on the amphipod *Eohaustorius estuarius:* Part Two. SFEI Report No. 1194. University of California, Davis.

The authors posed several possible explanations for the inconsistency in the dose-response patterns. Based on all of the experiments, the authors concluded that smaller organisms were more tolerant to fine-grained sediments.

Some additional insights into the work of Anderson et al. (2015, 2017) are warranted to understand the findings. Anderson et al. conducted a series of five experiments over a two-year period; the experiments exposed the graded amphipods (small, medium, and large) to various concentrations of kaolin clay. The experiments performed by Anderson et al (2015, 2017) included:

- Experiment evaluated amphipod exposed in reference sand spiked with increasing concentrations of kaolin clay to determine whether there was a dose-based relationship between amphipod mortality and increasing concentrations of kaolin clay (Anderson et al. 2015).
- Experiment evaluated the amphipod size (small, medium, and large) and their responses after exposure to 100% kaolin clay (Anderson et al. 2015).
- Experiment further evaluated the relationship on amphipod size with sensitivity to kaolin clay by exposing the amphipod size classes to reference sands spiked with increasing concentrations of kaolin clay. However, insufficient organisms were available to adequately evaluate the hypothesis in this experiment (Anderson et al. 2015).
- This experiment repeated Experiment 3 when sufficient size-class amphipods were available (Anderson et al. 2015).
- Experiments presented above were repeated to ensure the results could be replicated (Anderson et al. 2017).
- Experiment using field samples high in kaolin clay was performed using the same testing strategy and size classes of amphipods as Experiment 5 (Anderson et al. 2017).

They also performed another experiment using field-collected clays rather than the commercially purchased kaolin clays. The following observations need to be discussed further:

- Experiments 3 and 4 were conducted in the same way, and each exhibited inconsistent dose-response (percentage survival vs. percentage clay). In Experiment 3, lower survival was observed for the medium- and large-sized organisms than in Experiment 4. On average, the percentages survival for the medium- and large-sized organisms were 51 and 61%, respectively, for Experiment 3, and 82 and 72%, respectively, for Experiment 4. The size distributions in Experiment 4 were generally larger than Experiment 3. This result conflicts with the conclusion that larger organisms are less tolerant of fine-grained material.

- Experiments 3, 4, and 5 were repeat tests that used organisms collected at different times of the year. A dose-response pattern for percentage survival as a function of percentage clay was evident only in Experiment 5.

- The dose-response data for percentage survival as a function of percentage clay are variable. This result could be related to the difficulty in testing high concentrations of clay, and the results may represent normal variability for these exposures. The data from Experiments 2, 3, 4, and 5 could be compiled and averaged to see if a clear dose-response is observed when the data are considered in their entirety.

- Results from the experiments conducted on field-collected sediments (Experiment 6) should be compared with results obtained using laboratory spiked sediments (Experiments 2–5) to see if effects on survival occur at similar clay concentrations. This comparison would give an indication whether there are other factors present in field-collected samples that may impact the health of the organisms.

The work of Anderson et al. (2015, 2017) suggests that *E. estuarius* is sensitive to the presence of fine-grained material. We recommend this issue be evaluated before characterizing these samples as toxic in order to evaluate if the apparent toxicity is caused by the failure of the test organisms to adjust to grain size rather than due to a “toxic substance.”

If sediment “toxicity” is to be utilized by the RWQCB as a metric for sediment impairment, perhaps an organism that is more tolerant to changes in grain size should be considered, such as *Leptocheirus plumulosus*, which can tolerate grain sizes between >5% silt and clay to <85% (U.S. EPA 2001).[10]

<u>Recommendation</u>: The potential for fine-grained sediments to produce a positive response in a toxicity test should be evaluated and eliminated before listing any water body for toxicity on the 303 (d) list.

[10] U.S. EPA. 2001. Methods for assessing the chronic toxicity of marine and estuarine sediment associated contaminants with the amphipod Leptocheirus plumulosus. EPA/600/R-01/020 Office of Research and Development, Office of Water, Washington, DC.

5. The toxicity testing performed on samples from 1993–2008 did not measure or account for potential impacts from naturally occurring ammonia and hydrogen sulfides.

Ammonia and hydrogen sulfides occur naturally in estuarine sediments and have the potential to complicate the interpretation of toxicity results (USACE 2015.[11] , USGS 2009)[12].

Ammonia and sulfides naturally accumulate in marine and estuarine sediments and can interfere and confound interpretation of toxicity from persistent anthropogenic chemicals in tests with amphipods (Ferretti et al. 2000),[13] bivalves such as mussels and oysters, and sea urchins (USACE 2015).

The U.S. Army Corps of Engineers (USACE) and EPA Regional Dredging teams have considerable experience and have developed testing procedures to address the potential for ammonia and sulfide concentrations in sediment to cause toxicity.

For example in Table 4, the Seattle District and EPA Region 10 user manual reports action levels for un-ionized ammonia and hydrogen sulfide. At these action levels, the user manual recommends a purging strategy for the sediments so that the samples can be tested both with and without purging in order to isolate and evaluate the toxicity associated with persistent anthropogenic chemicals.

Because the concentrations of ammonia or hydrogen sulfide are not reported for the sediment samples presented in LOE ID 95805, 95810, and 95797, the toxicity associated with these confounding variables cannot be assessed.

Without this information, we believe that these samples should not be listed as toxic for the purposes of 303 (d) listing.

[11] USACE. 2015. Dredged Material Evaluation and Disposal Procedures. User Manual. U.S. Army Corps of EngineersSeattle District, U.S. Environmental Protection Agency, Region 10, Washington State Department of Natural Resources, and Washington State Department of Ecology. November 2015.

[12] USGS 2009. Benthic Flux of Nutrients and Trace Metals in the Northern Component of San Francisco Bay, California. U.S. Geological Survey. Scientific Investigations Report 2004-5196. Open File Report 2009-1286

[13] Ferretti JA, Calesso DF, and Herman TR. 2000. Evaluation of methods to remove ammonia interference in marine sediment toxicity test. Environ Toxicol and Chem. 19:1935–1941.

Table 4. Action level for addressing interference and confounding factors for toxicity evaluations with bivalve larval development, sea urchin larval development, and amphipod toxicity tests (USACE 2015)[9]

Test organism/test	Un-ionized ammonia (mg/L)-action level for purging study	Hydrogen Sulfide (mg/L)-action level for purging treatment
Bivalve larval development test (using *M. edulis* or *M. galloprovincialis*)	0.02	0.0025
Sea urchin larval development test	0.007	0.01
Amphipod test (using *E. estuarius*)	0.4	0.122

Recommendation: We recommend that future toxicity testing evaluate the concentrations of ammonia and hydrogen sulfide in the sediment, and, should these be elevated, employ a purging testing strategy similar to that used by USACE and EPA to evaluate these potential confounding variables.

Unless and until these confounding variables are evaluated confirm that the toxicity in the sediment samples is caused by a “toxic substance,” these samples should not be used to place these water body segments on the 303 (d) list for toxicity.

6. Listing of a pollutant using the generic parameter of toxicity does not provide necessary causality information for the development of a total maximum daily load (TMDL).

While we understand the use of the generic parameter of toxicity as part of the 303 (d) listing process, we caution the RWQCB that without determining causality, appropriate total maximum daily load (TMDL) targets and allocations for a TMDL cannot be derived. Rather, it will be necessary to determine the cause of toxicity before management options can be fully and successfully implemented.

This is also one of the reasons the potential confounding factors such as ammonia and hydrogen sulfide from naturally occurring estuarine processes need to be understood before sediment samples are listed as impaired.

In conclusion, we believe there are insufficient lines of evidence to support the 303 (d) listing of San Francisco Bay, Central as presented in LOE ID 95805, San Pablo Bay (LOE ID 95810), and Suisun Bay (LOE ID 95797) for the following reasons:

- The sediment samples should be evaluated from an annual perspective rather than using the entire period of 1993–2008. Furthermore, it appears that amphipod survival may be improving in the second part of the period rather than the early period. Thus, this trend of improving sediment toxicity would be a substantial reason for not listing for toxicity. Furthermore, the toxicity data are between 9 and 24 years old. Given that conditions within the Bay may be improving over time, and given sediment redistribution and deposition, more recent data should be used to assess whether the water bodies should be 303 (d) listed for toxicity.

- Insufficient samples were evaluated for bivalve or urchin larval development, and the results were too highly variable, to conclusively determine whether these samples were consistently toxic. Furthermore, confounding factors such as naturally occurring ammonia and hydrogen sulfide concentrations were not evaluated during the toxicity testing, so these results are inconclusive for assessing persistent anthropogenic chemicals.

- The amphipod *E. estuarius* is an unsuitable as a test animal for the high-clay concentrations in San Francisco Bay. Because grain size is known to confound toxicity tests performed using this organism, the confounding factor of grain size must be evaluated before listing. Should future amphipod testing be performed, we recommend that an organism that is more tolerant to changes in grain size should be considered, such as *L. plumulosus*. Because grain-size impacts were not evaluated, these samples should not be used as the basis for listing.

- As discussed earlier, estuarine sediments should not be listed for toxicity without measuring and understanding concentrations of ammonia and hydrogen sulfide in the sediment. Amphipods, bivalve larvae, and sea urchins are all very sensitive to these naturally occurring compounds. Should future testing be performed on these sediments, it is important that the ammonia and hydrogen sulfides be evaluated; should they be elevated (above the action levels), a purging strategy with side-by-side testing such as that used by USACE and EPA should be employed to evaluate potential interferences from these constituents. Because ammonia and hydrogen sulfide concentrations do not appear to have been measured in the sediment samples, these samples should not be used to list the sediments in San Francisco Bay, Central, San Pablo Bay, and Suisun Bay. In addition, a listing for unspecified toxicity does not provide information on the cause of the apparent observed "toxicity" in sediments. As noted in these comments, it has not been established that a pollutant contributes to the observed "toxicity" in the Bay sediment samples. Without information on the cause of toxicity, it will not be possible to develop a TMDL or implement management actions to address the "toxicity" in these water bodies.

We appreciate the opportunity to provide our comments regarding the proposed 303 (d) listing for toxicity in the San Francisco Bay, Central, San Pablo Bay, and Suisun Bay. If you have any questions or require additional information, please let us know.

Sincerely,

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Principal and Director, Ecological and Biological Sciences Practice

Susan C. Paulsen, PhD., P.E.
Principal and Director, Environmental and Earth Sciences Practice