ALAMEDA COUNTY WATER DISTRICT
ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, ZONE 7
CONTRA COSTA WATER DISTRICT
KERN COUNTY WATER AGENCY
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
STATE WATER CONTRACTORS
SAN LUIS & DELTA-MENDOTA WATER AUTHORITY
SANTA CLARA VALLEY WATER DISTRICT
WESTLANDS WATER DISTRICT

See List of Counsel for Water Agencies in Attachment 1

BEFORE THE

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

In the Matter of the Sacramento Regional County Sanitation District's Petition for Review of Action and Failure to Act by Regional Water Quality Control Board, Central Valley Region, in Adopting Waste Discharge Requirements Order No. R5-2010-0114 (NPDES No. CA0077682) and Time Schedule Order No. R5-2010-0115 for Sacramento Regional County Sanitation District, Sacramento Regional Wastewater Treatment Plant.	SWRCB/OCC File Nos. A-2144(a) and A-2144(b) (Consolidated) **ERRATA TO WATER AGENCIES' RESPONSE TO DISCHARGER'S PETITION FOR REVIEW**

I. SUMMMARY STATEMENT

The "Water Agencies"[1] submitting this brief are concerned that the Sacramento Regional County Sanitation District (Discharger) petition for review (Petition) of Waste Discharge Requirements Orders R5-2010-0114 (NPDES No. CA0077682) (Permit) and R5-2010-0115 will delay implementation of critically needed improvements to the Sacramento Regional Wastewater Treatment Plant and will result in further and unnecessary harm to the Bay-Delta ecosystem and drinking water supply. The discharger has spent millions of dollars over three decades on a "waste is good," or at least harmless, campaign, despite ever mounting scientific evidence that its discharge is one of the principal stressors damaging the Delta, and instead of investing those funds in the wastewater plant improvements so apparently necessary. The process of repermitting this wastewater treatment plant facility has taken many years over which time there has been considerable decline in the Bay-Delta health. The data, as can be found in the record, are now accumulating to indicate the current treatment processes are significantly contributing to this decline in health. It is imperative that the State Board act quickly to uphold the Regional Board's permit requirements and, to protect the endangered species of the Bay-Delta, even accelerate implementation of nutrient removal.

During the State Water Resources Control Board (State Board) periodic review of the 2006 Water Quality Control Plan for the San Francisco Bay-Sacramento-San Joaquin Delta Estuary, if not before, representatives for many of the Water Agencies submitting this brief brought to the State Board their concerns with the discharger's impacts to the Delta. On page 5 of the State Board staff report prepared in support of that periodic review, the staff responded. Staff explained:

> Ammonia and toxicity are priority issues for the Water Boards and,

[1] The Water Agencies participated as designated parties in the Permit proceedings of the Central Valley Regional Water Quality Control Board (Regional Board) that are the subject of the Petition. The Water Agencies are Alameda County Water District, Alameda County Flood Control and Water Conservation District, Zone 7, Kern County Water Agency, Metropolitan Water District of Southern California, Santa Clara Valley Water District, Contra Costa Water District, State Water Contractors, Westlands Water District and the San Luis & Delta-Mendota Water Authority.

> at this time, staff recommends that they be addressed primarily by the San Francisco Bay and Central Valley Regional Water Quality Control Boards (Regional Boards) as part of their water quality control programs for control of point and non-point sources of waste. The State Water Board and Regional Boards will continue to coordinate their efforts on these issues through the Water Boards Bay-Delta Team, which consists of representatives from the Division of Water Rights, the Division of Water Quality, the Division of Financial Assistance, and the Regional Boards. Ammonia and toxicity effects on beneficial uses will also continue to be considered during the State Water Board's review of various flow objectives.

The State Water Board accepted its staff's recommendation. *See* SWRCB Resolution 2009-0065. *See also* Strategic Workplan for Activities in the Bay-Delta (July, 2008).

Consistent with the approach endorsed by the State Board, the State Board and Regional Boards (Water Boards) coordinated their efforts on total ammonia-related issues through the Water Boards Bay-Delta Team, but left primary responsibility with the Regional Boards. The Regional Boards built on many years of prior work and investing heavily in additional research and data analyses.[2] The Central Valley Regional Water Quality Control Board (Regional Board) considered the results of those scientific efforts and issued Waste Discharge Requirements Orders R5-2010-0114 (NPDES No. CA0077682) (Permit) and R5-2010-0115. The final discharge limitations contained in the Permit require the Discharger to perform long overdue improvements to treat pollutants in its wastewater discharges. To allow for the protection and enhancement of beneficial uses of water within the Delta, the Water Agencies ask the State Board to take all actions needed to support those final discharge limitations and to ensure they are achieved as quickly as possible.

II. THE PROFOUND IMPACTS ON THE DELTA OF THE DISCHARGER'S WASTEWATER WARRANT A PERMIT AT LEAST AS STRINGENT AS THE ONE ISSUED BY THE REGIONAL BOARD

Sacramento Regional County Sanitation District (Discharger) has petitioned for review (Petition) of Waste Discharge Requirements Orders R5-2010-0114 (NPDES No. CA0077682) (Permit) and R5-2010-0115, which require the Discharger to perform long overdue improvements

[2] See www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/ambient_ammonia_concentrations/index.shtml

to treat pollutants in its wastewater discharges. The "Water Agencies" respond to the Petition as parties that are directly, substantially, and adversely impacted by the Discharger's Sacramento Regional Wastewater Treatment Plant (Treatment Plant).

The Petition largely consists of a critique of the Regional Board's permitting actions under *Topanga Ass'n for a Scenic Comm. v. County of Los Angeles* (1974) 11 Cal.3d 506, which requires an agency to draw relevant sub-conclusions supportive of its ultimate decision, as such "roadsigns" present an agency's analysis distilled from a potentially vast and disconnected evidentiary record.[3] It is this roadmap that the State Water Resources Control Board (State Board) will look to in order to determine whether the Permit is warranted. Should the State Board find any gaps in the roadmap that can be filled with evidence in the record, it is incumbent on the State Board to perform that function, or order the Regional Board to do so.

The reasons for requiring the Discharger to install advanced treatment facilities are compelling. The discharge is through a giant, 10-foot diameter, 400-foot long diffuser in the Sacramento River (River) that occupies designated critical habitat for various protected fish, and impacts a broad area because of poor mixing and documented engineering problems. The plume near the diffuser likewise occupies designated critical habitat, and consists of a turbulent brew of heated, toxic water, inhospitable to coldwater salmon and weak swimmers like the Delta smelt, displacing fish to narrow, unproven "zones of passage," if they exist and can even be found. Waste constituents in the discharge consume precious oxygen, depressing levels in the River below those safe for aquatic life miles downstream. Wastewater constituents are being detected not only in the River, but also downstream in the Sacramento and San Joaquin Delta, and further downstream in Suisun Bay, a full 80 miles from the diffuser. The wastewater is contributing to nuisance algal growth in distant water supply reservoirs filled with Delta water, and associated water treatment problems. These and other problems are manifest.

The real question here is: how was this failure of the federal Clean Water Act allowed to go on unabated for so long? Ultimate responsibility rests with the Discharger. Instead of

[3] *Id.* at 516-517.

accepting the considered judgment of the Regional Board and moving forward to address its discharge, the Discharger filed a 177-page petition, finding fault in almost every nook and cranny of the Permit. The Petition has foisted on the Water Boards a need to assure a robust set of *Topanga* "roadsigns," so that no Superior Court is tempted by the sheer volume of objection from the Discharger to find some fault. We stand ready to assist and are counting on the Water Boards to protect the waters upon which 25 million people rely, and which support a trillion dollar economy, including $27 billion for agriculture.

Notwithstanding the positive step represented by the Permit, the Delta crisis may not be over until the Discharger's harmful practices are curtailed. Given that reality, we respectfully request the Permit not just be upheld, but strengthened. The importance of our request is underscored by the Discharger's remarkable insistence that its waste is not adversely affecting the receiving waters, and that the Board's Antidegradation Policy does not even apply to it. At a minimum, we request the following permit improvements:

- ***First***, the Permit's 10-year timeframe for treatment plant improvements is too long. A decade for these improvements exposes the Delta to continued harm from the discharge, impacting precious resources, violating the water quality standards, and impairing beneficial uses. Under no circumstances should this timeframe ever be relaxed, and any opportunity to shorten it should be seized upon. The Permit should incorporate additional provisions that keep the Discharger on a strict schedule, with milestones identified and specified far in advance, and significant penalty for failure to comply. There is nothing infeasible with meeting this schedule ***if*** the Discharger is motivated to do so.
- ***Second*****,** interim limits on total ammonia nitrogen are too lax, and would allow total ammonia discharges to increase in coming years, despite the Discharger's demonstrated ability to use process improvements and operational approaches to limit these wastes to at or below recent performance. Interim measures like side-stream treatment need to be explored aggressively, as such measures have the

potential to mitigate further current conditions while permanent wastewater treatment facilities are being built. The pollution prevention plan must be strengthened as a vehicle to implement interim measures and allow for public oversight and comment.

- ***Third***, the Water Boards should remove the interim total ammonia nitrogen limits from the Permit and issue them through a stand-alone enforcement order. Such would be consistent with requirements imposed on other large municipal waste dischargers, such as the City of Stockton treatment plant, and serve to keep the Discharger focused on achieving timely compliance. The Discharger's pervasive non-compliance with water quality standards warrants such an approach, and corresponding findings.

Despite these concerns, a permit with requirements at least as stringent as those in the Permit unequivocally is required. Ample evidence to support such permit terms is present including, without limitation, the following:

- *The Discharger is the dominant source of nitrogen to the Delta, a sensitive estuary that has, and will continue to be, impacted adversely by such large nitrogen loading*. Nitrogen loading, in the form of total ammonia nitrogen, is problematic on many levels in the Delta, resulting in adverse impacts such as the following:
    - It degrades the integrity of at least three water bodies (the Sacramento River, the Sacramento-San Joaquin River Delta, and Suisun Bay), detectable at harmful levels 80 miles downstream of the discharge.
    - It exerts toxic effects at the base of the food web, depressing the primary productivity of the most important estuary on the Pacific coast.
        - Field samples and laboratory tests analyzed by highly regarded researchers, including from the University of California and the California State University systems, demonstrate that total ammonia nitrogen would have to be reduced by a factor of at least 21 to protect various small organisms upon which local fish

and other creatures graze.

- A peer-reviewed scientific paper (Glibert 2010) links these total ammonia nitrogen effects to the food supply of the Delta smelt, and explains that the smelt will not likely recover until total ammonia nitrogen is controlled.
- Depressing the food supply upon which fish rely impacts those fish, and may depress overall fisheries' yields.

  - At the same time, the ammonium stimulates the growth of undesirable and harmful bacteria, such as cyanobacteria, which itself can be toxic and adversely impact municipal water supplies.
  - The nuisance algal growth stimulated by these excess nutrients further violates the standards by creating harmful tastes and odors in violation of the Basin Plan. The Discharger must not be allowed to violate these water quality standards.

- *The Discharger's total ammonia nitrogen converts to nitrate once in the river, depleting precious oxygen*. The Discharger is illegally using the Delta to treat its total ammonia nitrogen, relying on Delta processes to convert it to nitrate. This conversion consumes significant amounts of dissolved oxygen essential to healthy fisheries such as the endangered salmon and Delta smelt. The oxygen demand is so high that it causes violations of dissolved oxygen standards miles downstream from the Treatment Plant. The Permit requires the Discharger to internalize this nitrification process at the Treatment Plant, finally stopping the Discharger from using the river for waste treatment.

  - The Discharger has expressed some willingness to add partial nitrification at the Treatment Plant, but wants to do no more to address its total nitrogen load. This is completely unacceptable as it simply exchanges one form of nitrogen (total ammonia) for another (nitrate). The proposed discharge of this new form of waste nitrogen (nitrate) is one of the clearest examples of how Antidegradation Policy is essential in this permit proceeding, as the Regional Board recognized.
  - Full nitrification (meaning total ammonia nitrogen in discharge is limited to no more

than 2.2 mg L on a daily basis and 1.8 mg L on an average monthly basis) is necessary for the reasons discussed above, among others.

- Denitrification (meaning nitrate in discharge is limited to no more than 10 mg L) is necessary as it can be anticipated based on current conditions and basic science that the nitrate will create major problems itself.
- Nitrate from the Treatment Plant reasonably would be expected to cause significant problems such as the following:
  - Because of the in-stream conversion from total ammonia nitrogen, the Treatment Plant already is doubling the nitrate load in the Sacramento River, as seen from upstream/downstream stations. Downstream concentrations are above thresholds where eutrophication potential is present. Excessive aquatic growth has been documented in Delta channels, and even the Clifton Court Forebay, presenting nuisance conditions likely from total nitrogen loads.
  - Once in shallow water supply canals or distant reservoirs where sunlight is more prevalent and light penetration greater, nitrate problems from Delta water and the Treatment Plant become manifest.

- *The wastewater filtration requirements in the Permit will remove harmful pathogens known to be present in the wastewater like Giardia and Cryptosporidium, restoring the integrity of the River and water supplies derived from it*. The plumbing of the Delta is upside down, with the waste coming in at the top, and the water supply coming out at the bottom. Advanced filtration not surprisingly has become the norm at wastewater treatment plants in this watershed, preserving the integrity of the high-quality receiving waters and the municipal and irrigation uses that depend on them. Advanced filtration has become the norm, so that dischargers are not allowed to export public health problems, or any non-negligible risk thereof. The filtration requirements in the Permit will bring the Discharger in step with other treatment plants, protect people swimming in the Sacramento River, prevent pathogens from being applied to local crops irrigated with river water, and will preserve the integrity of

municipal water from the Delta now and in the future, whether from existing diversions or new ones.

- *Antidegradation Policy requires full nitrification and denitrification, and advanced filtration.* This discharge has never gone through a meaningful Antidegradation Policy analysis until the Regional Board insisted on one for this Permit. The Discharger proposes to increase its wastewater discharge volumes by about 28% (from 141 mgd to 181 mgd), and would do so without removing the many pollutants in these new wastes. At most, the Discharger would convert one waste (total ammonia) for another (nitrate) – wastewater legerdemain. The Discharger tried to process its stripped down version of plant expansion (i.e., expand volume, but not treatment) through CEQA, but was overturned by the Superior Court. The treatment package of the Permit has not been subject to an EIR as a preferred alternative. Notwithstanding, Discharger argues it is immunized from anti-degradation because its new permit does not authorize wastewater volumes above previously authorized volumes. This is wrong; the Permit's treatment requirements ineluctably flow from Antidegradation Policy as:
    - Nitrification/denitrification and tertiary filtration needed to comply with the Permit are affordable and routinely used in many districts in surrounding communities, including Stockton, Roseville, Tracy and Lodi.
    - Other similarly situated treatment plants such as in the Santa Ana watershed where waste discharges are upstream of municipal water supply diversions employ similar advanced treatment.
    - Plants that discharge to rivers above other sensitive estuaries (e.g., Chesapeake and Narragansett Bays) employ similar advanced treatment.
    - Sewer fees for the Discharger's customers would be within the range of comparable districts even assuming the unlikely and perhaps exaggerated rate cases asserted by the Discharger.
    - The Discharger has no right to discharge and pollute receiving waters, and in doing so has placed an undue burden on the surrounding regions, and has resulted in significant

environmental damage and cost.

- *The Regional Board provided more than ample process to the Discharger*. The Regional Board exercised extraordinary patience over a decade allowing the Discharger to try to make its case. The Regional Board's series of informal and formal proceedings have resulted in a robust Permit and extensive record that is the product of intensive analysis by Regional Board staff. The Discharger seems to forget that it — not the Water Boards — bears the burden of persuasion here, a burden the Discharger plainly has not met.
- *The record demonstrates that the Regional Board fully considered the Discharger's input and properly documented the Permit*. Indeed, the Regional Board designed many Permit features in light of that input, and fully was within its discretion when it adopted a Permit that did not grant the Discharger the relief it was seeking. The Discharger argues, without merit, that the Regional Board's Response to Comments is inadequate because it fails to address each and every report incorporated by reference in the Petition. The Regional Board never had an obligation to respond in this manner, particularly when it had been so responsive over the course of the prior decade.

This Petition presents an important opportunity to address a key Delta plumbing problem and stressor – the Treatment Plant. There is no time to waste as this Plant goes about its business every day; the Delta and the millions of Californians who rely on it are suffering the consequences.

III. BACKGROUND AND PROCEDURAL HISTORY

The Permit provides an accurate but brief description of the Discharger and its Treatment Plant.[4] A more complete historical look shows a discharger that has resisted investments in improved treatment for decades. Its current resistance to deal squarely with the major impacts of its discharge is adversely affecting the Delta and downstream beneficial uses which is consistent with a long history of focusing on cost avoidance.

[4] Permit, pp 4-5.

The history also shows that the core issues in the current Permit – the need to upgrade the Discharger's secondary level plant with nitrification/denitrification and filtration – are not new. The Discharger has long known these treatment upgrades would one day be necessary and has planned for their implementation at least as far back as 1992. Yet it has until now avoided any significant upgrades to its Treatment Plant. Despite the fact that the Regional Board has required such improvements in treatment technology from numerous other dischargers throughout Region 5, the Discharger's Treatment Plant, originally financed with extensive state and federal grant funds, remains essentially unchanged from its original 1970s era design.

The record similarly shows that the Regional Board did not impose the Permit requirements at the last minute, in a "renewal characterized by haste."[5] To the contrary, the Regional Board has been discussing with the Discharger the need for nitrification/denitrification, filtration, and other plant improvements for nearly a decade. The Permit terms were developed through a comprehensive five-year review process conducted by the Regional Board that involved considerable deliberation with the Discharger despite no legal obligation to do so.

A. The Discharger Has A Long History Of Resisting Treatment Plant Upgrades

The Discharger was formed in 1973 to take advantage of state and federal funding to centralize the greater Sacramento area's approach to sewage collection and treatment.[6] Design and construction of the Treatment Plant began in 1977 and it was brought on line in 1982.[7]

Increasing treatment capacity. The Treatment Plant was originally designed with an Average Dry Weather Flow (ADWF) capacity of 136 million gallons per day (mgd).[8] Two years after the Treatment Plant came on line, the Discharger sought and received a capacity re-rating to

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[5] Petition, p. 15.

[6] *See, e.g.*, SRCSD 2011, Notice of Proposed Rate Adjustment and Public Hearing Date (2011) http://www.srcsd.com/pdf/218-mailer.pdf.

[7] *Id.*

[8] Regional Board, Order No. 77-137, Waste Discharge Requirements, June 24, 1977.

150 mgd.[9] Soon thereafter, the Discharger estimated that the re-rated capacity of 150 mgd would be exceeded by 1990, and so began a program to investigate ways of further increasing capacity.[10] The Discharger settled on a plan that squeezed even more capacity out of the original plant by focusing on hydraulic capacity improvements (i.e., processes that treat wastewater flow).[11] This expansion plan would bring the Treatment Plant to its current permitted capacity of 181 mgd.[12] In 1988 the Discharger completed a supplemental Environmental Impact Report (EIR) for the expansion and in 1990 sought and obtained approval for the re-rated capacity of 181 mgd.[13]

1. The Discharger Has Repeatedly Prepared And Then Rejected Master Plans Providing Treatment Upgrades

In the early 1990s, the Discharger began a series of master planning efforts to prepare for further capacity increases and treatment process upgrades that were likely to be imposed on its Treatment Plant's secondary treatment process. A primary regulatory driver for the first master planning effort was the State Board's adoption of the Inland Surface Waters and the Enclosed Bays and Estuary Plan,[14] which contained standards for toxic pollutants to fulfill requirements of the federal Clean Water Act – standards that could not be met with the Discharger's secondary treatment level.

1992 Master Plan: The 1992 Master Plan outlined treatment plant upgrades over a twenty-year period (ending in 2010), including four scenarios of treatment requirements: (1) continuation of existing secondary treatment; (2) advanced filtration for metals removal and nitrifying trickling filters for total ammonia reduction; (3) tertiary filtration and reverse osmosis but no total ammonia reduction; and (4) an advanced scenario that included filtration, reverse

[9] Regional Board, Order No. 84-077, Waste Discharge Requirements, June 22, 1984.

[10] SRCSD 1992, Sacramento Regional Wastewater Treatment Plant Master Plan, prepared by John Carollo Engineers, September 1992.

[11] *Id.*

[12] *Id.*

[13] Regional Board, Order No. 90-284, Waste Discharge Requirements, November 2, 1990.

[14] State Board Resolution No. 9l-33, April 11, 1991.

osmosis, and total ammonia reduction.[15] Regulatory drivers for tertiary treatment upgrades included the Inland Surface Waters and Enclosed Bays plans, a shift to a water-quality based method of control prompted by 1987 Clean Water Act amendments, the 1989 Central Valley Water Quality Control Plan (Basin Plan), the 1990 Pollutant Policy Document for the Delta, and state and federal Antidegradation Policies.[16] With regard to antidegradation, the 1992 Master Plan noted that these "policies . . . have remained dormant for years. However, both have recently resurfaced as a result of legal action against EPA."[17]

The Discharger won a reprieve in 1994 when, in litigation brought by the City and County of Sacramento, among others, a court ordered the State Board to rescind the Inland Surface Waters Plan and the Enclosed Bays and Estuary Plan.[18] With the regulatory requirements pushed back, the Discharger began an update to its 1992 Master Plan.

1994 Master Plan: In 1995, the Discharger completed its "1994 Master Plan Update." The 1994 Master Plan recognized that future regulatory requirements for metals and total ammonia reduction might nonetheless require implementation of tertiary treatment in the future, and maintained a plan for tertiary treatment including total ammonia reduction, filtration, and possibly reverse osmosis.[19]

Draft EIR for 1994 Master Plan Update: In April 1996, the Discharger released a Draft EIR for the updated Master Plan 2010.[20] The draft EIR acknowledged the impacts of the discharge, including the "[a]dditional quantities of metals, salts, organics, and other compounds would be discharged into the river due to the increased flow" and that "the increase in the effluent

[15] SRCSD 1992, pp 1-4; 2-2.

[16] *Id.*, pp 2-12 – 2-25.

[17] *Id.*, p. 2-24.

[18] *See* State Board Resolution 94-87.

[19] SRCSD 1995, Sacramento Regional Wastewater Treatment Plant Master Plan, prepared by John Carollo Engineers, August 1995, pp. 5-1, 5-3.

[20] SRCSD 1996a, Sacramento Regional Wastewater Treatment Plant Master Plan DEIR, prepared by ESA, April 1996.

discharge to the Sacramento River [] could cause detrimental warming of the river water," but the EIR did not propose tertiary treatment mitigation. Many of the Water Agencies reviewed the 1996 Draft EIR and submitted written comments detailing concerns, including impacts on aquatic species (i.e., Delta smelt, salmon) and corresponding restrictions on State Water Project (SWP) and Central Valley Project (CVP) operations, and other significant water quality impacts caused by the Treatment Plant's discharge, including salinity loading, total organic carbon (TOC), and pathogens (Giardia and Cryptosporidium).[21]

The State of California also expressed concern over loadings of TOC and dissolved organic carbon, pathogens, salinity, and an inadequate discussion of adverse effects on downstream beneficial uses in the 1996 Draft EIR.[22] The Discharger released a Final EIR for its Master Plan in August 1996.[23] The commenting Water Agencies reiterated their concerns.[24] In light of the comments, the Discharger abandoned this EIR process and started over "because of disagreements among technical experts . . ., particularly impacts to surface water quality."[25]

1997 Revised Draft EIR for Master Plan: In 1997, the Discharger released a revised Draft EIR for its Master Plan.[26] In the 1997 Draft EIR, the Discharger acknowledged the potential for significant water quality impacts from its Treatment Plant, including from increased loading of salinity, TOC, pathogens, and from thermal effects.[27] The 1997 Draft EIR concluded that source control, expansion of water reclamation programs, tertiary treatment of effluent, and

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[21] SRCSD 1996a, Sacramento Regional Wastewater Treatment Plant Master Plan FEIR, August 1996, pp. 2-3 – 2-17.

[22] *Id.*, p. 2-18.

[23] *See* SRCSD 1997a, Sacramento Draft Environmental Impact Report (Revised), September 1997, preface page.

[24] *Id.*, pp. H-17 – H-31.

[25] *Id.*, preface page.

[26] *Id.*

[27] *Id.*, pp. 2-11, 2-12, 2-13, 2-16.

changed operations would reduce water quality impacts to less-than-significant levels.[28] With regard to tertiary treatment, the Draft EIR specifically acknowledged the potential need for filtration, total ammonia reduction facilities, and reverse osmosis.[29]

Abandoned 1997 EIR: For unspecified reasons, the Discharger abandoned the 1997 EIR process and started over.

The Discharger's entirely new Treatment Plant master planning effort sought to avoid significant compliance expenditures in part through a "watershed approach" of addressing water quality issues.[30] This was in keeping with the Discharger's overarching philosophy of cost avoidance, with which the 1997 Draft EIR was apparently out of step: "Over the past eight years [since 1990] the District has identified several regulatory proposals which would have required significant expenditures by the District without commensurate benefits to the river. The District has successfully opposed such proposals."[31]

2003 Revised Draft EIR for 2020 Master Plan: In 2003, the Discharger released a Draft EIR on its new "2020 Master Plan" (2003 Draft EIR).[32] This new, draft EIR attempted to analyze only constructing additional conventional secondary treatment facilities to increase the Treatment Plant capacity to 218 mgd.[33] While the 1997 Draft EIR identified several potentially significant water quality impacts from the Treatment Plant's discharge, the 2003 Draft EIR now concluded that all water quality and aquatic biological impacts were not significant.[34] Indeed, the 2003

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[28] *Id.*

[29] *Id.*, pp. 4-29 – 4-32.

[30] *See* SRCSD 1997b, Letter to Board of Directors, Resolution Authorizing the Chair to Execute an Agreement with Carollo Engineers for Engineering Services to Prepare the 1998 Master Plan Update, September 10, 1997; SRCSD 1998, letter to Board of Directors, Presentation on the Sacramento Regional County Sanitation District's Watershed Approach to Addressing Regional Water Quality Issues, June 10, 1998.

[31] *Id.*

[32] SRCSD 2003, Sacramento Regional Wastewater Treatment Plant 2020 Master Plan Draft EIR, prepared by EDAW, Inc., August 2003.

[33] *Id.*, pp. 2-2, 3-22.

[34] *Id.*, pp. 2-13 – 2-23, 2-24 – 2-25.

Draft EIR found that the Treatment Plant expansion's sole significant impact was from construction impacts, like "dust."[35] The 2020 Master Plan had a contingency plan for tertiary treatment.[36] Yet despite finding that tertiary filtration was "environmentally superior to the proposed project because it would result in similar or lesser loadings of mercury, TDS, pathogens, chlorpyrifos, and diazinon and other constituents," the Discharger rejected it since it "would not reduce any of the project's significant or potentially significant impacts."[37] The other tertiary treatment option – reverse osmosis – was dismissed out of hand based on cost and energy consumption grounds.[38]

Objections to 2020 Master Plan: Many of the Water Agencies objected to the Discharger's water quality analysis and impact conclusions; failure to adequately consider tertiary treatment and other alternatives; inadequate analysis of cumulative impacts; lack of data; and truncated project description.[39] The Regional Board also objected to the 2003 Draft EIR, noting concerns with the lack of a full tertiary treatment alternative including total ammonia removal; compliance with the Thermal Plan; Antidegradation Policy; the data used; the computer model used; cumulative effects; the analysis of impacts from chlorine, toxicity, and total ammonia; river dilution; dissolved oxygen; nearby water intakes; and groundwater/sludge disposal.[40]

Litigation invalidated EIR: The Discharger proceeded to approve the project in 2004 without adopting mitigation for the water quality impacts identified in the extensive comments. Following a year of attempted settlement negotiations, six of the Water Agencies successfully challenged the Discharger's project approval under the California Environmental Quality Act

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[35] *Id.*, p. 2-27.

[36] *Id.*, pp. 2-5 – 2-6.

[37] *Id.*, p. 6-15.

[38] *Id.*, p. 6-12 – 6-13.

[39] SRCSD 2004, Sacramento Regional Wastewater Treatment Plant 2020 Master Plan Responses to Comments and Additional Information (Final EIR), prepared by EDAW, Inc., May 21, 2004, pp. 3-69 – 3-71, 3-79 – 3-82, 3-98 – 3-100, 3-103 – 3-108.

[40] *Id.*, pp 3-11 - 3-20.

CEQA).[41] In February 2008, the Sacramento Superior Court entered Final Judgment against the Discharger, invalidating its EIR and project approval.[42] The trial court found the EIR's analysis of water quality impacts was deficient and violated CEQA with respect to nutrient loading, pathogen loading, total organic carbon, chloride, chlorine, double dosing, and cumulative water quality impacts.[43] The Discharger has appealed the trial court decision and that appeal remains pending before the Third District Court of Appeal.[44] The Discharger has not done a remedial CEQA review.

2005 Permit Application: In 2005, the Discharger sought a new discharge Permit from the Regional Board for an expanded discharge of 218 mgd, corresponding with the planned expansion under the 2020 Master Plan. With the court's invalidation of the Discharger's EIR and expansion approval, the Water Agencies maintained that the Discharger did not have authority under CEQA to request the capacity increase.[45] On June 10, 2010, the Discharger withdrew its request for a capacity increase to 218 mgd and instead sought renewal of its discharge Permit at the existing permitted capacity of 181 mgd.[46]

For 29 years the Discharger has been able to avoid any significant investments in its Treatment Plant (originally constructed with grant funding), even though it has maintained backup tertiary treatment plans for at least 19 of those years. It has avoided making needed

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[41] *See* Robinson, E. 2010. Memorandum to State Water Contractors, Contra Costa Water District, and San Luis & Delta-Mendota Water Authority from Eric Robinson, Kronick, Moskovitz, Tiedemann & Girard, re: Impact of 2020 Master Plan EIR Litigation On Sacramento Regional Sanitation District NPDES Permit Application for Sacramento Regional Wastewater Treatment Plant, NPDES Permit No. CA0077682, May 26, 2010.

[42] *Id.*, p. 2.

[43] *Id.*, Ruling, p. 27 of 29.

[44] *Id.*, p.2.

[45] Robinson, E. 2010; Water Agencies 2010, Comments on Drinking Water Supply and Public Health Issues Concerning the Sacramento Regional Wastewater Treatment Plant NPDES Permit Renewal, February 1, 2010, pp. 2-3.

[46] SRCSD 2010, Press Release "SRCSD Withdraws Treatment Plant Capacity Increase Request, June 10, 2010.

upgrades by aggressively attacking regulatory programs and steadfastly holding on to its claim that its discharge has no adverse water quality effects, despite mounting evidence to the contrary. The Treatment Plant is now woefully out of step with the times and with other dischargers within the Central Valley region and beyond.

B. The Treatment Plant Is Out Of Date

The Permit will require that the Discharger upgrade its Treatment Plant with nitrification and denitrification (i.e., nutrient removal) and filtration facilities. In facing that requirement, the Discharger is not being singled out to invest in new or unproven technology. To the contrary, a review of NPDES Permits throughout the region shows that the Discharger is among 24 other treatment plants that are required to incorporate both nutrient removal and tertiary filtration. These plants are illustrated in Table 1. A spreadsheet summarizing the major Permit requirements for these wastewater plants is provided in Attachment 2.[47]

Table 1. Treatment Requirements for Central Valley Wastewater Treatment Plants.

Discharger	Permitted Average Dry Weather Flow, mgd	Treatment Requirements	
		Nitrification Denitrification	Tertiary Filtration
Sacramento	181	✓	✓
Stockton	55	✓	✓
Turlock	20	✓	✓
Roseville - Dry Creek	18	✓	✓
Manteca	17.5	✓	✓
Tracy	16	✓	✓
Roseville - Pleasant Grove	15	✓	✓
Vacaville	15	✓	✓
Woodland	10.4	✓	✓
Lodi	8.5	✓	✓
Davis	7.5	✓	✓

[47] This table has been updated from Attachment 2 of the Water Agencies Comments on the Tentative Order to reflect orders that have since been adopted by the Regional Board. *See also* West Yost Associates, Wastewater Control Measures Study (March 2011), available at http://www.swrcb.ca.gov/rwqcb5/water_issues/drinking_water_policy/dwp_wastewtr_cntrl_meas_stdy.pdf. This report, prepared for the Regional Board, lists 26 treatment plants that are currently achieving nutrient removal and tertiary filtration and 9 additional treatment plants that are required by current NPDES permits to achieve this standard of treatment. The report also identifies three treatment plants that are currently required to filter their effluent but do not have nutrient removal requirements.

Discharger	Permitted Average Dry Weather Flow, mgd	Treatment Requirements	
		Nitrification Denitrification	Tertiary Filtration
Mountain House	5.4	✓	✓
Olivehurst	5.1	✓	✓
Brentwood	5.0	✓	✓
Linda County Water District	5.0	✓	✓
Galt	4.5	✓	✓
El Dorado Irrigation District – El Dorado Hills	4.0	✓	✓
El Dorado Irrigation District – Deer Creek	3.6	✓	✓
Grass Valley	2.78	✓	✓
Placerville	2.3	✓	✓
Placer County Sewer Maintenance District	2.18	✓	✓
Auburn	1.67	✓	✓
Willows	1.2	nitrification	✓
Rio Vista – Northwest	1.0	✓	✓

Nitrification/denitrification has been required of many other dischargers to control water quality degradation due to discharge of total ammonia and nitrate, which affect the same beneficial uses designated for the River and Delta. In many instances, nitrification/denitrification and tertiary filtration implements Best Practicable Treatment or Control (BPTC).

Celeste Cantu, the General Manager of the Santa Ana Watershed Project Authority, in her testimony before the Regional Board, discussed standards for wastewater treatment plants in the Santa Ana Region.[48] Dischargers in the Santa Ana Region discharge into a drinking water source as well as important habitat, much like the Delta.[49] But since the 1990s, the Santa Ana Region has reached full tertiary treatment standards to protect its water for reclamation, habitat, and as a drinking water source.[50] "The Santa Ana River is protected because of its vital importance regionally. The Delta needs protection because of its vital state and national importance."[51]

[48] Meeting, State of California, Central Valley Regional Water Quality Control Board, Partial Transcript (December 9, 2010), Tiffany C. Kraft, CSR (Hearing Transcript), p. 34.

[49] *Id.*

[50] *Id.*

[51] *Id.*

The Water Agencies noted in their testimony that given the magnitude of impact from the Discharger's Treatment Plant – both in terms of sheer volume of discharge and the environmental sensitivity of discharging within the fragile Delta – few dischargers in the region are truly "similarly situated."[52] The Water Agencies suggested the Blue Plains Wastewater Treatment Plant in the District of Columbia would provide a more appropriate comparison.[53] Like the Discharger's Treatment Plant, that facility is the largest POTW in its watershed and discharges to the largest estuary on its coast – in each case an estuary which supports an extremely valuable but fragile ecosystem and significant recreation, fishing, municipal, and other important uses.[54] But unlike the Discharger's Treatment Plant, for years the Blue Plains facility has been addressing the water quality problems of its discharge by implementing nutrient reduction facilities and tertiary filtration.[55] The information presented to the Regional Board on this point is reproduced in Table 2. Since implementing nitrogen reduction, Chesapeake Bay and Potomac River aquatic health has rebounded, with improved habitat quality, increased diversity, and native species abundances.[56]

[52] Hearing Transcript, pp. 271-271.

[53] *Id.*

[54] *Id.*

[55] *Id.*

[56] Ruhl, H.A. and N.B. Rybicki. 2010. Long-term reductions in anthropogenic nutrients link to improvements in Chesapeake Bay habitat.

Table 2. Comparing the Sacramento Regional and Blue Plains Wastewater Treatment Plants

Sacramento Regional WWTP	Blue Plains WWTP
Discharges to the Sacramento River and Bay-Delta: • Largest estuary on the west coast • Valuable ecosystem supporting a wealth of plants and animals and several listed species. • Also supports significant recreation, fishing, municipal, and other important uses.	Discharges to the Potomac River and Chesapeake Bay: • Largest estuary on the east coast • Valuable ecosystem supporting a wealth of plants and animals and several listed species. • Also supports significant recreation, fishing, municipal, and other important uses.
• Largest POTW in watershed • 181 mgd, serves 1.3 million	• Largest POTW in watershed • 370 mgd, serves 2.0 million
• No significant upgrades since 1982 on-line date	• Began nutrient reduction in 1996; latest permit requires total reduction of 60%* • Tertiary filtration completed in 2007
Only major WWTP in watershed without advanced treatment	*Largest advanced WWTP in the world*

*The Blue Plains facility must achieve a total nitrogen (TN) effluent limit of 4.4 million lbs/year by 2015. (U.S. EPA 2010, NPDES Permit No. DC0021199, August 31, 2010, p. 55.)

C. The Permit Is A Product Of A Comprehensive Five-Year Permit Review Process, And Significant Interaction Between The Discharger And The Regional Board On The Major Permit Issues For At Least A Decade

The Discharger suggests that the Regional Board imposed the Permit requirements at the last minute, in a "renewal characterized by haste, particularly as related to the major issues that are the subject of this appeal."[57] To the contrary, the Regional Board has been discussing with the Discharger the need for nitrification/denitrification, filtration, and other plant improvements for at least a decade.

In February 2005, the Discharger filed its application. After years of coordination with

[57] Petition, p. 15.

the Discharger, the Regional Board issued a Tentative Permit in September 2010 and released a revised Tentative Permit in November 2010. By order dated December 9, 2010, the Regional Board approved the Permit on substantially the same terms as the revised Tentative Permit. The Regional Board's process, which went well beyond its statutory duties, ensured that the Discharger's and stakeholders' voices were heard.

Even prior to the Discharger's 2005 permit renewal application, however, the Discharger and the Regional Board engaged in substantive discussions regarding the principal issues now raised by the Discharger's Petition. Technical support for the 2005 permit application effectively began with development of the "2020 Master Plan" and the Discharger's August 2003 Draft EIR, discussed *supra*. As early as September 2003, in its comments on the 2003 Draft EIR on the 2020 Master Plan, the Regional Board expressed concerns regarding issues that would later become the subject of Permit requirements, including total ammonia and nutrient removal, tertiary treatment, compliance with the State Board's Thermal Plan, Antidegradation Policy requirements, dynamic modeling, and toxicity.[58]

The Regional Board continued to address each of these issues with the Discharger throughout the permit renewal process through various forms of correspondence. From 2004 into 2010, Permit Renewal Meetings were held regularly at the offices of the Regional Board. During these meetings, the Discharger's staff and consultants met with Regional Board staff to discuss all topics related to permit renewal. Additionally, formal letters as well as frequent informal email correspondence were exchanged throughout the same period. A chronology of correspondence between the Regional Board and the Discharger is provided in Attachment 3 ("Chronology").[59]

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[58] SRCSD 2004, Sacramento Regional Wastewater Treatment Plant 2020 Master Plan Responses to Comments and Additional Information (Final EIR), prepared by EDAW, Inc., May 21, 2004, pp. 3-11 – 3-20 [hereinafter Comments on DEIR; also on attached CD at RB020009].

[59] This correspondence was obtained by various requests by the Water Agencies for documents pursuant to the California Public Records Act. As correspondence between the Regional Board and the Discharger concerning the discharge facility, it is properly part of the record under Cal. Code Regs., Tit. 23, § 2050.5. However, since the Regional Board's record has not yet been filed, this correspondence is also provided on CD with Water Agencies' Response. Citations to these documents herein include a Bates Stamp page number reference corresponding with numbers assigned on the CD.

As evident from the following summary of this correspondence, the Discharger and the Regional Board have thoroughly discussed and debated the major issues of dispute for years, if not decades.

- ***Total ammonia and nutrient removal:*** The Regional Board has expressed concerns about the Discharger's total ammonia discharge into the Sacramento River for years. By virtue of the Regional Board's comments on the 2003 Draft EIR,[60] its 2007 letter to the Discharger and other organizations making a "Request for Maximum Effort to Protect the Delta Waters,"[61] and through joint total ammonia studies and analyses that the Regional Board and Discharger engaged in from 2007 forward to examine the potential link between total ammonia and the Pelagic Organism Decline (POD) in the Delta.[62] When study results began to indicate a potential link between total ammonia

[60] Specifically, in response to the 2003 Draft EIR, the Regional Board urged the Discharger to consider treatment alternatives to reduce total ammonia in its discharge because, "acute and chronic ammonia criteria could be exceeded in the near field, and the proposed project is predicted to contribute to significant increases in total ammonia concentrations in the far field, both of which could potentially be significant impacts." *Id*. at 3-18, RB020016. Additionally, the Regional Board requested further analyses of the Treatment Plant's effects on Dissolved Oxygen levels in the River resulting from the increased volumes of BOD and total ammonia in its discharge. *Id*. at 3-18, RB020016. In contrast, the Discharger repeatedly argued that "[p]roject-specific contributions of ammonia would not adversely affect any of the existing or future anticipated beneficial uses of the Sacramento River or Delta waters, or substantially impair the integrity of the Sacramento River or Delta," thus having a "less-than-significant impact on water quality." *Id*. at 3-32, RB020030 (SRCSD Responses to Comments).

[61] Central Valley Regional Water Quality Control Board, Request for Maximum Effort to Protect Delta Waters (July 16, 2007), SRCSD064700–03. The Request referred to the decline in the aquatic species of the Delta, including the Delta smelt, and contained the following message for the Discharger and other dischargers: "[Y]ou must make every effort to operate your wastewater treatment facility to reduce or eliminate any potential aquatic impacts from your discharge to Delta waters or to tributaries to the Delta." *Id.* The Regional Board asked the dischargers to "[o]perate the treatment facilities to minimize any toxic substances in the wastewater discharge, including effluent ammonia" and "to minimize oxygen-demanding substances in the wastewater discharge." *Id.*

[62] *See, e.g.*, SRCSD, Meeting with SRCSD, RB, CH2M HILL, Larry Walker Ass., and Dugdale Laboratory (Dec. 17, 2008), SRCSD04626; Email from Pamela Creedon, Executive Officer, CVRWQCB, to Mary Snyder, District Engineer, SRCSD (July 8, 2008 10:19 PM), SRCSD01749; Email from Cameron Irvine, Project Scientist, SRWTP to Chris Foe, CVRWQCB (July 5, 2008 04:42 PM), SRCSD0125310; Letter from Wendell Kido, SRCSD, to Karen Larson, CVRWQCB (Mar. 25, 2008), SRCSD126536; SRCSD, Meeting with RWQCB and DWR: Ammonia Analyses Discussion (Oct. 9, 2007), SRCSD02403 [hereinafter Ammonia Analyses Discussion]. *See also* Chronology of Correspondence Between SRCSD and CVRWQCB [hereinafter Chronology] (chronology of meetings held, and emails and letters exchanged

and the POD, the Discharger's position shifted from one of participation to one of opposition, challenging the protocol of the studies themselves and the results they produced.[63]

- ***Tertiary treatment, including filtration:*** Discussions between the Discharger and the Regional Board regarding tertiary treatment, including filtration, go back as far as the Regional Board's comments on the 2003 Draft EIR.[64] Furthermore, throughout the permit renewal process, the Discharger worked hard to convince the Regional Board and the California Department of Public Health (DPH) (formerly the Department of Health Services) to use enterococci as an alternative pathogen indicator instead of total coliform because it has lower detection rates, which, if adopted, would have lowered the Discharger's treatment costs and weakened the basis for requiring filtration.[65] The Discharger's approach was ultimately rejected by the Regional Board, based on DPH's recommendation.[66] The Discharger and Regional Board also debated the merits of tertiary treatment, with filtration, throughout 2008.[67]

  In March 2005, the Discharger released a "Pathogen White Paper," in which it

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between the Regional Board and SRCSD regarding the NPDES Permit Renewal).

[63] *See, e.g.*, Email from Robert Seyfried, Senior Civil Engineer, SRCSD to Chris Foe and Karen Larsen, CVRWQCB (Feb. 2, 2009 03:07PM), SRCSD01769; Email from Stephanie Fong, CVRWQCB to Cameron Irvine, Project Scientist, SRWTP (April 16, 2009 10:02 AM), SRCSD109319. *See also* Chronology.

[64] Comments on 2003 Draft EIR, at 3-13, RB020011.

[65] Larry Walker Associates, Pathogen White Paper (2009), RB016236.

[66] *See* Email from Kathleen Harder, CVRWQCB, to Vyomini Pandya, Assistant Engineer, and Robert Seyfried, Senior Civil Engineer, SRCSD (Apr. 28, 2009 9:43 AM), SRCSD07893.

[67] SRCSD, Meeting with the Regional Board (July 21, 2008), SRCSD06269 (Discharger arguing that water recycling efforts would be discouraged if tertiary filtration treatment was required); Letter from Kenneth Landau, Assistant Executive Officer, CVRWQCB, to Robert Seyfried, Senior Civil Engineer, SRCSD (Aug. 19, 2008), SRCSD062998 [hereinafter August 19 Letter] (Regional Board staff request that the Discharger add a chapter on BPTC and include alternatives for "nitrification/denitrification & filtration & ultraviolet light disinfection that are treatment methods used for the majority of wastewater treatment plants discharging to surface waters in the Delta or tributaries").

advocated for the use of an alternative pathogen indicator.[68] The Discharger thereafter sought to persuade the Regional Board to use enterococci, as opposed to total coliform, due to its lower detection rates, ultimately lowering the Discharger's treatment costs and potentially avoiding the need for filtration.[69] The Discharger also met with the California Department of Health Services (now DPH) to persuade them to accept the alternative indicator recognizing the Regional Board relies on DPH guidance in setting pathogen limits. DPH made clear, however, that it would not accept the alternative.[70]

- ***Thermal Plan compliance:*** Thermal Plan compliance was similarly discussed over the course of several years. Foreshadowing its analysis in the Permit, the Regional Board voiced its concern that the 2003 Draft EIR's "alternatives analysis . . . should have included alternatives for achieving full compliance with the State Board's Thermal Plan" and noted that it would reevaluate, during the upcoming discharge Permit renewal process, whether an exception to the Thermal Plan for the Treatment Plant would be appropriate in the renewed Permit.[71] The Discharger filed an application for an exception to the Thermal Plan in 2005, and argued that its discharge did not have a thermal impact.[72] The Discharger and Regional Board discussed this issue at length throughout the permit renewal process.[73]

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[68] Larry Walker Associates, Pathogen White Paper (2009), RB016236.

[69] *Id.*

[70] SRCSD, Agenda, Pathogen Indicator Selection for NPDES Permit Renewal (Sept. 24, 2008), SRCSD08550.

[71] Comments on DEIR, *supra*, at 3-11, RB02009.

[72] *See* Letter from Robert Seyfried, Senior Civil Engineer, SRCSD, to Ken Landau, Assistant Executive Officer, CVRWQB (Mar. 10, 2006), SRCSD00469–70 (application for exception to Thermal Plan); Letter from Robert Seyfried, Senior Civil Engineer, SRCSD, to Ken Landau, Assistant Executive Officer, CVRWQCB (May 12, 2005), SRCSD05017–22 [hereinafter May 12 Letter] (arguing that Treatment Plant effluent qualified for an exception to the Thermal Plan because it did not have a thermal impact);

[73] *See, e.g.*, Email from Kathleen Harder, CVRWQCB, to Robert Seyfried, SRCSD (Aug. 20, 2008 10:10 AM), SRCSD 062557; SRCSD, Meeting with the Regional Board, *supra*; SRCSD,

- ***Antidegradation Policy:*** The Discharger and the Regional Board likewise engaged in numerous discussions relating to the Antidegradation Policy beginning with the 2020 Master Plan and throughout the permit renewal process. Initially, the Discharger performed a Capacity Rating Study that showed the Treatment Plant was operating at 154 mgd, had a potential capacity of 207 mgd, and would have an operating capacity of 218 mgd after the Master Plan expansion.[74] The Discharger evaluated the water quality impacts of the expansion in its 2003 Draft EIR and found the increased discharge would have no significant water quality impacts.[75] The Discharger submitted its Antidegradation Policy analysis with its Permit application in 2005. Through many meetings over the permit renewal period, the Regional Board submitted numerous comments relating to the need for a more thorough Antidegradation Policy analysis.[76] In response, the Discharger submitted an Administrative Draft of the Antidegradation Policy analysis in 2009, but abruptly withdrew its analysis in 2010, and asked the Regional Board to base its permit renewal on its existing permitted 181 mgd capacity. In addition, the Discharger began arguing that withdrawal prevented the Antidegradation Policy analysis requirement from being triggered, "[b]ecause compliance with the [antidegradation] policies was previously considered, and the Permit does not allow for a reduction in water quality."[77]
- ***Toxicity:*** Toxicity discussions for the Permit renewal dates at least as far back as

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NPDES Renewal Meeting Summary (May 10, 2007), SRCSD 054684–88.

[74] Carollo Engineers, SRWTP Capacity Rating Study (Feb. 2005), RB015004.

[75] Comments on DEIR, *supra*, at 3-25, RB020023. *See* May 12 Letter, *supra*.

[76] *See* May 12 Letter, *supra*, August 19 Letter, *supra*, *see also* Chronology, *supra*.

[77] In the Matter of the Sacramento Regional County Sanitation District's Petition for Review of Action and Failure to Act by Regional Water Quality Control Board, Central Valley Region, in Adopting Waste Discharge Requirements Order No. R5-2010-0114 (NPDES No. CA0077682) and Time Schedule Order No. R5-2010-0115 for Sacramento Regional Country Sanitation District, Sacramento Regional Wastewater Treatment Plant, Petition for Review, 134 (Jan. 10, 2011).

2003, when the Regional Board questioned the Discharger's conclusions in the 2003 Draft EIR that the Treatment Plant discharges would not have toxic effects on passing and benthic organisms, and stated the need for the Discharger to "identify the specific chemical constituents causing the toxicity, and implement measures to remove those constituents from its discharge."[78] In 2004, the Discharger began conducting a Toxicity Reduction Evaluation at the Treatment Plant, and the Regional Board and the Discharger continued this dialogue through meetings, letters and emails discussing whole effluent toxicity test results, the Toxicity Reduction Evaluation and Toxicity Identification Evaluation, and toxicity violations.[79] In March 2005, the Discharger submitted a "Toxicity White Paper" to the Regional Board, advocating the use of alternative whole effluent toxicity tests and triggers.[80] In 2007, the Discharger submitted a request to the Regional Board to change the Permit's Monitoring and Reporting Program to reference new whole effluent toxicity testing methods, in order to avoid toxicity violations.[81] Continued discussion of the Toxicity White Paper and the Discharger's request for the test method change is reflected in a series of emails and letters between the Discharger and the Regional Board, as well as in Permit Renewal Meetings.[82]

- ***Dynamic modeling:*** The coordinated effort between the Regional Board and the Discharger to review the Discharger's dynamic model began in 2001 in conjunction with the 2020 Master Plan EIR. These discussions continued through the Regional

[78] Comments on DEIR, *supra*, at 3-17, RB020015.

[79] *See* Chronology, *supra*.

[80] *See* May 12 Letter, *supra*.

[81] Letter from Mitch Maidrand, Principal Civil Engineer, SRCSD to Jim Marshall, CVRWQCB (July 30, 2007), SRCSD08139.

[82] *See, e.g.*, Email from Cameron Irvine, SRCSD, to James Marshall, CVRWQCB (Oct. 15, 2007 10:38 AM), SRCSD08161. *See also* Chronology, *supra*.

Board's comments on the 2003 Draft EIR;[83] at Permit renewal meetings (which began in 2004) and in letters;[84] through the Regional Board's decision to hire Tetra Tech to review the Discharger's model and assist the Regional Board in developing an approach to use the model to prepare the Permit due to the complexity of the model;[85] through the Discharger's supplemental dye studies and corresponding reports during 2005, 2006, and 2007 to respond to Regional Board and Tetra Tech comments;[86] and through Regional Board staff acceptance of the Discharger's model for use in the permit renewal in 2009,[87] and continued discussions regarding the same.[88]

- ***Stakeholder views:*** In addition to providing opportunities for extensive input from the Discharger, the Regional Board provided opportunities for public input. In 2009 and 2010, Regional Board staff prepared and circulated two issue papers concerning the Discharger's Permit and asked for comment, one of which summarized the major permitting issues related to drinking water supply and public health, and the other summarized the major permitting issues related to aquatic life and wildlife preservation. Certain of the Water Agencies, as well as many other stakeholders, including the Discharger, provided comments on these papers.[89] Previously, on

[83] *See* Comments on DEIR, *supra*, at 3-13–3-15, RB020011–13.

[84] Letter from Robert Seyfried, Senior Civil Engineer, SRCSD, to Ken Landau, Assistant Executive Officer, CVRWQCB (Nov. 15, 2004), SRCSD05272–78.

[85] *See* Letter from Robert Seyfried, Senior Civil Engineer, SRCSD, to Ken Landau, Assistant Executive Officer (Nov. 28, 2005), SRCSD064796–00; CVRWQCB, Comments on Dynamic Model (Apr. 14, 2005), RB010411–26.

[86] *See, e.g.*, SRCSD, NPDES Permit Renewal Meeting Summary (May 10, 2007), SRCSD054684–88. *See also* Chronology, *supra*.

[87] Letter from Ken Landau, Assistant Executive Officer, CVRWQCB, to Mary K. Snyder, District Engineer, SRCSD (Apr. 2, 2009), SRCSD11205–06.

[88] *See, e.g.*, SRCSD, NPDES Permit Renewal Discussion Items (July 21, 2009), SRCSD06274–77. *See also* Chronology, *supra*.

[89] Alameda County Water District, et al., Comments on Drinking Water Supply and Public Health Issues Concerning the Sacramento Regional Wastewater Treatment Plant NPDES Permit Renewal, February 1, 2010 (Water Agencies' 2010 Comments on Drinking Water Issues); Alameda County Water District, et al., Comments on Aquatic Life and Wildlife Preservation

July 10, 2007, Regional Board staff met with certain Water Agencies to discuss some of the major concerns with the discharge. Those Water Agencies supplemented their meeting with a technical submittal to Regional Board staff in December 2007.[90]

IV. STANDARD OF REVIEW

The State Board must uphold a Regional Board permit if it is based on substantial evidence in the record and is not contrary to law.

Under Water Code section 13320, the State Board reviews the Petitions in light of "the record before the regional board, and any other relevant evidence which, in the judgment of the State Board, should be considered to effectuate and implement the policies of" the Porter-Cologne Water Quality Control Act.[91] The State Board may uphold the Regional Board's approval of the Permit as appropriate and proper or the State Board may take appropriate action itself, direct the Regional Board to take the appropriate action, refer the issue to another state agency with jurisdiction, or take any combination of these actions.[92]

A. The Regional Board's Permit Is Supported By Substantial Evidence In The Record

It is well-established that, "while [the State Board] can independently review the Regional Board record, in order to uphold a Regional Board action, we must be able to find that [the Regional Board's action] was founded upon substantial evidence."[93]

Substantial evidence includes, "facts, reasonable assumptions predicted upon facts, and expert opinion supported by facts."[94] The Regional Board may also rely upon the opinion of its

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Issues Concerning the Sacramento Regional Wastewater Treatment Plant NPDES Permit Renewal, June 1, 2010 (Water Agencies' 2010 Comments on Aquatic Life Issues).

[90] Summary of Drinking Water Quality Issues and Requested Permit Conditions for the Sacramento Regional Waterwater Treatment Plant NPDES Renewal, December 2007 (Water Agencies' 2007 Comments).

[91] Water Code § 13320(b).

[92] Water Code § 13320(c).

[93] *Exxon*, WQ 85-7, 1985 WL 20026, at *6.

[94] *See Citizens for Responsible and Open Gov't v. City of Grand Terrace* (2008) 160 Cal.App.4th 1323, 1332.

staff in reaching decisions and such opinion constitutes substantial evidence.[95]

To be "substantial," evidence need only provide enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached.[96] Absolute certainty is not required. As the U.S. EPA recently noted, "We do not demand certainty where there is none. There may be no strong reason for choosing [a particular numerical standard] rather than a somewhat higher or lower number. If so, we will uphold the agency's choice of a numerical standard if it is within a 'zone of reasonableness.'"[97] As long as the "agency's reasons and policy choices . . . 'conform to certain minimal standards of rationality' . . . the [agency decision] is reasonable and must be upheld."[98]

The substantial evidence standard applies to conclusions, findings and determinations, as well as to challenges to the scope of analysis of a topic, the method used to assess a beneficial use impairment and the reliability or accuracy of the data upon which the Regional Board based its Permit decision, because these types of challenges involve factual questions.[99]

The State Board is to indulge all reasonable inferences from the evidence that would support the Regional Board's determinations.[100] If reasonable minds may disagree as to the wisdom of the Regional Board's Permit decision, the Regional Board's decision should be upheld.[101]

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[95] *See Anthony v. Snyder* (2004) 116 Cal.App.4th 643, 660-61; *McBail & Co. v. Solano County LAFCO* (1998) 62 Cal.App.4th 1223.

[96] *Id.*

[97] *In re Upper Blackstone Water Pollution Abatement District*, slip. op., ___ E.A.D. ___, 2010 WL 2363514 at *41 (E.A.D. May 28, 2010) (quoting *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d 506, 525 (D.C. Cir. 1983) (citation omitted).)

[98] *Sanofi-Aventis U.S. LLC v. Food and Drug Administration*, 733 F.Supp.2d 162, 172 (D.D.C. 2010) (quoting *Small Refiner Lead Phase-Down Task Force v. EPA*, 705 F.2d at 520-21.)

[99] *See San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal.App.4th 645, 654 [describing substantial evidence review of environmental impact assessments].

[100] *See Western States, supra,* 9 Cal.4th at 571.

[101] *See Laurel Heights Improvement Ass'n v. Regents of University of California* (1988) 47 Cal.3d

This deferential standard applies to review of all numerical limits imposed under the NPDES Permit, including water quality based effluent limitations WQBELs) imposed pursuant to 40 C.F.R. 122.44(d)(1)(i). Section 122.44(d)(1)(i) requires WQBELs to control pollutants which, among other things, have the reasonable potential to cause violations of state numeric water quality standards or narrative criteria for water quality. Reasonable potential findings can be based on application of state standards, such as the State Board's Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (2005) SIP), but the Regional Board may use any method, so long as the Regional Board describes the method and rationale.[102] The reasonable potential determination need not be based on statistical analysis, nor even on a numeric analysis of any particular pollutants.[103]

The Permit is supported by evidence far surpassing the substantial evidence threshold. The Discharger's Petition challenges the Permit's stringency based on unsubstantiated fears, speculation and opinion about purportedly high economic costs and allegedly low environmental benefits. But substantial evidence does not include speculation, unsubstantiated opinion or evidence that is clearly erroneous.[104] "Unsubstantiated fears and desires of [a Permit] opponent do not constitute substantial evidence."[105]

Many of the Permit defects alleged in the Discharger's Petition arise from the Discharger's failure to meet *its* burden to prove that relatively lax Permit terms were justified, rather than from any failure of the Regional Board to support its Permit approval with substantial evidence. The Discharger's failure to meet its burden of proof under state and federal

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376, 393 [detailing substantial evidence review of environmental impact assessments].

[102] *In The Matter Of Own Motion Review Of Waste Discharge Requirements For The University*, WQ 2010-0005, 2010 WL 2023327, at *3 (citing WQO 2004-0013, at 6).

[103] *Divers' Environmental Conservation Organization v. State Water Resources Control Board* (2006) 145 Cal.App.4th 246, at 257-58.

[104] *See Citizens for Responsible and Open Gov't v. City of Grand Terrace* (2008) 160 Cal.App.4th 1323, 1332.

[105] *See Porterville Citizens for Responsible Hillside Dev. v. City of Porterville* (2007) 157 Cal.App.4th 885, 901 [citing *Gentry v. City of Murrieta* (1995) 36 Cal.App.4th 1359, 1417].

Antidegradation Policy is a prime example.

B. The State Board May Further Strengthen The Permit By Considering Additional Evidence And Making Further Findings

The State Board may supplement the record with "other relevant evidence" supporting or strengthening the Permit terms.[106] The State Board may make additional findings supporting or strengthening the Permit terms and may even take original jurisdiction over, and directly approve, the Discharger's Permit.[107] Although the Regional Board's record and findings more than adequately support the Permit limits requiring nutrient removal and tertiary filtration, the State Board has the discretion to supplement the record and findings to strengthen the Permit even further. The Water Agencies are submitting here supplemental information that responds to issues raised in the Petition to which the Water Agencies did not have the opportunity to respond in the proceedings before the Regional Board. The specific evidence and bases for asking the State Board to consider this information is outlined in the Water Agencies' Appendix of Supplemental Information Supporting Response to Discharger's Petition for Review.

V. THE NITROGEN LIMITS IN THE PERMIT ARE APPROPRIATE FOR THE LARGEST SINGLE DISCHARGER OF WASTE NITROGEN TO THE DELTA

The Discharger is discharging on average 14 tons of total ammonia into the Delta every day, resulting in the presence of total ammonia nitrogen in the Sacramento River, across the entire Delta, and all the way to Suisun Bay, 80 miles downstream. The Discharger's Treatment Plant is the dominant source of total ammonia to the Sacramento River and Delta. Once the Treatment Plant's total ammonia is discharged, it slowly is converted to nitrate, which itself causes major problems. The total ammonia nitrogen and nitrate limits in the Permit are long overdue, and represent a good first step towards correcting the profound problems caused by this discharge.

The Permit is on solid ground in imposing total ammonia nitrogen and nitrate limits that reduce the total nitrogen discharged by the Treatment Plant. The *Topanga* "analytic road map"

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[106] Water Code § 13320(b).

[107] *See* Water Code § 13320(c) ["In taking any action, the state board is vested with all the powers of the regional boards under this division."].

supporting the nitrogen limits is compelling; reasonable potential analysis of this discharge ineluctably leads to nitrogen limits at least as stringent as those in the Permit. Further, the Permit is consistent with precedent recognizing the need to impose nitrogen effluent limitations to protect beneficial uses that include protecting primary productivity and preventing nuisance.

A. Total Ammonia Nitrogen From The Treatment Plant Violates Various Water Quality Standards And Clean Water Act Principles, Causing Profound, Adverse Effects On The Delta

The Regional Board succinctly summarized why total ammonia nitrogen discharges to surface waters can cause profound, adverse effects in a watershed: "it is toxic to aquatic life, affects the nutrient balance in the river, reduces dissolved oxygen, affects aquatic ecosystem food supply, and is a precursor for the formation of nitrosamines."[108] Key points supporting the nitrogen limits include without limitation:

- *The Treatment Plant's total ammonia nitrogen is toxic to plankton at the base of the food chain, where adverse impact can propagate up trophic levels, depressing fisheries' yields, and causing other problems*. Published research demonstrates that the total ammonia nitrogen is toxic to planktonic organisms called copepods, such as *Eurytemora affinis* and *Pseudodiaptomus forbesi*, upon which larval fish graze. Published research also demonstrates that the ammonium is toxic to some phytoplankton such as diatoms. These toxic impacts depress the food supply for the Delta smelt and other fish, and reduce fisheries yields in critical habitat for federally listed fish, including the winter and spring-run Chinook salmon, the Delta smelt, and green sturgeon. These impacts violate the toxicity standard for the Delta which requires that the Delta "be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life," and violate various beneficial uses of the Delta, including SPWN (spawning, reproduction, and early development), WARM and COLD (warm and cold freshwater

[108] Regional Board Staff Report, at 13.

habitat) and MIGR (migration of aquatic organisms). The Delta has "one of the lowest primary production rates of any major estuary in the world," and the Discharger's total ammonia nitrogen discharge plays a role in that condition.[109]

- *Ammonium stimulates the growth of undesirable and harmful cyanobacteria that itself can be toxic*. The Discharger's ammonium creates conditions conducive to the growth of less nutritious, and often toxic, cyanobacteria (i.e., bluegreen algae), and also flagellates. The growth of these nuisance cyanobacteria and flagellates violates the biostimulatory standard for the Delta which requires the Delta to be free of, "biostimulatory substances which promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses." The growth of these nuisance cyanobacteria also violates the Delta's toxicity standard because species like *Anabaena flos-aquae*, *Microcystis aeruginosa*, and *Aphanizomenon flos-aquae* are known to produce neurotoxins that are toxic to humans, fish, and wildlife.
- *Once released to the Delta, the Treatment Plant's total ammonia nitrogen begins to convert to nitrate, which consumes precious oxygen in the water column*. Converting total ammonia nitrogen (which contains no oxygen) into nitrate (which does) adversely scavenges oxygen dissolved in the water column. This adverse process causes oxygen levels in the Delta miles downstream from the Treatment Plant to fall repeatedly below the applicable oxygen standard. This oxygen is essential to aquatic life in the Delta, including the fish species listed above. Even the Discharger agrees it must reduce the total ammonia nitrogen to achieve compliance with the oxygen standard.
- *Excess nitrogen creates nuisance aquatic weeds that are choking Delta channels; nuisance algal blooms in water supply aqueducts and reservoirs that create risk to*

[109] Staff Response to Comments at 20-21 (SRCSD "does not appear to dispute the fact that ammonia concentrations are suppressing nitrogen uptake and primary production in Suisun Bay"). Slide 41, TR page 294, lines 6-16; *see also* Water Agencies' Hearing Presentation, Slide 41.

public health, increase drinking water treatment costs and cause taste and odor problems in municipal water supplies if not controlled. These effects demonstrate that nitrogen from the Treatment Plant is adversely flooding the Delta and water supply facilities with excess nutrients causing nuisance and violating the biostimulation standard. High nutrient levels produce excess algae growth in water supply reservoirs and conveyance facilities, which increases total organ carbon (TOC), a disinfection byproduct precursor, loading to water treatment plants. This TOC increases the risk to public health by increasing production of harmful disinfection byproducts, many of which are known carcinogens or adversely impact reproductive health, as well as increasing water treatment plant operational costs. Excessive algal growth causes taste and odor problems in municipal water supplies and increases costs to water treatment plant operations. These impacts violate the domestic and municipal water supply designation (MUN) for the Delta, as well as the taste and odor standard, and impose significant costs on water suppliers.

- *The Discharger has the temerity to suggest that its total ammonia nitrogen actually is having a beneficial effect on the Delta,*[110] *an argument that turns the federal Clean Water Act on its head*. "In no case shall a State adopt waste transport or waste assimilation as a designated use for any waters of the United States."[111] This federal regulation was promulgated, "to prevent water bodies from being used as open sewers,"[112] which is exactly what the Discharger proposes to do under its "waste-is-good" theory. The Regional Board's regulations make clear: "disposal of wastewaters . . . cannot be satisfied to the detriment of beneficial uses."[113]

[110] *See, e.g.*, Petition at p. 90 ("nitrogen-limited phytoplankton upstream from the SRWTP[ ] potentially benefit from the ammonia introduced at the discharge").

[111] 40 C.F.R. 131.10(a).

[112] 48 Fed. Reg. 51400, 51410 (Nov. 8, 1983).

[113] Basin Plan, p. II-1.00.

In sum, the Discharger's total ammonia nitrogen is violating water quality standards. These far-reaching effects adversely impact the River, the Delta, Suisun Bay, designated critical habitat for various listed species, distant water supply reservoirs, and municipal water treatment plants. These impacts mandate numeric nitrogen limits at least as stringent as those in the Permit. The rational basis for, and requirements of, the Permit's nitrogen limits, in the form of limits on total ammonia nitrogen and nitrate, are more particularly described in Sections V and VI, *infra*).

B. Controlling Nitrogen To Protect Primary Productivity And Prevent Nuisance Is Consistent With NPDES Precedent

Many other jurisdictions have limited discharges of nitrogen and other contaminants that affect primary productivity at the base of the food web. U.S. EPA began implementing the Chesapeake Bay Total Maximum Daily Load (TMDL) program in 2005, which limits the discharge of nitrogen and phosphorous by municipal (including 402 municipal wastewater facilities) and industrial sources from Maryland, Virginia, Delaware, West Virginia, Pennsylvania, New York, and Washington, D.C. to address excessive nutrient loading to Chesapeake Bay.[114] These limits are necessary to achieve dissolved oxygen criteria, as well as other criteria, set for Chesapeake Bay.[115]

The Blue Plains Wastewater Treatment Plant, which falls within the Chesapeake Bay program, employs nitrification/denitrification technology to remove and limit nitrogen as a nutrient from its discharge.[116] As part of the Chesapeake Bay program, the Blue Plains facility is undergoing a major upgrade to further reduce the Treatment Plant's nutrient loading to the Chesapeake Bay watershed.[117]

Similarly, permits have been upheld that have imposed strict restrictions on nitrogen

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[114] U.S. EPA, Region 3, "Progress on Reducing Pollution from Wastewater Facilities," *available at* http://www.epa.gov/reg3wapd/npdes/index.htm (last visited April 18, 2011).

[115] *Id.*

[116] U.S. EPA Final Fact Sheet, NPDES Permit Reissuance, NPDES Permit No. DC0021199 at 7 (Aug. 31, 2010).

[117] *Id.*

discharges. For example, the U.S. EPA's Environmental Appeals Board (EAB) recently upheld a 5.0 mg/L monthly average total nitrogen limit for the months of May – October for the Upper Blackstone Water Pollution Abatement District, based on eutrophication effects seen in the Seekonk and Providence Rivers and Narragansett Bay from municipal wastewater discharges, which in turn lead to violations of Rhode Island water quality standards.[118] The EAB found the eutrophication in the region is "adversely affecting the composition of fish and wildlife; adversely affecting the physical, chemical or biological integrity of the habitat; and causing dissolved oxygen to drop well below 5.0 mg/L. The effects of eutrophication, including [nuisance] algae blooms and fish kills, are also interfering with the designated uses of the water."[119] The EAB also found no evidence challenging the conclusion that the predominant sources of nitrogen to the watershed were municipal wastewater treatment facilities in Rhode Island and Massachusetts.[120]

> The District's references to uncertainty or lack of precision in the Region's determination of the District's contribution to the problem relative to the contributions of non-point sources of nitrogen and other municipal waste treatment plants are simply insufficient to overcome the substantial weight of scientific evidence in the record that, even if the precise relative contribution is uncertain, the District's discharges are a significant contributor of nitrogen to the Blackstone River, which discharges to the Seekonk and Providence Rivers, thereby contributing to those rivers' nitrogen-driven eutrophication problem that frequently violates Rhode Island's water quality criteria.[121]

Similarly, in Mount Hope Bay, Somerset, Massachusetts, the EAB upheld thermal discharge requirements in the NPDES Permit for the Brayton Point Station power plant based on primary productivity concerns.[122] The permittee had requested a variance to thermal discharge Permit requirements, but the agency rejected the variance in part due to the "negative effects on

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[118] *In re Upper Blackstone Water Pollution Abatement District*, slip op., ___ E.A.D. ___, 2010 WL 2363514 (E.A.D. May 28, 2010).

[119] *Id*. at *27 (citation omitted).

[120] *Id.* at *30 (quotations and citations omitted).

[121] *Id.* at *32.

[122] *In re Dominion Energy Brayton Point, LLC*, 12 E.A.D. 490 (2006).

the phytoplankton (i.e., absence of the normal winter-spring phytoplankton bloom, appearance of nuisance algal blooms)."[123] The agency found that the proposed variance would not "significantly relieve any of these impacts."[124]

The above cases join a long history of precedent recognizing the need to impose effluent limitations to protect primary productivity in watersheds from the effects of excessive nutrient loading.[125]

VI. THE TOTAL AMMONIA NITROGEN LIMITS IN THE PERMIT ARE APPROPRIATE

The Discharger spends dozens of pages in its Petition fly-specking the Regional Board's findings and supporting science on total ammonia nitrogen.[126] These criticisms are groundless. Stripped of the confusion sowed by the Discharger, the Regional Board has in fact followed a simple, two-step analysis with which this Board is very familiar. First, the Regional Board determined the end-of-pipe water quality based effluent limitations for total ammonia nitrogen. Second, the Regional Board properly exercised its discretion to deny Discharger's request for a mixing zone.

A. The Regional Board Properly Established a Water Quality Based Effluent Limitation (WQBEL) for Total Ammonia Nitrogen

The Regional Board properly set a WQBEL for total ammonia nitrogen. NPDES permits must include effluent limitations for all pollutants that are or may be discharged at levels that have the reasonable potential to cause or contribute to an exceedance of a narrative water quality standard.[127] Water quality standards are established to protect the beneficial uses of state waters,

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[123] *Id.* at 554.

[124] *Id.* at 555.

[125] *See Montgomery Environmental Coalition v. Costle*, 646 F.2d 568, 575 (D.C. Cir. 1980) (with respect to the Potomac River, "[e]xcessive nutrient levels degrade water quality both because the proliferation of algae is itself a nuisance and because algae respiration and subsequent death and decay use up oxygen dissolved in the river's waters"); *U.S. v. Smithfield Foods*, 972 F. Supp. 338, 346 (E.D. Va. 1997) (discharge of phosphorus and nitrogen impair organisms "which participate in metabolic activities of the estuaries and serve as food for fish.").

[126] The limits are on total ammonia, the bulk of which is ionized total ammonia.

[127] 40 C.F.R. § 122.44(d)(1)(i).

including freshwater habitat, and the spawning, reproduction, development, and/or migration of aquatic life.[128] The water quality objectives established by the Basin Plan include the narrative standard that "all waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal or aquatic life."[129]

The Regional Board reasonably concluded that the Discharger's untreated total ammonia nitrogen "has a reasonable potential to cause or contribute to an exceedance of the Basin Plan's narrative toxicity objective in the receiving water."[130] The Clean Water Act provides three options for setting limits to determine if a narrative standard is being exceeded:

> Where a State has not established a water quality criterion for a specific chemical pollutant that causes, has the reasonable potential to cause, or contributes to an excursion above a narrative criterion within an applicable State water quality standard, the permitting authority must establish effluent limits using one or more of the following options:
>
> > (A) . . . using a calculated numeric water quality criterion. . . . Such a criterion may be derived using a proposed State criterion, or an explicit State policy or regulation interpreting its narrative water quality criterion, supplemented with other relevant information . . . .; or
> >
> > (B) . . . on a case-by-case basis, using EPA's criteria guidance under CWA section 304(a), supplemented where necessary by other relevant information; or
> >
> > (C) [using] an indicator parameter for the pollutant of concern. . . .[131]

Thus, while effluent limits "must" be set, any "one or more" of the three "options" could be applied when setting them.

In the Permit, the Regional Board applied Option (B), "using EPA's criteria guidance" for total ammonia nitrogen – the National Recommended Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life for Total Ammonia (1999) – to calculate an average

[128] Basin Plan II-1.00 - 2.00.

[129] Basin Plan III.8.01.

[130] Permit at F-55.

[131] 40 C.F.R. § 122.44(d)(1)(vi)(A)-(C).

monthly ammonia effluent limitation (1.8 mg/L^{-1}) and maximum daily effluent limitation (2.2 mg/ L^{-1}).[132] Following the procedures in the SIP, the Regional Board then compared the calculated effluent limits to the existing data.[133] Because Discharger does not remove total ammonia nitrogen, its discharge is 10-20 times greater than the applicable limits; as such, the discharge unquestionably has the "reasonable potential to cause or contribute to an exceedance" of the narrative toxicity objective in the receiving water.[134]

In evaluating the "reasonable potential to exceed" and setting the effluent limits, the Regional Board needed to go no further and, on that basis alone, the first step in the Regional Board's analysis should be affirmed. The Regional Board further supported the limits, however, by reference to numerous studies and extensive data showing the serious harms caused to aquatic life by the Discharger's waste, including the work of Dr. Inge Werner, Dr. Swee Teh, Dr. Richard Dugdale and his colleagues, and others.[135] That research, discussed below, provides further support for the effluent limitations.

Discharger's assertion that the Regional Board erred in setting the limits is clearly wrong under the law.[136] Discharger asserts, incorrectly, that in setting effluent limitations, the "Regional Board ***must use*** a calculated numeric water quality criteria derived from '. . . a proposed state criteria, or an explicit State policy or regulation interpreting narrative water quality criterion . . ."[137] As outlined, however, there are three ***options*** for a permitting authority to apply in setting the effluent limits. Nothing required the Regional Board to use the option the Discharger cites. The Regional Board's use of Option (B) is perfectly proper and lawful.

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[132] Permit at F-54-57 (developing limits using the "NAWQC for the protection of freshwater aquatic life . . ."). *See also* Regional Board Staff Response to Comments (RTC) at 18 ("The ammonia limits in the tentative permit were developed to meet the 1999 U.S. EPA ammonia criteria at the end of pipe without dilution.").

[133] SIP § 1.3, Appx 2 (flowchart).

[134] *See* Staff RTC at 18, Table 1.

[135] *See* Permit, Attachment J.

[136] *See* Petition at 78-81.

[137] *See* Petition at 79 (emphasis added); *see also* Petition at 111-112 (repeating argument).

The Discharger also cites the Basin Plan and argues that research by Dr. Teh, Dr. Dugdale, and others should not have been considered because it is not "relevant and appropriate." This contention is frivolous. The Basin Plan directs that, when regional boards "evaluate compliance with the narrative water quality objectives" the boards may consider:

> on a case-by-case basis, direct evidence of beneficial use impacts, all material and relevant information submitted by the discharger and other interested parties, and relevant numerical criteria and guidelines developed and/or published by other agencies and organizations . . . . [T]he Board evaluates whether the specific numerical criteria, which are available through these sources and through other information supplied to the Board, are relevant and appropriate to the situation at hand and, therefore, should be used in determining compliance with the narrative objective.[138]

This direction in the Basin Plan is designed to give the Board the ability to evaluate a range of additional information and then to use its judgment to consider whether the information is relevant "to the situation at hand." The "situation at hand" is whether the daily dumping of 14 tons of total ammonia nitrogen has the potential to cause or contribute to violations of water quality standards and impact beneficial uses. Dr. Teh has done toxicity testing evaluating the impacts of total ammonia nitrogen and the Discharger's effluent on copepods that are essential to the food web in the River and Delta, concluding the total ammonia nitrogen is acutely toxic and disruptive to the reproductive life cycle at levels present in the River.[139] Dr. Dugdale similarly has evaluated the effect of total ammonium on the uptake of nitrate by phytoplankton, concluding the ammonium is preventing spring blooms that help feed aquatic life in the Delta.[140] The Regional Board would have abused its discretion had it not recognized this work to be relevant and appropriate for consideration.

The Discharger appears to be arguing that the Regional Board is obligated to conduct a separate and distinct analysis on each shred of information presented to it, and commits error if it does not. This strained interpretation is inconsistent with the plain language of the Basin Plan –

[138] *Id.* Basin Plan at IV-17.00 (4th Ed.).

[139] Permit at Attachment J; *see also* Declaration of Dr. Swee Teh ("Teh Decl."), Exhibits 1-6.

[140] Permit at Attachment J; *see also* Report of Dugdale, Wilkerson and Parker.

where "case-by-case" logically refers to each permit action; not each piece of evidence – and also would turn the substantial evidence test on its head. Here, the Regional Board weighed and evaluated supplemental information, including the work of Dr. Teh and Dr. Dugdale, as described in a separate Attachment to the Permit. (Permit, Attachment J.) The Basin Plan does not require more.

The Discharger wholly has failed to establish any error in setting the total ammonia nitrogen WQBEL. Under the Clean Water Act, setting an effluent limit, including deciding what information may be "relevant" in making that determination, falls squarely within the permitting authority's discretion and technical expertise.[141] That is precisely what the State Board has directed Regional Boards to do in the SIP – exercise their informed discretion and determine what information to consider.[142]

B. The Regional Board's Denial Of A Total Ammonia Nitrogen Mixing Zones Was Proper

The Regional Board has broad discretion to accept or deny mixing zones and dilution credits.[143] Here, because the Regional Board fully explained its decision and based it on the facts

[141] *See, e.g., In Re: Upper Blackstone Water Pollution Abatement District*, NPDES Permit No. MA 0102369, 2010 WL 2363514 (EAB May 28, 2010).

[142] SIP at 5 (when setting WQBELs, "the RWQCB shall use all available, valid, relevant, representative data and information, as determined by the RWQCB" and "shall have discretion to consider if any data are inappropriate or insufficient for use in implementing this Policy."). *See In Re: Upper Blackstone, supra* ("As such, the petitioner bears a particularly heavy burden to establish clear error or an abuse of discretion because the [EPA Environmental Appeals] Board generally defers to the permit issuer on questions of technical judgment."); *American Paper Institute, Inc. v. EPA*, 996 F.2d 346, 351 (D.C. Cir. 1993) ("a permit writer will inevitably have some discretion in applying the criteria to a particular case."); *In re: City of Attleboro, Ma Wastewater Treatment Plant*, Permit No. MA 0100595, 2009 WL 2985479 (EAB Sept. 15, 2009) (citing *In re Town of Ashland Wastewater Treatment Facility*, 9 E.A.D. 661, 667 (EAB 2001)) ("the [Environmental Appeals] Board generally gives substantial deference to the permit issuer on questions of technical judgment.").

[143] SIP § 1.4.2 at 15 ("The allowance of mixing zones is discretionary…"); *see, e.g., In the Matter of the Petition of Sacramento County*, WQO 2003-0014, 2003 WL 25914833, at *4 (Sept. 16, 2003) (the Regional Board acted within its discretion in not including a "mixing zone" for compliance with groundwater limitations); *In the Matter of the Petition of City of Stockton*, WQO 2003-0002, 2003 WL 25914826, *2 (March 19, 2003) (Regonal Board did not abuse its discretion in denying mixing zone where the Regional Board identified numerous factors in its decision to reject the Petitioner's flow studies and deny dilution credits); *In the Matter of the Petitions of Napa Sanitation District, Bay Area Clean Water Agencies, and San Francisco Baykeeper*, WQO 2001-16, 2001 WL 1773995, *10 (Dec. 5., 2001) ("In all cases, the Regional

of the discharge, the decision is entitled to deference and should be upheld by this Board.[144]

1. The Regional Board's Reliance on SIP Criteria When Denying the Mixing Zone Request Was Proper

The Regional Board correctly found that a mixing zone for total ammonia nitrogen was not warranted under the California SIP. The SIP provides that certain "conditions must be met" before "allowing a mixing zone."[145] For one, a mixing zone "shall not" cause or compromise specific listed conditions.[146] Further, the SIP directs that the permitting authority "shall deny or significantly limit a mixing zone and dilution credit as necessary to protect beneficial uses, meet the conditions of this Policy, or comply with other regulatory requirements. Such situations may exist based upon the quality of the discharge, hydraulics of the water body, or the overall discharge environment."[147]

Following the SIP, the Regional Board examined an extensive body of literature and concluded that, to protect beneficial uses, the total ammonia nitrogen WQBEL must be met at the discharge point.[148] The Board listed 11 reasons for its decision. Generally, these include the following:

- Research indicates the total ammonia nitrogen from the Discharger is found in the River downstream at levels that are acutely/chronically toxic to native copepods many

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Boards have the discretion to determine whether or not a mixing zone and dilution credits are appropriate for a discharge."). A regional board's decision to deny a mixing zone is thus entitled to deference so long as the regional board has explained the basis for the denial. *In the Matter of the Petition of Yuba City*, WQO 2004 – 0013, 2004 WL 1859680, *7 (July 22, 2004).

[144] In *Yuba City*, cited by the Discharger, Petition at 200, although the State Board held that the Regional Board erred in denying a mixing zone, it did so because the State Board concluded that "the Regional Board did not consider the City's submittals prior to adopting the Permit." *Id*. at *7. In contrast, here, the Regional Board has thoroughly considered the Discharger's submissions atnd has explained its denial of a mixing zone (for total ammonia).

[145] SIP § 1.4.2.2 at 17.

[146] SIP § 1.4.2.2(A)(1)-(11).

[147] SIP § 1.4.2.2(B) at 17.

[148] F-41; F-54 to F-58, Attachment J; *see also* F-91 to F-94.

miles beyond the requested mixing zone.[149] This pervasive, toxic loading is a major stressor to the health of the ecosystem and thereby compromises beneficial uses across the water body.

- Research indicates the total ammonium from the Discharger is found in the River downstream at levels that inhibit nitrate uptake by diatoms, preventing phytoplankton blooms that support a healthy ecosystem. These impacts likewise occur many miles downstream and into Suisun Bay – far beyond the requested mixing zone.[150]
- The Regional Board found the discharge consumes the assimilative capacity of oxygen needed for aquatic life, which necessarily includes species listed under the federal and state endangered species laws.[151]
- Further, the Regional Board referenced the evidence that the discharge is shifting the food web that supports biologically sensitive aquatic life in the River and Delta by altering the nitrogen to phosphorous ratio of nutrients.[152]

The Regional Board reasonably found the discharge would not satisfy the requirements for a mixing zone outlined in the SIP, as it would (1) compromise the integrity of the entire water body; (2) adversely impact biologically sensitive or critical habitats, including, but not limited to, habitat of species listed under federal endangered species laws; and (3) produce undesirable or nuisance aquatic life.[153]

The Discharger challenges this approach, arguing that even assuming there were downstream effects, because the concentrations do not exceed the U.S. EPA's 1999 Water Quality Criteria for Ammonia, the Regional Board *had* to grant the request for a mixing zone.[154]

[149] Permit at F-56, J-1 to J-3.

[150] Permit at F-56, J-5 to J-7.

[151] Permit F-56 to F-57, J-8 to J-10.

[152] Permit F-56, J-5 to J-8.

[153] *See* Permit, citing SIP § 1.4.2.2(A)(1)-(11).

[154] Petition at 57-64.

This novel argument fails as a matter of law, because while the Regional Board may choose to set the effluent limit based on the U.S. EPA criteria (Option B above), the SIP provides wholly different standards for determining whether or not to allow a source to dilute its discharge in state waters.[155] Nothing in the SIP – or any other provision of federal or state law – required the Regional Board to put blinders on when making a mixing zone decision and consider only one 12-year old U.S. EPA criteria. Instead, the Regional Board properly retains the authority under the SIP to decide whether or not there would still be "adverse effects to the overall water body,"[156] including those listed in section 1.4.2.2(A)-(B).

The 12-year old criteria are not the most current scientific evaluation of the toxic effects of total ammonia nitrogen, particularly on the species of concern in the Delta. At the August 2009 Ammonia Summit, Drs. Werner, Teh and Johnson each independently, and using different methods, reported that the U.S. EPA 1999 Criteria are not fully protective of local species of concern.[157] Further research (outlined in Permit Attachment J and supplemented below) confirms that levels below the U.S. EPA 1999 Criteria are toxic to aquatic life. In deciding whether to allow the Discharger to continue to dilute its waste in the Delta, it was not only appropriate to look beyond the 12-year old criteria, it would be irresponsible to do otherwise.

2. The Regional Board's Decision To Deny A Mixing Zone Request Was Well Supported By The Record

The record fully and credibly supports the Regional Board's decision not to grant the requested mixing zone.[158] None of Discharger's scattershot attacks on the extensive data and research have merit.

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[155] *See* SIP § 1.4.2.

[156] SIP, Appendix 1-3 (definition of mixing zone).

[157] *See* Werner, I. 2009. Effects of total ammonia and wastewater effluent associated contaminants on Delta smelt. Oral Presentation at the Ammonia Summit, Rancho Cordova, CA, August 18-19, 2009; Teh, S. J 2009. "Acute toxicity of ammonia, copper, and pesticides to key copepods, Pseudodiaptomus forbesi and Eurytemora affinis, of the San Francisco Estuary," Oral Presentation at the Ammonia Summit, Rancho Cordova, CA, August 18-19, 2009; Johnson, M.L. 2009. Species sensitivity distributions and exposure concentrations; placing recent results into context. Oral Presentation at the Ammonia Summit, Rancho Cordova, CA, August 18-19, 2009.

[158] Permit at F-56 and Attachment J.

a. The record documents that concentrations of total ammonia nitrogen downstream of the proposed mixing zone would present toxic and chronic impacts on aquatic life

The record strongly supports the decision to deny a mixing zone because the evidence demonstrates the total ammonia nitrogen discharge is toxic to copepods and fish at levels observed far downstream of the discharge.[159]

Scientific data in the record and analyzed by Professor Swee Teh and his colleagues at the University of California – Davis,[160] for example, demonstrates that the enormous daily loadings of total ammonia nitrogen are causing acute and chronic toxicity impacts on aquatic life in the River and Delta.[161] Dr. Teh's initial tests on Sacramento River water at Hood Station 8 miles downstream, conducted in 2008, showed 95% mortality to *Eurytemora affinis*, a Delta copepod and food for Delta smelt.[162] Additional 96-hour toxicity tests in 2009 documented that concentrations of total ammonia nitrogen and copper in Delta water collected many miles downstream from the proposed mixing zone exceed the lethal concentration for the Delta

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[159] *See* Permit at J-1 to J-4; Staff Response to Comments at 18, Central Valley Regional Water Quality Control Board Meeting – December 9, 2010 (Staff RTC); *see also* Water Agencies' Comments at 9-11 (citing literature).

[160] Professor Teh is a PhD in Comparative Pathology and a Research Toxicologist and Pathologist in the Department of Anatomy, Physiology, and Cell Biology at the University of California - Davis. He is the Interim Director of the Aquatic Toxicology Laboratory at the UC-Davis School of Veterinary Medicine, and a UC-Davis Faculty Member for the Graduate Group in 1) Agricultural and Environmental Chemistry, 2) Ecology, and 3) Pharmacology and Toxicology, at the Center for Aquatic Biology and Aquaculture, the Center for Health and the Environment, and the John Muir Institute of Environment. Teh Decl. Exhibit 1.

[161] The relevant work include Dr. Teh's presentation at the Ammonia Summit at Central Valley Regional Water Board http://www.waterboards.ca.gov/centralvalley/water_issues/delta_water_quality/ambient_ammonia_concentrations/index.shtml (August 18-19, 2009), Teh Decl. Exhibit 2; Werner, et al., Pelagic Organism Decline (POD): Acute and Chronic Invertebrate and Fish Toxicity Testing in the Sacramento-San Joaquin Delta 2008-2010, Final Report Submitted to the California Department of Water Resources (July 24, 2010), Teh Decl. Exhibit 3; Full Life-Cycle Bioassay Approach to Assess Chronic Exposure of P. forbesi to Ammonia/Ammonium to the Delta Pelagic Organism Decline Contaminants Work Team (July 2010), Teh Decl. Exhibit 4; Letter from S. Teh to C. Foe (November 10, 2010), Teh Decl. Exhibit 5; S. Teh, et al., Final Report, Full Life-Cycle Bioassay Approach to Assess Chronic Exposure of Pseudodiaptomus forbesi to Ammonia/Ammonium – Submitted to C. Foe and M. Gowdy (March 4, 2011), Teh Decl. Exhibit 6.

[162] Permit at J-4.

copepods *P. forbesi* and *E. affinis*.[163] In follow-up 31-day full-life cycle chronic toxicity studies, which Dr. Teh reported at the July 6, 2010, Interagency Ecological Program (IEP) Contaminant Work Team meeting, Dr. Teh found that *P. forbesi* reproduction and survival was negatively affected by total ammonia nitrogen concentrations as low as 0.36 mg/L.[164] Total ammonia nitrogen concentrations at such levels were present in 2009 and 2010 up to *30 miles downstream* of the discharge.[165] Given these results, it is entirely reasonable to reject the Discharger's request for a mixing zone.

The Discharger claims Dr. Teh's 96-hour toxicity tests used a pH of 7.2 that allegedly was not representative, asserting that the average River pH is 7.8.[166] This criticism is groundless because the pH of 7.8 is at most an *average* value during a period of time. The record establishes that the River pH has in fact ranged to 7.2 and lower, meaning the copepods are exposed to total ammonia nitrogen at the lower pH. As Dr. Teh explains:

> The actual pH in the River and the discharge fluctuates over time and so the actual pH is both lower and higher than 7.8. In fact, the pH value between April 1, 2009 and August 31, 2009 from the California Data Exchange Center (http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SRH for Sacramento River at Hood is 7.33±0.12. The mean ± Standard deviation pH value during the 30 days period in July 2009 for Sacramento River at Hood is 7.22±0.08.[167]

Thus, there are substantial periods of time when the average pH is at the 7.2 pH level. In fact,

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[163] Permit at J-2; Teh Decl. at ¶ 6 and Exhibit 3 Werner, et al., Pelagic Organism Decline (POD): Acute and Chronic Invertebrate and Fish Toxicity Testing in the Sacramento-San Joaquin Delta 2008-2010, Final Report Submitted to the California Department of Water Resources (July 24, 2010).

[164] Permit at J-2 to J-3; Teh Decl. ¶ 9 and Exhibit 4.

[165] Permit at J-3; Teh Decl. ¶ 14 and Exhibit 5 (total ammonia nitrogen exceeded 0.36 mg/L in *44% of the samples* collected between Hood and Isleton in 2009-2010). *See also* Data provided by Chris Foe, Central Valley Regional Water Quality Control Board, collected between March 2009 and February 2010; *and* Permit at J-2 to J-3.

[166] Petition at 74, 77.

[167] Teh Decl. ¶ 11.

> the pH in the Sacramento River at R3 below the treatment plant **ranges to 7.2 and lower over 20% of the time**. That indicates the unsafe, toxic effects from the ammonia-nitrogen concentration I observed would have been present over 20% of the time and thereby interfered with the normal growth, survival, and propagation of the *P. forbesi* in the receiving water.[168]

Dr. Teh repeated his analysis and observed toxic effects at a higher pH of 7.8, finding that "conditions with a pH of 7.8 and a total ammonia nitrogen concentration of 0.73 mg/L would be toxic to *P. forbesi*."[169] These levels are present in the River outside of the mixing zone a significant percentage of the time. According to the Discharger's own data "from January 2005 to April 2010, the total ammonia nitrogen concentration in the Sacramento River at R3, 4,200 feet below the Treatment Plant and well outside the Discharger's proposed mixing zone of 350 feet, exceeds 0.73 mg/L nearly 20% of the time. The river pH was 7.8 or lower on all occasions when the total ammonia nitrogen level exceeded 0.73 mg/L."[170]

Despite the fact that Dr. Teh has been performing toxicity tests for two decades, the Discharger criticizes Dr. Teh's testing for using a copepod from the Delta, *P. forbesi*, known to be important to the pelagic food web. Apparently, the Discharger would rather that Dr. Teh used a test species of little relevance, or one not even native to the Delta. This criticism is without merit. For example, a report that Petitioner cites, Meyer et al. (2009) (cited at Petition at 104), expressly recommends conducting acute and chronic toxicity tests with major prey items of the POD species such as the copepod *E. affinis*.[171] As Dr. Teh explains:

> These are well-established toxicity test protocols, which I followed, and there is no scientific basis that precludes using the EPA method to test the toxic effects on an organism other than those specified in the methods. In this instance, as we wanted to test the specific effect on aquatic organisms of particular concern in the Delta, it

[168] Teh Decl. ¶ 11 (emphasis added). A pH less than 7.2 occurred in 24% of the samples between January 2005 and April 2010. *See* data file provided by Kathy Harder, Regional Board, entitled "Compilation of SRCSD Effluent and Receiving Water Concentration Data," (July 13, 2010).

[169] Teh Decl. at ¶ 12 and Exhibit 6.

[170] Teh Decl. at ¶ 12.

[171] Meyer, J.S., P. J. Mulholland, H. W. Paerl, and A. K. Ward. 2009. "A Framework for research addressing the role of ammonia/ammonium in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary ecosystem." Report to CalFed Science Program at p. 12.

> only made sense to use a copepod that is a central part of the Delta food web.[172]

The genesis of this work by Dr. Teh was a group of nationally recognized experts who urged that this very type of testing should be done. As Dr. Teh explains, "testing a Delta copepod that was part of the underlying food web was needed in order to evaluate the overall effect of ammonia on aquatic life in the Delta. *A Framework for Research Addressing the Role of Ammonia/Total ammonia in the Sacramento-San Joaquin Delta and the San Francisco Bay Estuary Ecosystem* 12 (April 13, 2009) (". . . analogous acute and chronic toxicity tests should be conducted with major prey items of the POD species")."[173]

The assertion that an aquatic life criterion for total ammonia nitrogen should be based solely on ambient *un-ionized* ammonia is likewise groundless.[174] Having created that straw man, the Discharger then claims there is no cause for concern, because the reported ambient *un-ionized* ammonia concentrations in the River outside the mixing zone are below the 72-hour effects observed.[175] This analysis is misleading and wholly irrelevant. The reason is simple: *Un-ionized* ammonia is only a small fraction of the total ammonia-nitrogen to which organisms are exposed in the River and Delta. In fact, "*almost all* of the total ammonia in the Sacramento River (98-99%) is *ionized ammonia*."[176] Using only the un-ionized fraction would exclude from testing the vast majority of the total ammonia nitrogen dumped by Discharger. That would be nonsensical, as "organisms are in fact exposed to total ammonia, and not just the unionized fraction." "[W]here the actual results demonstrate that the "*total ammonia* concentrations . . . affected the survival and reproduction of *P. forbesi*," it is that total ammonia that should be evaluated.[177]

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[172] Teh Decl. ¶ 13.

[173] Teh Decl. ¶ 13.

[174] Petition at 75-76.

[175] Petition at 77. Even using un-ionized ammonia, the chronic criteria for *P. forbesi* are exceeded in 13% of the samples from R3-1, 4,200 feet downstream of the point of discharge and well outside the Discharger's requested chronic mixing zone of 350 feet, between 2005 and 2010 (criteria=0.006 un-ionized ammonia).

[176] Teh Decl. ¶ 16 (emphasis added).

[177] Teh Decl. ¶ 16. It would also be inconsistent with the 1999 Update of Ambient Water Quality

The Discharger also claimed there were "irregularities" in Dr. Teh's test results because he found an "inverse relationship" between total ammonia nitrogen toxicity and pH for *P. forbesi* which differs from the responses for organisms included in the U.S. EPA ammonia database.[178] This is not an irregularity, but "due to basic principles of chemistry and the physiologic and mechanistic differences in ammonia and ammonium excretion between fish and copepods."[179] That the relationship may differ is not at all surprising, as the U.S. EPA's 1999 report indicated that the mechanism of pH dependence on total ammonia nitrogen toxicology varies among species.[180]

The Discharger also claims using Dr. Teh's work is "unlawful" under state and federal law, arguing that "when establishing effluent limitations" the Regional Board "must use . . . a proposed State criterion, or an explicit State policy or regulation interpreting its narrative" objective. (Petition at 79.) Yet, the Discharger is apparently confused. Dr. Teh's data are not being used to set the effluent limits. If they were, the limits would be even lower. The data were used to decide whether the Discharger has proven it should have a mixing zone that would allow the public's waters to be used to dilute Sacramento's waste. Nothing in the law imposes the constraints on the type of data the Regional Board should consider in making that judgment.

b. The Regional Board properly relied on Dr. Swee Teh's November 10, 2010 expert letter report

The threshold at which total ammonia nitrogen is toxic to certain aquatic organisms important to the Delta's food web is a key issue. One such threshold supporting the Permit is 0.36 mg of nitrogen per liter – the threshold at which Dr. Swee Teh and his colleagues at the University of California, Davis found total ammonia nitrogen to be toxic to *P. forbesi*.

Criteria for Ammonia which strongly suggested the effects of pH on total ammonia toxicity are due to the joint toxicity of ammonium (NH_4^+) *and* un-ionized ammonia (NH_3). *See* U.S. EPA's National Recommended Ambient Water Quality Criteria for the Protection of Freshwater Aquatic Life for Total Ammonia (EPA-822-R-99-014) (1999) (EPA 1999 Report), Teh Decl. ¶ 16.

[178] Petition at 78.

[179] Teh Decl.¶ 17 (explaining difference).

[180] *See* U.S. EPA 1999 Report.

The Discharger's attempt to exclude one aspect of Dr. Teh's analysis should be rejected. The Discharger objected at the December 9, 2010, hearing to the admission into the record of Dr. Teh's November 10, 2010 letter report to Dr. Chris Foe, a Regional Board Environmental Scientist, arguing that the public comment period on the draft Permit had closed on October 8, 2010. The Regional Board overruled the objection and entered the letter report into the record, a decision supported on multiple grounds as follows:

- *Rebuttal Evidence*: The Regional Board properly used Dr. Teh's letter report to rebut challenges to Dr. Teh made in the Discharger's October 8, 2010, comments. Those comments challenged the findings and conclusions Dr. Teh presented on July 6, 2010, to the IEP Delta Pelagic Organism Decline (POD) Contaminants Work Team.[181] That presentation contained data regarding test methods, results and conclusions. In its October 8, 2010 comments, the Discharger proffered several objections to the results, including how the studies were conducted.[182] In part in response to those objections, Dr. Teh redid that work and reproduced the results, rebutting any inference that those results were unreliable. As staff testified at the December 9 hearing, the letter report confirmed

  > [I]nformation . . . was presented to the contaminant work team meeting several months earlier. Essentially, the numbers have not changed. The organism did not change. We just redid the tests.[183]

- *Report Addressed Discharger's "Oral Talk" Objection*: The Discharger complained that Dr. Teh's July presentation was an "oral talk," suggesting that somehow that made it an improper basis upon which the Regional Board might rely. The Discharger cannot have it both ways – complain about an oral talk, and then object when the

[181] *See* Exhibit 4 to the Declaration of Dr. Swee Teh, submitted herewith.

[182] SRCSD letter to Kathleen Harder, CVRWQCB, Subject: SRCSD Comments and Evidence regarding Tentative NPDES Permit, Time Schedule Order, and Permitting Options Circulated on September 3, 2010. dated, October 11, 2010. at 38.

[183] Hearing Transcript at 410:21-411:1.

Regional Board responds to the criticism by furnishing a written document confirming what was said orally at an earlier time.

- *Access To Written Presentation Underlying July "Oral Talk"*: Dr. Teh's oral presentation was complemented by a written presentation of which the Discharger was well aware. The Discharger's expert, Dr. Diane Engle, indicated at the December hearing that Dr. Teh had emailed his presentation to a small group; in fact, it had been emailed to no less than four representatives of the Discharger, including Dr. Engle, on July 19, 2010. But the Discharger did not act on its knowledge, choosing instead to try to create an evidentiary issue.
    - Dr. Engle apparently did not pursue the matter herself, despite having received a copy of the July presentation. Given Dr. Engle's involvement with the IEP POD Contaminants Work Team and her work as a panel member at the Central Valley Regional Board's Ammonia Summit, she had access to the study information and conclusions since early July 2010. As a recipient of the State Board's Reg5 Delta Water Quality email distribution list, Dr. Engle would also have received the "2010 Ammonia Update" written by Dr. Chris Foe, and available on the Regional Board's website on October 7, 2010, which contained reference to Dr. Teh's study results.
    - Indeed, on October 7, 2010, Dr. Foe summarized the status of total ammonia nitrogen research since the Regional Board's August 2009 Ammonia Summit. Part of the update included a summary of Dr. Teh's presentation to the IEP Work Team. That summary clearly states that ". . . *P.forbesi* reproduction and nauplii survival was negatively affected by ammonia concentrations as low as 0.36 mg-N/L."[184] The update was provided nearly a week before the comment period for the September draft Permit expired. The Discharger had ample opportunity to raise questions regarding Dr. Teh's findings or studies.

[184] Foe, Chris, CV-RWQCB Letter to Jerry Bruns, CVRWQCB and Karen Taberski, SFB-RWQCB, Subject: 2010 Ammonia Update, October 7, 2010.

- *The Regional Board Independently Evaluated The Underlying Tests And Is Relying On Its Own Expertise – Not Solely On Dr. Teh's*: The subject studies were conducted in conjunction with Dr. Foe, of the Regional Board, who is indentified on the July presentation as a co-presenter.[185] Dr. Foe testified that, "we have also gone to the lab, looked at the test methods, and reviewed the actual data."[186] He confirmed that he independently reviewed the data from the studies.[187]
- *Other Indicia of Trustworthiness*: As noted above, Dr. Teh is an experienced research and faculty member at the University of California, Davis. His letter report confirmed the results of earlier studies and also updated results of the continuing studies that were funded by the State Water Board researching the effects of total ammonia nitrogen on copepods. The Discharger is challenging a UC Davis professor collaborating with a Regional Board Ph.D. scientist, properly using State Water Board funding to test propositions very important to this Permit. The Regional Board acted properly in allowing the letter report which enabled the Regional Board members to act upon the most recent and relevant information.

Overall, the Discharger's objection on the basis of fairness of process was properly overruled. The Discharger had ample notice of Dr. Teh's research and findings prior to the December 2010 hearing; it had notice that the Regional Board was, in part, relying on his findings and conclusions to support the Permit as was set forth in the September draft Permit. In comments on the draft Permit, the Discharger addressed Dr. Teh's July 2010 presentation and attacked his conclusions. The Discharger had the opportunity to subpoena Dr. Teh for the hearing to examine him regarding his conclusions, but failed to do so. At the hearing, the Regional Board's staff, as well as persons directly affected by or interested in the adjudicatory proceeding,

[185] *See* Hearing Transcript at 410:21 – 411:1.

[186] Hearing Transcript at 411:5-6.

[187] Hearing Transcript at 410:21 – 411:10.

may present evidence. The staff and the other persons are then subject to cross-examination.[188] The Discharger had the opportunity to cross-examine Dr. Foe as to his assertion that Dr. Teh's November 10 letter was a corroboration of earlier studies and findings, and as to Foe's assertion that he independently examined the study methods and data to confirm the findings regarding the affects of total ammonia nitrogen on *P. foresbi*. The Discharger did not engage in any cross-examination of Dr. Foe as to his assertions and should therefore be estopped from asserting the deprivation of an opportunity to do so. The Regional Board determination to overrule the Discharger's objections should be upheld.

c. The ammonium is inhibiting nitrate uptake, contributing to low diatom abundance and reducing diatom primary production

The Regional Board reasonably concluded that the Discharger should not be allowed to dilute its effluent in a mixing zone because the ammonium is depressing primary productivity by inhibiting nitrogen uptake by diatoms and reducing diatom productivity and biomass.[189] Regional Board monitoring data demonstrate that while "[a]nnual average ammonia concentrations increased 11.5-fold in the River downstream of the SRWTP,"[190] nitrate uptake essentially ceases and primary production declines after the discharge.[191] The "primary productivity" of the phytoplankton and zooplankton at the base of the Delta food web – essential to a healthy ecosystem – has been depressed. Most of the world's largest estuaries have a higher primary productivity rate than the Delta,[192] and declines in several zooplankton species have followed the observed declines in phytoplankton biomass as measured by chlorophyll *a* ("chl-*a*"). Research indicates that Delta-wide chl-*a* levels are now low enough to limit zooplankton abundance,[193] and

[188] 23 Cal. Code Regs. § 648.5.1.

[189] *See* Permit at 56; J-5 to J-8.

[190] Permit at J-5.

[191] *See* Water Agencies' Slide 40; Hearing Tr. 293:9-240:4. *See also* Dugdale Report at ¶¶ 20 and 21.

[192] Hearing Tr. at 125:5 to 125:9.

[193] Müller-Solger, A., A.D. Jassby and D.C. Müller-Navarra. 2002. Nutritional quality of food resources for zooplankton (*Daphnia*) in a tidal freshwater system (Sacramento-San Joaquin River

zooplankton are an essential prey item for endangered fish species in the Delta, including the Delta smelt.[194]

The Delta's algal species composition has shifted from diatoms to flagellates, cryptophytes and cyanobacteria, which are a lower quality food, and to invasive macrophytes such as *Egeria densa*.[195] The shift from diatoms to smaller celled phytoplankton results in a less efficient food web. Cloern and Dufford (2005) state, "[s]ize is important because many metazoan consumers, such as calanoid copepods, cannot capture small particles, including the nutritionally-rich nanoflagellates. . . ."[196] Recent studies in the Delta's low salinity zone by Slaughter and Kimmerer (2010) observed lower reproductive rates and lower growth rates of the copepod, *Acartia* sp., in the low salinity zone compared to taxa in other areas of the estuary. They conclude that "[t]he combination of low primary production, and the long and inefficient food web have likely contributed to the declines of pelagic fish."[197] Research has shown that "[t]he efficiency of energy transfer from phytoplankton to consumers and ultimate production at upper trophic levels vary with algal species composition: diatom-dominated marine upwelling systems sustain 50 times more fish biomass per unit of phytoplankton biomass than cyanobacteria-dominated lakes. . . ."[198]

Delta). *Limnol Oceanogr* 47(5):1468-1476.

[194] Sommer. T, C. Armor, R. Baxter, R. Breuer, L. Brown, M. Chotkowski, S. Culberson, F. Feyrer, M. Gingras, B. Herbold, W. Kimmerer, A. Mueller-Solger, M. Nobriga and K. Souza. 2007. The Collapse of Pelagic Fishes in the Upper San Francisco Estuary. *Fisheries* 32(6):270-277; Winder, M. and A.D. Jassby. In press. Shifts in zooplankton community structure: Implications for food web processes in the Upper San Francisco Estuary. *Estuaries and Coasts*. DOI 10.1007/s12237-010-9342-x.

[195] *See* Water Agencies' June 1 Comments at 13.

[196] Cloern, J.E., and R. Dufford. 2005. Phytoplankton community ecology: principles applied in San Francisco Bay. *Mar. Ecol. Prog. Ser.* 285:11-28.

[197] Slaughter, A. and W. Kimmerer. 2010. Abundance, composition, feeding, and reproductive rates of key copepodsspecies in the food-limited Low Salinity Zone of the San Francisco Estuary. Poster Presentation at the 6th Bienniel Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010.

[198] Cloern and Dufford, 2005, *supra*.

To draw the connection to the Discharger, the Regional Board cited the work, among others, of Drs. Richard Dugdale, Frances Wilkerson and Alexander Parker, from the Romberg Tiburon Center, San Francisco State University, who have found ammonium concentrations from the discharge are so high they "are suppressing nitrogen uptake and algal primary production in both Suisun Bay and the Delta."[199] "[A]mmonia begins to suppress nitrate assimilation and primary production rates at 0.014 mg/L N with complete shutdown by 0.056 mg/L N," equivalent to 4µmol/L (4 micro moles/L)."[200] This has inhibited spring phytoplankton blooms, a crucial food source for aquatic life in the Delta and estuary.

Dugdale and his colleagues found nitrogen uptake declined with increasing ammonium concentrations in the five stations immediately downstream of the Treatment Plant and at Rio Vista, far beyond the requested mixing zone.[201] Indeed, the annual average ammonium concentrations at Chipps Island, 40 miles downstream, was 0.1 mg/L N in 2009 and 2010, almost ten times the level that would begin to suppress nitrate uptake.[202] Primary production has not only declined, but the remaining production has shifted to less desirable species.[203]

The Discharger criticizes the Regional Board's reliance on the Dugdale work, arguing first that because invasive clams could otherwise preclude a summer-fall bloom,[204] the 30,000 pounds

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[199] Permit at J-5 to J-6 (citing research by Dugdale et al 2007; Wilkerson et al 2006); *see also* Water Agencies' Slide 39. The Dugdale research team are well known experts in the field. Their CVs are attached as Exhibit 1 to the Dugdale Report.

[200] Permit at J-6.

[201] *See* Parker, A.E., A.M. Marchi, J.Drexel-Davidson, R.C. Dugdale, and F.P. Wilkerson. 2010. "Effect of Ammonium and Wastewater Effluent on Riverine Phytoplankton in the Sacramento River, CA. Final Report. May 29, 2010. *See* Water Agencies' Comments at 12; Wilkerson, F., R. Dugdale, A. Marchi, and A. Parker. 2010. "Different response types of phytoplankton to changing nutrient regimes in SF Bay/Delta: Bottom up effects of ammonium and nitrate." Oral Presentation at 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010.

[202] Permit at J-5; *see* Hearing Tr. 123:34 to 124:1.

[203] Permit at J-7 ("larger algal cells (diatoms) are favored and grow faster in the nitrate-dominated river above the SRWTP while smaller phytoplankton species (flagellates and blue green algae) are competitively superior and grow faster at the higher ammonia levels present downstream of the SRWTP.")

[204] Petition at 84-85.

of total ammonia nitrogen per day should be left unregulated. Surely the Clean Water Act does not envision unlimited discharge of toxic discharges because the full benefits of removing the harmful discharge may not always be achieved at all times. This is not the first time the Discharger has argued for inaction on the basis that "existing conditions are already bad."[205] The Superior Court in the CEQA case regarding the Discharger's 2020 Master Plan rejected the argument that nutrient controls could be avoided where "significant impact may have been concealed" because the Discharger was discharging to waters already over-enriched.[206] The court relied on CEQA precedent that concluded such arguments "trivialize the project's impact."[207]

In this case, the clams are no excuse for the Discharger. It is undisputed that the clams are not abundant in the spring, and thus removing the total ammonia nitrogen would facilitate a spring bloom. These blooms would provide substantial benefit to the Delta ecosystem.[208] While clams could interfere with summer/fall blooms now, they may not be as abundant in the summer/fall in the future. This invasive species largely has disappeared in both South San Francisco Bay and in San Pablo Bay and may well undergo a similar decline in Suisun Bay. In addition, removing total nitrogen under the Permit may mitigate the effects of clams, as studies in other systems have shown that clams are most prevalent when the Nitrogen (N) to Phosphorus (P) ratio – the N:P ratio (discussed further, *infra)* – is high. Peer reviewed literature has shown that invasive clams and aquatic weeds invaded the Delta, the Potomac River and the Ebro River Estuary in Spain only when N:P ratios increased.[209] It has been observed in the Potomac River that as controls on total ammonia and nitrogen were implemented and the N:P ratio declined, the invasive clams receded and native grasses began to return.[210]

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[205] CEQA SOD, at 21.

[206] CEQA SOD, at 21.

[207] CEQA SOD, at 21.

[208] Dugdale Report ¶ 4.

[209] *See* Water Agencies' Comments at 20 (citing research by Glibert (2010), Ruhl and Rybicki (2010) and Ibanez et al (2008)).

[210] Slide 49, Water Agencies Hearing Presentation.

The claim that the spring blooms would be small, citing data from 1977-1986, is likewise without merit.[211] Representative data indicate that spring blooms likely would be very significant. Large spring blooms occurred *before* the Plant started-up (1982), and "for the period 1969 – 1977, Suisun Bay chlorophyll *a* concentrations were as high as 30-40 µg/L during spring."[212] Dugdale Report ¶ 5, Figure 2.[213] Spring blooms in the Sacramento River downstream of the plant were also as high as 30-40 µg/L between 1975 and 1981, prior to the Treatment Plant coming on line in 1982.

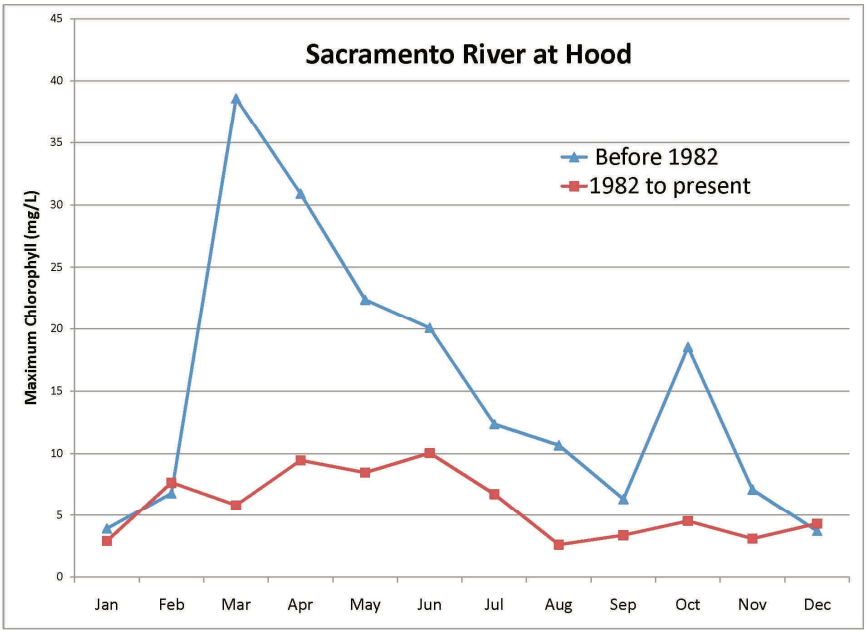

Figure 1. Maximum monthly chlorophyll a concentrations measured in the Sacramento River at Hood prior to 1982 and from 1982 to present. Data is from the California Department of Water Resources Environmental Monitoring Program stations C3 and C3a from January 1975 through December 2010.

[211] Petition at 85-86 and SR Figure 4.

[212] Ball, M. and J. Arthur, Planktonic Chloropnhyll Dynamics in the Northern San Francisco Bay and Delta, in T. Conomos, San Francisco Bay: The Urbanized Estuary. Pacific Division, American Association for the Advancement of Science, San Francisco at 265-285 (1979).

[213] Sacramento Regional's Figure 4 (Petition at 86) is misleading. It uses *average* data during each month over the ten year period. Therefore, it does not depict the range of concentrations that actually occurred. Figure 1 in the Dugdale Report, attached, shows the range of concentrations; spring blooms during this same time period reached 30-40 µg L^{-1}. Moreover, as the treatment plant started up in 1982, the earlier data from Ball and Arthur (cited by Dugdale) is more representative, Figure 2 in the Dugdale Report.

Consistent with the current Dugdale research, the spring blooms observed in 2000 and 2010 when ammonium concentrations were low reached a comparable level to the historic spring blooms.[214] Moreover, "diatoms were the dominant phytoplankton during [the 1969-1977 blooms] and in 2000 and 2010."[215] "[T]hese results strongly suggest that high chlorophyll *a* concentrations characteristic of the pre-1987 period should occur more frequently during spring if the low NH_4 conditions were restored to Suisun Bay."[216] Unlike the recent blooms in Suisun Bay, Figure 1 above shows that there have not been any blooms in the Sacramento River region of the Delta since the Treatment Plant came on line, likely because ammonium concentrations have never been low enough for long enough to remove the inhibitory effect.

The Discharger misinterprets time series data of chlorophyll *a* and ammonium concentration in Suisun Bay from Dugdale *et al*. (2007).[217] Dugdale reported five periods from 2000-2003 during which the ammonium concentration reached 4 *u*M/L or lower in Suisun Bay. While a bloom did not occur in three of these five instances, each was *during the summer* when clam grazing, as Discharger itself alleges, was expected to discourage a bloom.[218] The fourth instance was during spring (Spring 2003), but the field program ended mid-spring without recording further data. Thus, there "are no data to support the assertion that 10 µg/L was the peak chlorophyll, as that value could very well have represented the beginning of an upward slope in chlorophyll" as was observed in April 2000 when "ammonium reduced to 1.9 µmol/L."[219]

The Discharger erroneously disputes the relationship between the discharge and reduced phytoplankton growth by noting there is no dramatic step change in biomass (as measured by

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[214] Dugdale Report ¶ 7.

[215] Dugdale Report ¶ 5.

[216] Dugdale Report ¶ 7.

[217] Petition at 86-87.

[218] Dugdale Report ¶ 10.

[219] Dugdale Report ¶ 11.

chl-*a*) concentrations immediately after the discharge point (at River Mile 44).[220] But, biomass measured after the discharge point includes the phytoplankton which have floated downstream, so "the full effect of the discharge on biomass will not be seen until further downstream."[221] The data show that further "downstream of the treatment plant chlorophyll declines by up to 75% compared to chlorophyll above the SRWWTP discharge."[222] Even more important are the phytoplankton process rates which do show a step change at the discharge point and are an indication of the phytoplankton physiological health. Those data show "both primary production rates and phytoplankton nitrogen uptake rates are suppressed in downstream stations . . . as compared to rates above the discharge."[223] Indeed, "beginning immediately downstream of the SRWWTP diffuser, primary production and phytoplankton NH_4 uptake rates decline by 20 to 36% and NO_3 uptake decreases by 80%."[224]

Pointing to data showing there are also declines in chlorophyll *a* upstream of the Treatment Plant, the Discharger claims those data mean their daily discharge of 14 tons of total ammonia nitrogen is not the cause of the decline in productivity, suggesting there is some unknown upstream cause.[225] But, whether reductions in chlorophyll *a* have been observed in the data collected above the discharge point is beside the point, at least absent evidence of a common causative agent both upstream and downstream.[226] The Discharger identifies no such agent; its

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[220] Petition at 91-92 (and Figure 7).

[221] Dugdale Report ¶ 20.

[222] Dugdale Report ¶ 20, citing Parker, A.E., A.M. Marchi, J. Drexel-Davidson, R.C. Dugdale and F.P. Wilkerson, 2010, "Effect of ammonium and wastewater effluent on riverine phytoplankton in the Sacramento River, CA, Final Report to the State Water Resources Control Board.

[223] Dugdale Report¶ 21.

[224] Dugdale Report ¶ 21, citing Parker *et al*., 2010, *supra*.

[225] *See* Petition at 91-96.

[226] The reason for the decline in chlorophyll found at upstream stations is not well understood, "although the input of freshwater from the American River (between I-80 and station "TOW; Tower Bridge") has been suggested to dilute chlorophyll in the Sacramento River. Additional losses from zooplankton grazing or sinking of phytoplankton cells may also be important." Dugdale Report ¶ 22; *see* Water Agencies' Comment at 15.

argument is non-scientific and speculative. What is relevant is that the total biomass and rate of nitrate, ammonium and carbon uptake are markedly lower downstream, as compared with upstream. That is well documented and supports a decision to deny a mixing zone.

The polluter even claims that its waste is facilitating phytoplankton growth.[227] Nothing could be further from the truth. To support its novel claim, Petitioner distorts "enclosure" or "grow-out" experiments presented by Dr. Parker,[228] claiming because the total biomass was higher in the enclosure containing downstream river water, the River was nitrogen limited and benefited from the discharge. However, the grow-out experiments are isolated from the natural river flows and biogeochemical processes, so they "cannot be used to assess nutrient limitation in a natural system."[229] What they can assess is whether ammonium inhibits growth by measuring the nitrogen and carbon uptake rates, and, in these experiments, the tests showed the water collected from downstream of the discharge had a lower nitrate, ammonium and carbon uptake rates than that upstream.[230] The results are fully consistent with the core aspect of the Dugdale work considered by the Regional Board in rejecting the mixing zone: elevated ammonium concentrations suppress nitrogen uptake and primary production.

The Discharger points to data presented by Dr. Parker (SR-Figure 10) to argue that because that figure shows the carbon uptake increasing in the confluence zone (where the Sacramento and San Joaquin rivers join), factors other than ammonium must be controlling phytoplankton and primary production in the River.[231] Figure 10 does not support this

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[227] Petition at 89-91.

[228] These experiments collected water from upstream of the Treatment Plant (at Garcia Bend) in one enclosure and water from downstream (at River Mile 44) and ran tests for four days. Dugdale Report ¶ 14. The ammonium concentration in the downstream enclosure was above the 4uM L-1 inhibition threshold and higher than in the upstream enclosure. After four days the total biomass was higher downstream, and Discharger asserts that means the additional ammonium in the discharge enhanced growth. Petition at 89-90.

[229] Dugdale Report ¶ 15.

[230] Dugdale Report ¶ 21.

[231] Petition at 95-96.

speculation, but, rather, is fully consistent with the proposition that excessive ammonion is inhibiting both nitrate and ammonium uptake. As the Dugdale group explains, "the decline in primary production downstream of the [Treatment Plant] was the result of both the shutdown of NO3 uptake by NH_4 and the inhibition of NH_4 uptake by the elevated ammonium concentration. We interpret the increase in carbon fixation at the confluence as a result of the declining NH_4 concentration allowing NH_4 uptake and associated primary production to increase."[232]

d. The pending proposed U.S. EPA aquatic life criteria for ammonia provides another basis to reject the mixing zone

It would be reasonable for the Regional Board to rely on the U.S. EPA's 2009 proposed Ammonia Criteria Update as part of the evidence to reject the requested mixing zone.[233] The 2009 Ammonia Criteria are based on current science to update the U.S. EPA's 1999 Ammonia Criteria. These include more stringent total ammonia criteria for native freshwater mussels, which are known to reside in the Sacramento River.[234] Total ammonia concentrations in the River exceeded the 2009 Ammonia Criteria downstream of the mixing zone 21 percent of the time between 2007 and 2008 and 41 percent of the time in 2009.[235]

The Discharger does not dispute the scientific analysis underlying U.S. EPA's proposed 2009 toxicity criteria. Nor does it question the fact that the proposed criteria repeatedly have been exceeded. Discharger argues that it is improper for the Regional Board to rely on U.S. EPA's 2009 Ammonia Criteria when deciding whether to grant a mixing zone "because it is a draft and not available for use in a regulatory setting."[236] But the Regional Board did not apply

[232] Dugdale Report ¶ 24.

[233] Permit at F-56. Draft 2009 Update Aquatic Life Ambient Water Quality Criteria For Ammonia – Freshwater (December 2009), available at http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/pollutants/ammonia/upload/2009 _12_23_criteria_ammonia_ 2009update.pdf.

[234] Permit at F-56. While the Discharger is correct that the "without mussels" criteria is not more stringent than existing criteria, Petition at 123-24, this fact is irrelevant because mussels are present and thus the "with mussels" criteria is applicable.

[235] Permit at J-4.

[236] Petition at 122.

the criteria as a binding regulatory standard. The Regional Board may have considered the 2009 Ammonia Criteria as part of its responsibility to consider the best, currently available data. It would be a reasonable exercise of the Regional Board's authority to protect water quality for it to consider these criteria as one of several reasons it rejected the Discharger's request to dilute its waste in the River. U.S. EPA reported to the Regional Board that it expects to adopt the criteria this year.[237] The criteria are available and represent the most current analyses, and thus appropriately could be considered in establishing effluent limits in the Permit.

e. The Regional Board reasonably considered the formation of nitrosamines in denying the request for a mixing zone

The Discharger contends that the Regional Board improperly denied mixing zones for total ammonia on the basis of nitrosamines. It is beyond dispute that the Discharger currently must disinfect its discharge, and that disinfection generates harmful nitrosamines in the effluent discharged to the River. It is also not contested that nitrosamines are "highly mutagenic compounds that are suspected of carcinogenic activity to the human body."[238] The mixing zone requested by Discharger would allow these harmful compounds to persist. It was entirely reasonable for the Regional Board to reject a mixing zone and thereby largely eliminate the discharge of these harmful compounds.

The Discharger argues there is no regulatory level for nitrosoamines, and that drinking water notification levels for nitrosoamines are not mandatory.[239] Discharger's claims miss the mark, as they fail to demonstrate that it was in any way unreasonable for the Regional Board to consider the potential effects of nitrosoamines in exercising its discretion to grant or deny a mixing zone. To the contrary, the Regional Board reasonably exercised its discretion and considered all the data available to it, including data that showed the precursors to harmful nitrosamines, such as nitrosodimethylamines (NDMA), were present at significantly higher levels

[237] Permit at F-56.

[238] Permit at J-10.

[239] Petition at 120-122.

below the discharge.[240] Specifically, DWR found "NDMA precursors significantly greater (3-4 times) below the discharge compared with above the discharge."[241] The nitrosamine precursors found in the effluent also may result in nitrosamines at downstream drinking water treatment plants.[242]

f. Additional peer-reviewed published research by Professor Glibert establishes that the nutrient discharge is causing a shift in algal communities by changing the nutrient ratios to favor harmful, invasive species

As further support for its decision to deny the mixing zone, the Regional Board referred to the research by Dr. Patricia Glibert that finds altered nutrient ratios in the Delta are the likely source of the observed shift in the phytoplankton community.[243] Dr. Glibert, a professor at the University of Maryland Center for the Environmental Science Horn Port Laboratory, is an aquatic ecologist and nutrient biogeochemist with over 30 years of experience working on issues related to nutrient loading, nutrient ratios, eutrophication, changes in trophic dynamics, harmful algae, and management implications of nutrients loading all over the world. Dr. Glibert has studied and published on a wide range of topics related to nutrients and food web dynamics.[244]

While not essential to confirm the decision of the Regional Board, Dr. Glibert's published, peer-reviewed work[245] provides additional record support to deny the requested mixing zone and require total ammonia and nitrate removal. Dr. Glibert's work has revealed significant correlations between the shifting nutrient ratios in the Delta, as a result of the significant nutrient

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[240] Permit at J-10 to J-11.

[241] *Id.* at J-11.

[242] *See* Water Agencies' Comments at 27-28; Staff RTC at 23-24.

[243] Permit at J-7 to J-8.

[244] Dr. Glibert's experience is described in her declaration responding to the issues raised by the Discharger, Declaration of Dr. Patricia Glibert (Glibert Decl.) and her CV (Glibert Decl. Exhibit 1).

[245] In contrast, the challenges by Dr. Engle and Mr. Suverkropp were neither published nor peer reviewed.

loadings from the Treatment Plant, and the composition of the base of the food web.[246] Dr. Glibert found a measureable change in the ratio of nitrogen to phosphorous (the N:P ratio) in the Delta, an increase in total N loading, a decrease in total P loading, and a change in the dominant form of nitrogen from nitrate to total ammonia.[247] The variation in these nutrient concentrations and ratios is highly correlated to variations in the nutrient composition of the Treatment Plant's discharges. These nutrient variations are in turn related to variations at all levels of the food web, to variations in the composition of phytoplankton,[248] to variations in the composition of zooplankton, and to variations in the abundance of several fish species. Dr. Glibert proposed that the food web changed over time in response to altered nutrient loads, forms and ratios and these relationships, in turn, were related to changes in Delta smelt. Common to all of these loads and ratios was not only the increase in ammonium loads from wastewater discharge in the upper Sacramento River but the timing of these changes. In addition, as evidenced by the recent increase in annual blooms of *Microcystis*, and in the shift in the algal composition in the Delta, the algal community that comprises the food web has been shifting at the same time that the nutrient ratio has been changing.[249]

The core principles of Dr. Glibert's research are well-established in the record and supported by other research from around the globe. For example, the N:P ratio has long been shown to influence phytoplankton composition and the presence – or absence – of native species and vegetation, as extensive studies have repeatedly demonstrated across a range of estuaries in the United States and elsewhere around the globe, as well as in the laboratory.[250]

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[246] *See* Water Agencies' Comments at 16-23 (citing and discussing research by Dr. Glibert and others).

[247] Glibert, P., 2010a. "Long-term changes in nutrient loading and stoichiometry and their relationships with changes in the food web and dominant pelagic fish species in the San Francisco Estuary, California," Reviews in Fisheries Science.

[248] Glibert, P. 2010b. Changes in the quality and quantity of nutrients over time and the relationships with changes in phytoplankton composition. Oral Presentation at 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010.

[249] Water Agencies' Comments at 18.

[250] *See* Water Agencies' Comments at 19-23 (collecting and discussing literature).

The Discharger, however, makes a series of attacks on Dr. Glibert's work. As detailed in Dr. Glibert's rebuttal (Glibert Declaration) these challenges are without scientific merit.[251]

First, the Discharger erroneously claims that factors other than ammonium are the cause of the *Microcystis* blooms, such as water transparency, flows, specific conductivity and others.[252] In fact, considerable data and an extensive literature suggests that *Microcystis* blooms have been associated with ammonium, as cyanobacteria favor an environment in which ammonium is available and "the literature demonstrates that abundance and toxicity of *Microcystis* are significantly enhanced by ammonium, particularly under high nutrient ratios."[253] While these invasive blooms may do better under certain water conditions, those conditions are not the root cause. Quite simply, it is the nutrients that are – "there is no biological way to produce biomass from 'transparency, flows and specific conductivity.' Nutrients, including nitrogen, phosphorus and carbon (along with other micronutrients), are the fundamental elements on which biomass is made."[254]

Second, the Discharger alleges several "defects" in Dr. Glibert's analytical approach, including the use of the cumulative sums of variability statistic (CUSUM).[255] Dr. Glibert used

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[251] The bulk of the Discharger's attacks are based on the unpublished work prepared by consultants. Thus, while the Discharger took great pains to challenge certain data the Regional Board considered because those data were not published, e.g., Petition at 79-80, 95, 122, in contrast to Dr. Glibert's research, the SRCSD's critiques of Dr. Glibert's work have not been published or peer reviewed. Petition at 98-102.

[252] Petition at 97-98.

[253] Glibert at 4. In addition to Dr. Glibert's work, Lehman found significant relationships between nitrogen and Microcystis for several seasons and sites and noted that Microcystis is a "nitrogen lover." See Lehman, P. 2010. Factors that have influenced the increase of Microcystis blooms in the San Francisco Estuary since 2003. Oral Presentation at the 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010. Also, Dr. Carol Kendall of the USGS, based on analyses of stable isotopes, observed that Microcystis in the Delta is growing ammonium . *See* Water Agencies' Comments at 21; Kendall, C. 2010. Use of stable isotopes for evaluating environmental conditions associated with Microcystis blooms in the Delta. Oral Presentation at the 6th Biennial Bay-Delta Science Conference, Sacramento, CA, September 27-29, 2010 and Kendall, C. 2011; *see also* Use of stable isotopes for evaluating environmental conditions associated with Microcystis blooms in the Delta. Oral Presentation at the 2011 IEP Annual Workshop, Folsom, CA, March 30, 2011.

[254] Glibert at 5.

[255] CUSUM represents a cumulative sum of scaled deviations from a target value. A simple

CUSUM as a tool, in context of established principles of biology and ecology, to assess trends in nutrients, phytoplankton, zooplankton and fish, in the Delta, including the relationship between the presence of ammonium and the decline of certain fish species, such as the Delta smelt.[256] There is nothing unusual about using CUSUM to investigate these relationships. In fact, CUSUM is an accepted statistical tool that "is increasingly being applied in ecological analysis" by many researchers.[257]

Among other claims by the Discharger:

- The Discharger asserts that, "CUSUM series mute seasonal and other short term variation."[258] However, this contention shows the Discharger's wholesale lack of understanding of the analysis. A central purpose of the CUSUM series is in fact to identify long-term patterns and it does that by smoothing short-term variation so that the long-term variation and changes over time are not masked by the noise associated with short-term variation.[259] Thus, this is in no way a "defect" in the analysis.
- The Discharger asserts that CUSUM cannot be interpreted in the same way as a regression analysis and results in "inflated R2" values.[260] Again, that completely misses the point. CUSUM shows relationships or trends in the data and is not intended to be the equivalent to running a regression analysis on the raw data. As such, the regression statistics (like R2) will be different. Indeed, there would be no

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analogy is the scoring in golf – the total score is the raw score, but the CUSUM type score is the running sum of the deviation from "par."

[256] Glibert at 18.

[257] Glibert at 12-16 (describing a series of peer reviewed articles and published reports). Among the researchers are Briceño and Boyer (2010a) who are using CUSUM statistics in the course of their work directed by the United States related to the ongoing development of nutrient discharge limits in Florida.

[258] Petition at 100, lines 7-9.

[259] Glibert at 19, *citing* Breaker and Flora (2009).

[260] Petition at 101, lines 3-7.

reason to do the CUSUM analysis if it were the same as a regression on the raw data.[261]

- The Discharger makes the fantastic claim that Dr. Glibert's CUSUM correlations – which were accepted for publication after peer review – "violate virtually every assumption of a standard correlation analysis."[262] In reality, the use of CUSUM plots to detect change "are well known and well described in the statistics literature. The heteroscedastic nature, or nature of the variance of the residuals, of the data of these curves, is not relevant to the nature of their trends over time."[263] The issues raised by the Discharger are not factors that affect the direction of the trends in CUSUM curves. Dr. Glibert used the CUSUM curves as guidance as to when inflection points occurred and when one variable changed and another did not. This guidance, combined with her vast knowledge of nutrient biogeochemistry and phytoplankton physiology, provided the basis for her conclusions. Indeed, these types of analyses are currently being used in a variety of contexts, including to provide guidance in evaluating when total phosphorus (TP) and algal biomass (chlorophyll *a*) for a site in Florida changed in order to assess the relationship between those two variables.[264]
- The Discharger asserts that "autoregressive" time series data are not appropriate for CUSUM change point analysis.[265] ("Autoregressive" data are data in which a point in time is a function of a previous point in time.) Notwithstanding the Discharger's claims, the published literature makes plain this is a non-issue. Breaker (2007) and

[261] Glibert at 20.

[262] Petition at 100, lines 16-19. (The Discharger bases this assertion on the work of its consultant, Mr. Suverkropp, who has a Master's degree in animal science.)

[263] Glibert at 21.

[264] Briceño and Boyer 2010a.

[265] Petition at 100, lines16-19.

Breaker and Flora (2009) addressed this extensively and found no evidence that autoregressive data can affect the direction of change in a CUSUM analysis.[266]

- The Discharger further asserts that Dr. Glibert paired CUSUM series which spanned different ranges of years.[267] This assertion is flatly wrong. All the analyses in Glibert 2010 were performed for data pairs spanning the same years.[268]
- The Discharger also claims that Dr. Glibert's analyses (in her peer-reviewed and published 2010 paper) were based on an inadequate geographic coverage.[269] The Discharger offers absolutely no data, calculations or other support for this blanket assertion that data from two stations was inadequate. Since Dr. Glibert was looking at how nutrient changes may have affected the Delta, it was appropriate that the stations bracket the area impacted by the largest source of ammonium/nitrogen on the Sacramento River, the Discharger's Treatment Plant.[270]
- The Discharger complains that Dr. Glibert used a biased selection of variables, suggesting there are other pairings of other variables that should be considered.[271] The fact that other data could be studied in no way diminishes the ability of the Regional Board to rely on Dr. Glibert's peer-reviewed research to support the Permit. Dr. Glibert never intended that her paper "would be the only analysis evaluating the relationship between nutrients and components of the food web of the Bay Delta."[272]

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[266] Glibert at23-26.

[267] Petition at 101, lines 1-2.

[268] Glibert at 27.

[269] Petition at 99, lines 15-18.

[270] Dr. Glibert has since expanded her analysis to other areas of the Delta and the relationships she observed and reported in Glibert 2010 between nutrients and the various trophic levels remains the same. *See* Glibert at 30.

[271] Petition at101, lines 10-11.

[272] Glibert at 30.

Other relationships may be explored, and Dr. Glibert has continued to explore those in a follow up paper.

- The Discharger complains that Dr. Glibert omitted "many well-known hypotheses" from her article.[273] Her paper was focused on the relationships between nutrients and the food web. While it is true that Dr. Glibert did not analyze every known hypothesis in her paper, the assertion that this somehow invalidates the findings in her paper is absurd.

In short, none of the Discharger's criticisms of Dr. Glibert's CUSUM analysis have merit. Most importantly, none affect the overarching conclusion from Glibert (2010) that changes in nutrients are related to changes in phytoplankton and to changes in zooplankton and ultimately to changes in fish abundance in the Delta. Dr Glibert has repeated her statistical analyses comparing CUSUM relationships to relationships using raw data for ***10 different sets of comparisons*** (shown in Table 3 below) and, regardless of the method used, the overall trends are the same. These examples "demonstrate that while the actual statistical significance of CUSUM-CUSUM, log-log and untransformed relationships vary, those of CUSUM-CUSUM do not change the overall trend or pattern as the direction of change is never altered. Application of CUSUM curves allows a new window into the dynamics of change. It expands our horizons with which data can be interpreted."[274]

Table 3. Example comparisons from Bay Delta time series data illustrating the correlations of variables when regressed using untransformed, "raw" data, log-transformed data and CUSUM-transformed data. The untransformed DIN/TP values are mg L^{-1}/mg L^{-1}; those of NH_4^+ are mg L^{-1}; *Eurytemora* and *Neomysis* are individuals m^{-3}; diatoms are cells mL^{-1}; delta smelt is summer townet index and young of the year striped bass are fall midwater trawl catch per tow. The nutrient data were from the confluence to Suisun Bay. The table displays the regression coefficient on the "X" variable of a Prais Winston Regression of "Y" on "X". The p column displays the density in the tail of a student t distribution with n-2 degrees of freedom for a one tailed test. The R^2 column indicates the share of the variation in "Y" explained by variation in "X" around an intercept as all regressions include an intercept. The p-values are calculated from a covariance matrix robust to first order serial

[273] Petition at 101, lines 23-26.

[274] Glibert at 36.

correlation and heteroskedasticity.[275]

Parameter X	Parameter Y	n	Untransformed		Log-Log		CUSUM	
			p	R^2	p	R^2	p	R^2
DIN/TP	Chl a	32	0.0000	0.58	0.0000	0.67	0.0000	0.60
	Diatoms	32	0.0001	0.49	0.0000	0.79	0.0000	0.57
	Eurytemora	32	0.0007	0.44	0.0000	0.55	0.0000	0.53
	Neomysis	32	0.0000	0.52	0.0000	0.67	0.0000	0.62
	Corbula	20	0.0001	0.54	0.0003	0.76	0.0086	0.19
NH_4^+	Chl a	32	0.0016	0.36	0.0005	0.41	0.0227	0.24
	Diatoms	32	0.0060	0.36	0.0002	0.56	0.0050	0.30
	Neomysis	32	0.0039	0.56	0.0004	0.45	0.0001	0.64
Eurytemora	Delta Smelt	32	0.0022	0.42	0.0581	0.12	0.0002	0.51
	YoY Str Bass	31	0.0015	0.32	0.0015	0.29	0.0001	0.40

After unsuccessfully trying to discredit Dr. Glibert's statistical analysis, the Discharger goes on to assert that the "Permit ignores alternative hypotheses that would explain observed changes in phytoplankton composition in the Delta."[276] This is a red herring. Whether or not other factors are also impacting phytoplankton composition is irrelevant to whether the Regional Board properly denied the request to use the River to dilute the discharge. It has been more than adequately demonstrated that the Discharger's 14 tons of total ammonia nitrogen per day has the reasonable potential to affect phytoplankton abundance and species composition. That other factors might also be affecting phytoplankton may be an issue in other forums; however, it should not influence the limits imposed by this Permit.

Even if it were relevant, the other factors that the Discharger claims are important to consider may also be due to the Discharger's nitrogen loads. The Discharger asserts that top-down effects on phytoplankton composition – such as selective grazing by clams and zooplankton – are not acknowledged in the Permit, but are likely to influence species composition."[277] There are several problems with this assertion. First (as discussed *supra*), Dugdale et al. (2007) point out that clam abundance and grazing is low in spring. Therefore, clam grazing cannot be the

[275] Table 1 from Glibert at 35.

[276] Permit at 104, lines 4-6.

[277] Petition at 105, lines 6-8.

cause of the decline in spring blooms. Second, while the Amur River clam, *Corbula amurensis,* may have been introduced in ballast water, the record evidences the clam's ability to outcompete other bivalve species may be the result of the nutrient imbalance caused by the Discharger's own effluent discharges.[278] This relationship is further supported by similar trends of bivalve invasions following changes in nutrient regimes in other systems including in the Potomac River (Cummins et al. 2010), the Ebro River Estuary (Ibáñez et al., 2008), and the Dutch Delta, Lake Veere (Wijnhoven et al., 2010).[279] In addition, there is no evidence of a long term relationship between abundance of *C. amurensis* and calanoid copepods. In fact, *Eurytemora affinis,* preferred food for Delta smelt, was already in decline before the clams became established (Glibert 2010).

The Discharger asserts that grazing by clams and zooplankton may contribute to the occurrence of *Microcystis*;[280] however, none of the references cited by the Discharger provide direct evidence of this effect. The closest connection provided is reference to a study on zebra mussels in the Great Lakes (Vanderploeg et al 2001). "However, in a survey of 61 lakes in Michigan, where a strong association between invasive zebra mussels and *Microcystis* was observed, the relationship was *only for lakes with P levels less than 25 µg/L* (Raikow et al., 2004), thus implying that there is nutrient control as well as grazing control."[281]

The Discharger goes on to assert that the Permit fails to include evidence that a shift in phytoplankton composition represents a degradation of food resources.[282] The State Board should not be moved by this sleight of hand, as a shift in species composition in and of itself is a

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[278] Glibert (2010) shows a strong relationship between clam abundance and nutrient concentrations and forms in Suisun Bay. *See also* Table 3, Glibert at 4 and 32 and Water Agencies Comments on Aquatic Life Issue Paper at 21.

[279] *See* Water Agency Testimony on December 9 (2010) at Slide 49; *see also* Glibert at 32 and 44.

[280] Petition at 105, lines 6-9.

[281] Glibert at 38.

[282] Petition at 106, lines 3-4.

violation of the Basin Plan requirement to protect aquatic life.[283]

Regardless, second, there is ample evidence in the record to support the Permit assertion that the observed shift in phytoplankton composition is detrimental to the ecosystem. The Permit recognizes that diatoms are more nutritious to primary consumers like zooplankton than flagellates and bluegreen algae and that "changes in algal food availability and its quality or a "bottom up" effect is one factor hypothesized to contribute to the POD."[284] There is no doubt that the increasing frequency and magnitude of *Microsystis* blooms in the Delta is detrimental, a point even the Discharger concedes.[285] The literature is extensive on the negative effects of *Microcystis* on ecosystem as well as human health.[286]

The Discharger has the audacity to claim that a shift away from diatoms may actually be beneficial, asserting that "direct feeding on diatoms can cause reproductive failure in copepods.[287] To support this claim the Discharger provides a table summarizing results of feeding experiments on "copepod species from the Delta or their cofamilials."[288] "While it is true that *some* diatoms can cause reproductive failure in *some* copepods when fed at specific feeding rates, **there is no evidence that *all* diatoms cause detrimental effects in *all* copepods at *all* feeding rates.**"[289] The table provided by the Discharger does not include any study results for the two copepod species, *Eurytemora affinis* and *Pseudodiaptomus forbesis,* known to be "important forage organisms for larval fish, including Delta smelt, in the Delta."[290] In fact, Bouley and Kimmerer

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[283] *See* Basin Plan III.8.01, *supra* ("all waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal or aquatic life."

[284] Permit at J-8.

[285] Petition at 108, line 16-17.

[286] *See* Water Agencies Comments on Aquatic Life Issue Paper at 19 (citing literature).

[287] Permit at 107, line 17.

[288] Permit at 109.

[289] Glibert at 40.

[290] Permit at J-2.

(2006) did show experimentally that *P. forbesi* feed on diatoms and dinoflagellates in the laboratory.[291] Jones and Flynn (2005) and Ask, et al. (2006) demonstrated that diatoms do support *E. affinis* growth, egg production and metabolism.[292] And Glibert (2010) observed that "as diatoms declined, so did *E. affinis.*" In addition, Slaughter and Kimmerer (2010) observed lower reproductive rates and lower growth rates of the copepod, *Acartia* sp., in the low salinity zone compared to taxa in other areas of the estuary. They conclude that "[t]he combination of low primary production, and the long and inefficient food web have likely contributed to the declines of pelagic fish."[293] Cloern and Dufford (2005) also state, "[t]he efficiency of energy transfer from phytoplankton to consumers and ultimate production at upper trophic levels vary with algal species composition: diatom-dominated marine upwelling systems sustain 50 times more fish biomass per unit of phytoplankton biomass than cyanobacteria-dominated lakes. . . ."[294]

Contrary to the Discharger's arguments, the work of Dr. Glibert is further credible and reliable support for the Regional Board's denial of total ammonia nitrogen mixing zones.

g. The Regional Board demonstrated that total ammonia nitrogen removal is required to meet dissolved oxygen (DO) requirements

The Regional Board reasonably concluded that total ammonia nitrogen removal was needed, and no mixing zone should be granted for total ammonia nitrogen, because the massive discharge was consuming the available oxygen capacity in the Delta and causing violations of the Basin Plan's water quality objective for dissolved oxygen of not less than 7.0 mg/L.[295] Meeting this water quality objective is critical, as dissolved oxygen is essential to maintaining aquatic life. That Discharger's daily discharge of thousands of pounds of untreated total ammonia nitrogen

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[291] Glibert at 40.

[292] Water Agencies Comments on Aquatic Life Issue Paper at 20.

[293] Water Agencies Comments on Tentative Order at 12.

[294] Water Agencies Comments on Tentative Order at 12.

[295] Permit. at F-56, J-8 to J-10.

would deplete DO in the River is standard chemistry and well established by observed data.[296]

More specifically, the subject discharge includes total ammonia nitrogen and biological oxygen demand (BOD); it is standard chemistry that these substances demand and consume oxygen in water. As a result, it is not at all surprising that the Discharger's massive discharge is depleting DO in the Sacramento River for miles downstream.[297] As the Regional Board found, "[t]he oxygen depleting constituents from the SRWTP use or will use all the assimilative capacity of the River and Delta leaving no assimilative capacity available to other communities that currently reduce oxygen demanding constituents by implementing advanced treatment processes."[298] While other communities are already implementing advanced nutrient removal at their facilities,[299] the Discharger is not. As the Permit explains, these impacts on DO are among the many reasons the Regional Board is requiring the Discharger to implement nitrification, denitrification, and advanced filtration.[300]

The record supports the Regional Board's finding of repeated violations of the DO requirements. The data gathered by state agencies confirm the current discharge is contributing to depressed DO levels downstream of the Treatment Plant. The California Department of Water Resources (DWR) observed repeatedly in 2008 and again in 2009 that DO levels were below the Basin Plan's established objective of 7 mg/L at Hood, which is located about eight miles downstream from the discharge – and well beyond the proposed mixing zone.[301] DWR "found *over 12,000 data points* showing the dissolved oxygen is less than the water quality objective.

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[296] *See* Water Agencies' Comments at 26-27.

[297] *See* Permit at F-95, J-8 to J-10; Water Agencies' Comments at 25-27.

[298] Permit at F-95.

[299] *See* Permit at J-10.

[300] *See* Permit at F-95, J-8 to J-10.

[301] DWR monitoring data, 2008-2009, attached to, Department of Water Resources Office Memo from Sal Batmanghilich, Chief Real-time Monitoring Section to Kathleen Harder, Central Water Quality Control Board re Hood water quality station Dissolved Oxygen QA/QC data. July 22, 2010.

This represents 17 percent of the time from May 2008 to June of [2010]."[302] These depressed levels have an adverse impact on aquatic life in the River and Delta. As the staff explained at the December 2010 hearing, the Basin Plan objective is important for protecting aquatic life, including sensitive salmon species, "especially larval salmon moving downstream."[303]

Discharger argues that the DWR's Hood data are unreliable, and emphasizes that its data at Hood do not show DO concentrations less than the Basin Plan objective.[304] The Regional Board expressly considered these very same objections and reasonably concluded it could not exclude DWR's DO data and only consider the Discharger's data, as Discharger urged.[305] Although Discharger's data showed uniformity with DWR's data at other monitoring locations, its Hood data differed.[306] This difference does not demonstrate, as Discharger argues, that the DWR Hood data are unreliable. Instead, the Regional Board reasonably decided that "to protect beneficial uses it must be assumed that the River at times, is less than the water quality objective of 7.0 mg/L and the Discharger is currently using all the assimilative capacity in the Sacramento River from Freeport to Rio Vista for oxygen demanding constituents."[307]

The Regional Board was justified in raising concerns about Discharger's DO "Low Dissolved Oxygen Prevention Assessment" model. The model is based on limited ambient dissolved oxygen sampling and "the Discharger's data generally reports higher dissolved oxygen concentrations than data from other sources."[308] In addition, the methodologies used to calibrate and validate the Discharger's model make its predictions unreliable.[309]

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[302] Hearing Tr. at 127:16 to 127:19 (emphasis added).

[303] *Id.* at 127:20 to 128:1.

[304] Petition at 112-17.

[305] *See* Hearing Tr. at 128:13 to 128:14; Permit at J-9 to J-10.

[306] Permit at J-9 to J-10.

[307] *Id.* at J-10.

[308] Permit at J-10.

[309] *See* Water Agencies' Comments at 26-27.

The Discharger's model validation is unreliable because when the Discharger compared its modeling results to actual data; and the two did not match, the Discharger rejected the data rather than its model, which is incompatible with standard model validation practices. And, contrary to the representations of the Discharger, DWR did provide a QA/QC of the Hood monitoring data.[310] DWR compared its continuous QA/QC'd data and its CDEC data, corrected for PST.[311] The DWR's summary chart that it provided to the Regional Board shows that while there were a limited number of minor instrument errors, those instrument errors did not occur during the times in question, when DO values dropped below the 7.0 mg/L objective.[312]

Moreover, the Discharger misrepresented the facts when it stated that there have been no criticisms of its model.[313] As explained in the Mixing Zone Section, below, the Bureau of Reclamation ("Reclamation") objected to the basic underpinning of the model, as the Dischargers' model incorporates two of Reclamation's outdated hydrodynamic and temperature models. Reclamation also objected to the Discharger's removal of many years of the most recent hydrologic data, thereby raising serious questions about its ability to model current conditions in the river.

The Discharger also failed to mention that the Regional Board's consultant, Tetra Tech, recommended that the Regional Board reject the Dischargers' Low Dissolved Oxygen Prevention Assessment (2010) ("LDOPA"). As the independent Tetra Tech reviewers concluded:

> . . . no statistical analysis of the model fit is provided and the crowded multi-year plots tend to hide relatively large discrepancies between individual measurements and predictions that are often on the order of 2 mg L^{-1} or more.[314]

[310] Memorandum from DWR to Regional Board, Re: Hood water quality station, dissolved oxygen QA/QC data, July 22, 2010.

[311] *Ibid*.

[312] *Ibid*.

[313] SRCSD Petition, p. 115.

[314] Tetra Tech Memorandum, to Diana Messina, Central Valley Regional Water Quality Control Board, from Jonathan Butcher, Ph.D., P.H., Re: Sacramento Regional LDOPA, June 29, 2010, p. 6.

And:

> The modeling framework . . . seems to have been driven more by the desire to do a Monte Carlo statistical analysis across the range of upstream flows and effluent loads…than by an intent to accurately simulate DO in the lower Sacramento River.[315]

And:

> The 7 mg L^{-1} target is written as an instantaneous criterion. The LDOPA modeling, however, produces only daily average DO concentrations and is calibrated only at the daily average scale. This is an inevitable result of the approach to model development, which ignores tidal reversals, works with daily average travel times, and does not consider diurnal algal growth and respiration cycles. As such, the modeling cannot represent the intra-day variability in DO concentrations, and cannot assess the maximum intra-day DO depression that will occur during tidal reversals and near-reversal stagnation events when reaeration declines.[316]

With these uncertainties, the Discharger's LDOPA is unreliable and cannot be used as a predictive tool to determine either the magnitude or frequency of future violations of the Basin Plan. The Tetra Tech reviewers ultimately concluded that, "As presently formulated, the LDOPA does not ensure attainment of the water quality objective specified in the Basin Plan."[317]

Discharger argues that its compliance or non-compliance with DO objectives is unrelated to whether a total ammonia mixing zone should be granted, or the need for the total ammonia nitrogen limits and full nitrification.[318] The Permit documents numerous factors, including the DO levels that weigh in favor of denying the requested mixing zone. The DO levels already drop below the water quality standard in the Basin Plan, thereby indicating that protected beneficial uses are impaired. In addition, Discharger's model likely underestimates potential future impacts. The Regional Board's decisions to require nutrient removal and reject the requested mixing zone were reasonable.

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[315] *Id*. at p. 4.

[316] *Id*. at p. 7.

[317] Id. at p. 2.

[318] Petition at 118-19.

VII. THE NITRATE LIMITS IN PERMIT ARE APPROPRIATE

The Discharger mischaracterizes the Regional Board's approach in setting the Plant's nitrate limit. The Discharger's Petition suggests that the Regional Board based the 10 mg/L nitrate limit and denial of a nitrate mixing zone solely on the drinking water maximum contaminant level (MCL) and the protection of the MUN designated use from a public health standpoint.[319] The Discharger has grossly oversimplified the Regional Board's analytic roadmap that supports the 10 mg/L nitrate limit.

The Regional Board appropriately started its analytical roadmap with the 10 mg/L end-of-pipe drinking water MCL for nitrate, as the entire Sacramento River and Delta are designated MUN. But it did not stop there, as excessive nutrient levels from the plant can and do significantly and adversely affect a number of designated uses in addition to MUN's public health aspects. In addition to the Basin Plan's incorporation of the public health drinking water MCLs, the Regional Board recognized the Basin Plan's requirement that waters not contain biostimulatory substances which promote nuisance aquatic growths or otherwise adversely affect beneficial uses, and not contain taste or odor producing substances.[320] The Regional Board considered the evidence and found that excess nitrogen creates nuisance algae growth in water supply aqueducts and reservoirs, causing taste and odor problems in municipal water supplies and impacting water treatment plant operations. The Regional Board found that excessive algal growth increases total organic carbon (TOC) loading to water treatment plants, increasing the potential for formation of trihalomethanes. The Regional Board found that excess nitrogen is affecting the N:P ratio, adversely affecting the aquatic community. After considering the evidence of these significant and adverse water quality effects, all far downstream of the Treatment Plant's discharge, the Regional Board appropriately denied a mixing zone.[321] Granting

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[319] *See, e.g.*, Petition at pp. 125 ("the denial (of a mixing zone) has nothing to do with the merits of a human health mixing zone"); 127 ("there is no need for an end-of-pipe limit equal to the MCL to protect the Municipal (MUN)."

[320] Basin Plan, pp III-3.00, III-7.00.

[321] Permit, pp. F-45 – 46.

a mixing zone – in effect requiring no nitrogen removal and allowing a pass on denitrification facilities – would result in continued and indeed worsened adverse beneficial use effects, compromising the integrity of the entire water body, adversely impacting biologically sensitive and critical habitats, and producing undesirable nuisance aquatic cpmdotopms, all of which are violations of State Implementation Plan criteria for granting mixing zones in the first place.[322]

In addition to mischaracterizing the Regional Board's analytical roadmap, the Discharger asserts that the 10 mg/L nitrate limit is unnecessary to protect MUN use; that adverse impacts of excess nutrients have not been identified and documented; that a reasonable potential analysis has not been performed; that the State Implementation Plan (SIP) for denial of a mixing zone is inapplicable and regardless its criteria are not met; and that costs have not been considered. None of these arguments has any merit. The claims regarding Reasonable Potential Analysis and costs are addressed in Sections IV and XIV; the others are addressed below.

1. It Is Appropriate To Base The Nitrate Limit On the Drinking Water MCL

The entire Sacramento River and Delta are designated for municipal and domestic water supply beneficial use (MUN). The Basin Plan requires that waters designated for MUN meet, *at a minimum*, primary and secondary drinking water MCLs adopted by the Department of Public Health (DPH).[323] The primary MCL for nitrate (as N) is 10 mg/L, which is equivalent to 45 mg/L as nitrate.[324] Exposure to nitrate in drinking water at levels greater than the MCL increases the probability of adverse health effects, particularly for infants.[325]

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[322] *Id.*

[323] Basin Plan, Exh. 25, III-3.00.

[324] California Code of Regulations, Title 22, Division 4, Chapter 15, Article 4, § 64431.

[325] *See, e.g.*, Cal. Code Regs., tit. 22, § 64482(b), which requires that drinking water systems that detect nitrate at levels above 23 mg/L (as nitrate) but below the MCL of 45 mg/L (as nitrate) notify consumers that "Nitrate in drinking water at levels above 45 mg/L [nitrate] is a health risk for infants of less than six months of age. Such nitrate levels in drinking water can interfere with the capacity of the infant's blood to carry oxygen, resulting in a serious illness; symptoms include shortness of breath and blueness of the skin. Nitrate levels above 45 mg/L [nitrate] may also affect the ability of the blood to carry oxygen in other individuals, such as pregnant women and those with certain specific enzyme deficiencies. If you are caring for an infant, or you are pregnant, you should ask advice from your health care provider."

The Regional Board imposed an AMEL of 10 mg/L for nitrate (as N), in part based on the primary drinking water MCL of 10 mg/L (as N).[326] Given the MUN designation for the entire Sacramento River and Delta, and the health risks of nitrate at levels exceeding the MCL, it was fully appropriate for the Regional Board to base the nitrate limit on the drinking water MCL. Indeed, the Basin Plan requires this limit as a minimum level of human health protection.

The Permit follows the Regional Board's past practice of imposing nitrate limits where "the conversion of ammonia to nitrate and the conversion of nitrite to nitrate present a reasonable potential for the discharge to cause or contribute to an in-stream excursion above the Primary MCLs for nitrite and nitrate."[327] The Regional Board has imposed such an effluent limit for nitrogen on many permits that discharge to the Delta or upstream of the Delta, and has used nearly identical language in justifying such a limit for nitrogen on those dischargers.[328] In the majority of these permits, the Regional Board set the limit "to assure the treatment process adequately nitrifies and denitrifies the waste stream to protect the beneficial use of municipal and domestic supply."[329] In each one of these cases, the Regional Board provides the same analysis as that provided in the Discharger's Permit.[330]

The Discharger argues that since "the closest drinking water diversion is Barker Slough Pumping Plant, 40 miles distant,"[331] its Treatment Plant should be the exception to the rule and allowed to exceed the Basin Plan's minimum limits of MUN protection in the intervening reaches, since "effluent will be sufficiently diluted at downstream drinking water diversion points

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[326] Permit, p. 72.

[327] *Id.*

[328] *See, e.g.*, Order No. R5-2009-0085 (City of Manteca), p. F-45; Order No. R5-2007-0036 (City of Tracy), p. F-37; Order No. R5-2006-0096 (County of Linda Water District), p. 41; Order No. R5-2010-0092 (Placer County Sewer Maintenance District No. 1), p. F-46.

[329] *Id.*

[330] *Id.*

[331] Actually, the Freeport Regional Water Authority intake is only 6,000 feet upstream from the discharge location and during reverse flow events can be exposed to diluted effluent from the Treatment Plant. *See* discussion in Section VII.C., *infra.*

to meet the Primary MCL."[332] In other words, the Regional Board should ignore the fact that the Sacramento River and Delta are designated MUN by applying MUN only where an actual physical municipal water use diversion currently exists.

The State Board considered and rejected this argument in its 2002 Review of Waste Discharge Requirements for Vacaville's Easterly Wastewater Treatment Plant.[333] In that matter, the Regional Board set an effluent nitrate limit for a wastewater treatment plant discharging to a tributary to the Delta – Old Alamo Creek – in order to protect the MUN use in the Delta.[334] The limit was based on the primary drinking water MCL of 10 mg/L for nitrate and assumed no dilution.[335] The discharger objected to the nitrate limit because Old Alamo Creek is not used for drinking water and because the plant effluent is significantly diluted by the time it reaches an actual drinking water intake.[336] The State Board rejected the argument, stating that "[t]he Basin Plan requires that waters designated for MUN meet, at a minimum, primary and secondary drinking water MCL's adopted by the Department [of Public Health]."[337] In the Vacaville matter, there was a question concerning Alamo Creek's ability to assimilate nitrate and whether it could be dedesignated MUN in the future. On these questions, the State Board indicted that the 10 mg/L nitrate MCL at a minimum would have to be met at the Delta boundary: "If MUN is designated for Old Alamo Creek, it is uncertain whether the nitrate limits could be relaxed. MUN is designated an *existing Delta use*. There is at least minimal dilution *at the Delta boundary*."[338]

The Regional Board appropriately can base its nitrate limit on the drinking water MCL

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[332] Petition, pp. 126-127.

[333] SWRCB, In the Matter of the Review of Waste Discharge Requirements Order No. 5-01-044 for Vacaville's Easterly Wastewater Treatment Plant, Order No WQO 2002-0015, 2002 Cal. ENV LEXIS 29.

[334] *Id.*, p. 109.

[335] *Id.*

[336] *Id.*, pp. 109-110.

[337] *Id.*, p. 110.

[338] *Id.*, p 113, italics added.

and appropriately rejected the Discharger's proposal to disregard the public health MUN protections except at actual, far field drinking water intakes.

2. Excess Nitrogen Creates Nuisance Aquatic Weed and Algal Growth and Causes Taste and Odor Problems in Domestic Water Supplies

The Regional Board considered evidence of nuisance aquatic weed and algae growth and taste and odor problems caused by excess nitrogen in setting the Permit's nitrate limit.[339] Elevated levels of nutrients (phosphorus and nitrogen compounds) can stimulate nuisance algal and aquatic weed growth that includes production, by specific Cyanobacteria, of noxious taste and odor compounds and algal toxins. In addition to algal produced taste and odor and algal toxin concerns, increases in algal and aquatic weed biomass can impede flow in conveyances, and shorten filter run times and increase solids production at drinking water treatment plants.

Nitrogen levels in water diverted from the Delta are at concentrations that can produce nuisance algal and aquatic weed growth and adversely affect MUN beneficial uses. Mean annual concentrations of nitrogen and phosphorous at points in the Sacramento River above and below the Treatment Plant, downstream in the Delta at the confluence of the Sacramento and San Joaquin Rivers, and at the SWP and CVP intakes is shown in Table 4. All nitrogen levels are higher than the 0.25 to 0.30 mg/L concentration that has been associated with a high risk of nuisance growth and eutrophication; phosphorus is also higher than the 0.035 to 0.042 mg/L values associated with eutrophication.[340] Levels of both nutrients exceed U.S. EPA Ecoregion I (which includes the Central Valley) total nitrogen and phosphorus reference conditions of 0.31 mg/L and 0.047 mg/L, respectively.[341] The reference condition is the 25th percentile of the

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[339] *See, e.g.*, Staff RTC pp. 28-30.

[340] Van Nieuwenhuyse and Jones (1996) and OECD (1992), cited in U.S. Environmental Protection Agency, Office of Water, *Ambient Water Quality Criteria Recommendations: Information Supporting the Development of State and Tribal Nutrient Criteria; Rivers and Streams in Ecoregion I,* EPA 822-B-01-012 (December 2001): 20, http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/rivers/rivers_1.pdf.

[341] U.S. Environmental Protection Agency, Office of Water, *Ambient Water Quality Criteria Recommendations: Rivers and Streams in Ecoregion I* (December 2001), http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/rivers/rivers_1.pdf. Ecoregion 1 consists of the Central Valley in California and Willamette Valley in Oregon.

nutrient data for sites within the ecoregion and is meant to represent the nutrient concentrations in minimally impacted water bodies.

Table 4. Mean annual nitrogen and phosphorous concentrations in the Delta (From Foe 2010)

Location	Total N (mg/L)	Total P (mg/L)
EPA EcoRegion I Reference Condition	0.31	0.047
Upstream – Sacramento River at Garcia Bend	0.41	0.08
Downstream – Sacramento River at Hood	0.88	0.11
Downstream at Confluence – Chipps Island	0.80	0.14
SWP Intake – Bethany Reservoir	1.04	0.12
CVP Intake – DMC off Highway 4	1.36	0.15

The Discharger's Treatment Plant is the major source of the excess nutrients in the Sacramento River. As indicated by the data in the above table, the Plant's effluent significantly increases the nutrient concentrations in the Sacramento River.[342] Based on Foe 2010 data, the Treatment Plant *more than doubles* the total nitrogen and total dissolved nitrogen concentrations in the Sacramento River.[343] Jassby 2008 calculated that the Treatment Plant's discharges accounted for *90 percent* of the total ammonia nitrogen load in the Sacramento River at Hood. [344] Fullerton 2009, showed that total ammonia from Hood can be traced to the confluence of the San Joaquin and Sacramento Rivers and to Potato Point in the Central Delta.[345] It is important to note that reducing only total ammonia from the discharge (e.g., nitrification without denitrification

[342] *See* Foe 2010 at p.11: ("The SRWTP increased nutrient concentrations in the Sacramento River. . . . The average ammonia concentration increased 11.5 fold.")

[343] *Id.* at p. 28: (TN from 0.41 mg/L upstream to 0.88 mg/L downstream; TDN from 0.32 mg/L upstream to 0.82 mg/L downstream.)

[344] Jassby, Alan. 2008. Phytoplankton in the Upper San Francisco Estuary: recent biomass trends, their causes and their trophic significance. San Francisco Estuary and Watershed Science. 6(1):Article 2.

[345] Fullerton, David. 2009. Ammonium concentrations and the food chain in Suisun Bay and the Delta. Presentation at August 2009 Ammonia Summit, Rancho Cordova, CA August 18-19, 2009.

facilities) will not reduce the Treatment Plant's total nitrogen to the Sacramento River and Delta. The average of 14 tons of total ammonia nitrogen discharged each day will merely convert to 14 tons of nitrate nitrogen.[346]

The Discharger asserts that there is no evidence of any adverse effects of nitrogen from its plant.[347] To the contrary, evidence in the record is more than sufficient to show that the substantial nutrient loading from the Treatment Plant is contributing to serious nuisance conditions.

In 2007 (and resubmitted by reference in Water Agencies' comments on Tentative Permit at 29), the Water Agencies provided the Regional Board with comments and technical information on permitting issues of major concern.[348] Chief among their concerns was nutrient loading from the Discharger's Treatment Plant. The Water Agencies provided information and sworn declarations of their officials documenting on-going, nutrient-related adverse impacts from Delta water. For example, evidence shows that DWR has treated Clifton Court Forebay for aquatic weeds and algae multiple times each summer.[349] "Aquatic weed accumulation may be so severe that pumping at the Harvey O. Banks Delta Pumping Plant is restricted or halted and water delivery to the California and South Bay Aqueducts is shut down."[350] The practice of treating Clifton Court for control of nuisance aquatic growth was halted in 2007, however, over concerns of potential impacts to listed fish species. DWR also has treated the South Bay Aqueduct (SBA) to control algae that are stimulated by nutrient-rich Delta exports. Including preventative treatments, DWR has treated the SBA for algal control between 10 and 16 times per year. Periodic treatment of the California Aqueduct and Southern California SWP reservoirs is also

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[346] *See* Staff RTC, p. 28.

[347] *See, e.g.*, Petition p. 127 ("What are the negative effects? Where?"); p. 131 ("Nitrate discharge above 10 mg/L AMEL would not cause pollution or nuisance").

[348] Water Agencies' 2007 Comments, *supra*.

[349] *Id.*, Exhibit 5.

[350] *Id.*

necessary for the same reason.[351]

The experiences of many of the Water Agencies provide further evidence of the effects of nutrient-related impairments. In the Declaration of Leah Orloff, Senior Water Resource Specialist for the Contra Costa Water District (CCWD), Dr. Orloff explained that CCWD experiences algal growth in its Mallard, Martinez and Los Vaqueros reservoirs and in the Contra Costa Canal.[352] The Delta is the source water for all of these facilities. Regular application of copper sulfate is standard in Mallard and Martinez Reservoirs, especially in the summer months, to control for the formation of toxins, to prevent taste and odor (T&O) problems, and to maintain healthy levels of dissolved oxygen. Copper sulfate is applied in the Contra Costa Canal.[353]

Even with treatment of the South Bay Aqueduct (SBA), which conveys Delta water to the East Bay and South Bay regions, water agencies still contend with algal-related T&O problems. According to Doug Chun, Water Quality Manager for the Alameda County Water District, even though the majority of SBA water is treated with ozone, some 226 T&O complaints were received from 2000 to 2005, indicating that present treatment is unable to fully meet consumer acceptance criteria.[354] The T&O complaints were related to the presence of MIB (2-methylisoborneol) and/or Geosmin, two algal compounds that are noticeable even at extremely low nanogram/L levels. Mr. Chun stated that ACWD has experienced filter clogging in its water treatment plants from algal die-off following the application of algaecides in the SBA.[355]

Retail water supply contractors of the Alameda County Flood Control & Water Conservation District, Zone 7 (Zone 7) have experienced customer complaints due to T&O events.[356] According to G.F. Duerig, Zone 7 General Manager, Zone 7 has been operating using

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[351] *Id.*

[352] *Id.*, Exhibit 6 (Declaration of Leah Orloff at ¶ 4).

[353] *Id.*

[354] *Id.*, Exhibit 7 (Declaration of Doug Chun at ¶ 3).

[355] *Id.*

[356] *Id.*, Exhibit 8 (Declaration of G. F. Duerig at ¶ 4).

interim T&O control measures since 2004. In 2006, which was a relatively mild algal growth season, these control measures cost approximately $300,000 and were marginally effective. According to Ms. Duerig, Zone 7's retailers have continued to urge Zone 7 to include permanent, more effective T&O improvements to existing treatment plants. As of 2007 a feasibility study was underway to identify costs related to such improvements. Initial estimates for the T&O improvements to control algal derivatives ranged from $9,000,000 to $21,000,000.[357]

Similarly, Bruce Cabral, Water Quality Manager for the Utility Operations Division of the Santa Clara Valley Water District (SCVWD) stated that SCVWD has had to upgrade its powdered activated carbon (PAC) systems at its Penitencia and Rinconada water treatment plants (WTP) to address algae-related tastes and odors.[358] In addition, Mr. Cabral stated that SCVWD had to upgrade its Penitencia and Santa Teresa WTPs to ozone for primary disinfection in order to reduce disinfection byproducts and to improve the ability to remove taste and odors from source waters. SCVWD also added hydrogen peroxide which, when used together with ozone is intended to help with extreme T&O control. The Penitencia WTP and Rinconda WTPs had to use PAC in each year from 2003 to 2007 to ensure that water delivered to the public was aesthetically acceptable. In 2004, the Penitencia WTP used PAC for each of 97 days.[359]

According to Mic Stewart, Water Quality Manager for the Metropolitan Water District of Southern California (MWD), MWD has experienced a large number of T&O episodes.[360] Dr. Stewart stated that in 2002, MWD experienced 12 T&O events in reservoirs and conveyance facilities that required treatment with copper sulfate. Most of these facilities contained SWP

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[357] *Id.*

[358] *Id.*, Exhibit 9 (Declaration of Bruce Cabral at ¶ 4).

[359] *Id.*

[360] *Id.*, Exhibit 10 (Declaration of Mic Stewart at ¶ 6). *See also* attachments to this exhibit which include presentations given by MWD to its member agencies to report on the T&O incidents and the resulting management efforts taken during 2002, 2004, 2005 and 2006. Excerpts from MWDSC's Annual Report to the Drinking Water Program for 2003 through 2006 are also included in Exhibit 10. These excerpts document and describe the complaints received as well as the corrective actions taken.

water. Dr. Stewart explained that algal productivity is significantly greater in SWP water than in MWD's other source, the Colorado River water (a finding that has been confirmed in lab tests).[361] In 2005, MWD experienced another 12 episodes requiring treatment. Even so, water delivered to the public exceeded public acceptance threshold levels for MIB and/or Geosmin in each year from 2001 to 2005. In 2004, concentrations of Geosmin reached 55 ng/L in water served from MWD's Joseph Jensen Filtration Plant. Geosmin has an earthy/musty odor that some consumers can begin to detect at concentrations as low as 5 ng/L. The SWP is the source of supply for the Jensen Filtration Plant.[362]

Information in the record submitted with the Water Agencies comments on the Regional Board's Public Health Issue paper further document on-going nuisance conditions within MWD's service area due to excess nutrients in the SWP supply and MWD's comprehensive program to monitor and manage algae in its source water reservoirs.[363]

Managing algal blooms through the application of copper sulfate and other aquatic herbicides to reservoirs and conveyance facilities creates other problems. SBA SWP contractors have reported spikes in T&O compounds after the application of copper sulfate due to the large mass of decaying algae and release of off-flavor compounds from within their cells.[364] Large masses of decaying algae resulting from copper sulfate treatments can also impact water treatment plant operations, especially during the first couple events of the year.[365]

Algal cell death can have more serious consequences as well, since algal toxins can be released. Microcystin, an algal neurotoxin, is currently under consideration for regulation by U.S.

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[361] *Id.* at ¶ 8. *See also* Staff RTC, p. 30.

[362] Water Agencies' 2007 Comments*, supra,* Exhibit 10 (Declaration of Mic Stewart at ¶ 6).

[363] *See* Taylor, W. D., et al., "Early Warning and Management of Surface Water Taste-and-Odor Events", Project No. 2614 (Denver, CO: AwwaRF, 2006); Taylor, B., "T&O Events 2008 and Quagga Mussel Management in Lakes" (Presentation). MWDSC Member Agency Water Quality Managers Meeting, Los Angeles, CA, November 6, 2008.

[364] *See, e.g.*, Water Agencies' 2007 Comments, *supra*, Exhibit 9 (Declaration of Bruce Cabral at ¶ 3).

[365] *See, e.g.*, *id.*, Exhibit 7 (Declaration of Doug Chun at ¶ 3).

EPA under the Safe Drinking Water Act. The North Coast Regional Water Quality Control Board and the U.S. EPA have warned that microsystins from algae blooms in the Klamath River present a significant potential health threat to humans.[366] Blooms of *Microcystis aeruginosa*, cyanobacteria that produce microcystin, have been detected in Delta waters at an increasing frequency and magnitude since 1999 (Water Agencies Comments on the Tentative Permit at 18).[367] There has been sufficient concern among local public health officials to post warnings against body contact recreation in Delta waters. [368]

In recent years, there have been greater restrictions placed on the use of copper sulfate and other aquatic herbicides in source water reservoirs. As previously mentioned, the application of aquatic herbicides by DWR at Clifton Court Forebay was recently suspended over concerns of impacts to listed fish species in the Delta. The use of aquatic pesticides is also regulated under the Statewide General NPDES Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the U.S., adopted by the State Board in May 2004.[369] U.S. EPA has revised the copper sulfate label to limit the relative size of the area that can be treated in any one application and limit the timing of successive applications to protect non-target species. These constraints challenge water agencies' abilities to address T&O and other algae related issues.[370]

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[366] Eureka Reporter. "Authorities Advise Caution on Klamath River," *The Eureka Reporter*, October 4, 2005.

[367] Lehman, P. W., G. Boyer, C. Hall, S. Waller and K. Gehrts. 2005. Distribution and toxicity of a new colonial *Microcystis aeruginosa* bloom in the San Francisco Bay Estuary, California. *Hydrobiologia* 541:87-99. Water Agencies Comments on the Tentative Permit at 18.

[368] Breitler, A. "Tainted Delta Water May Pose Danger; Toxic Algae Levels High Enough To Kill Pets, Sicken Users," *The Record* (Stockton, CA), September 14, 2007.

[369] In November 2006, U.S. EPA adopted a regulation that adds pesticide application to waters of the U.S. to the list of discharges that do not require NPDES permits. It is uncertain if the SWRCB will rescind the General Permit in response to the U.S. EPA regulation. The SWRCB's chief counsel has recommended that the permit not be rescinded, pending the outcome of legal challenges to the new U. S. EPA regulation (*see* State Water Resources Control Board, Office of Chief Counsel, "New Pesticide Regulation" (memorandum, January 2, 2007), http://www.waterboards.ca.gov/npdes/docs/aquatic/memorandum.pdf). Permittees can file a Notice of Termination to terminate coverage under the General Permit or continue coverage until the SWRCB determines if any action is needed.

[370] *See, e.g.*, William D. Taylor et al., *Early Warning and Management of Surface Water Taste-and-Odor Events*, Project No. 2614 (Denver, CO: American Water Works Association Research

Copper sulfate treatment can create problems with water treatment plant sludge disposal. Lake and aqueduct treatment temporarily elevates copper concentrations in the drinking water treatment plant influent. Coagulation processes at the treatment plant remove much of this copper, but the copper is then transferred to the sludge. Depending on copper levels in the plant influent and coagulant dose, the sludge may be characterized as hazardous waste requiring special disposal. As Dr. Stewart noted in his declaration, sludge from MWD's drinking water treatment plants already has been characterized as hazardous waste on more than one occasion due to the presence of copper associated with the application of copper sulfate.[371]

In sum, there is no shortage of evidence in the record showing that significant nuisance conditions already are occurring due to excessive nutrient concentrations in the Delta. That is not surprising given that nutrient levels in the Delta already exceed U.S. EPA Ecoregion I criteria for eutrophication. The Discharger, whose Treatment Plant dumps 14 tons of nitrogen to the Delta each day and is responsible for more than doubling of the nitrogen concentrations in the Sacramento River, loses credibility by asserting that its "nitrate discharge . . . would not cause pollution or nuisance."[372]

3. Excess Algal Growth Increases Total Organic Carbon (TOC) Loading to Domestic Water Treatment Plants

The Regional Board considered evidence that excessive algal growth increases TOC loading to water treatment plants.[373] Higher TOC loading increases the formation of trihalomethanes and increases disinfectant levels required to achieve disinfection goals. In the Delta, TOC sources include algae as well as tributary-inputs, agricultural drainage, tidal marsh, wastewater discharge, and urban runoff. [374] It has been estimated that algal productivity may add

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Foundation (AwwaRF), 2006).

[371] *See* Water Agencies' 2007 Comments, *supra*, Exhibit 10 (Declaration of Mic Stewart at ¶ 7).

[372] Petition, p. 131.

[373] *See, e.g.*, RTC pp 28-29.

[374] Jassby and Cloern 2000; *see also* CALFED Bay-Delta Program, California Bay-Delta Authority, 2005, CALFED water quality program assessment report [Internet], prepared by Brown and Caldwell, available from: http://calwater.ca.gov/content/Documents/WQP_

as much as 1 mg/L TOC as Delta water travels down the California Aqueduct from San Luis reservoir to Lake Silverwood.[375]

As the Regional Board noted, an increase in TOC results in an increased potential for the formation of trihalomethanes and other disinfection byproducts (DBPs) through drinking water treatment, as increased TOC in source water supplies (1) increases the quantity of DBP precursors available to react with disinfectants, and (2) increases the amount of disinfectant required. Since DBPs have been linked to cancer formation and harmful reproductive effects, U.S. EPA requires water suppliers to remove TOC from water treatment plant source waters.

An increase in source water TOC represents a degradation of water quality and a substantially increased burden on domestic water treatment plant operators to ensure that public health protection can be maintained. Both Mr. Chun of ACWD and Dr. Stewart of MWD detailed some of the water quality concerns that TOC poses to their respective agencies' operations.[376] Mr. Chun, for example, explained that for agencies like ACWD that use ozone as the primary disinfectant, "enhanced coagulation" treatment is often required to respond to higher TOC in the source waters and comply with the U.S. EPA's Stage 1 Disinfectants and Disinfection Byproducts Rule. Under these regulations, if the TOC running annual average is between 2.0 and 4.0 mg/L, drinking water utilities must remove 25% of the TOC in the source water influent; if the running annual average exceeds 4 mg/L, utilities must achieve at least 35% removal. Mr. Chun explained that if ACWD's source water TOC concentrations increased by a mere 0.2 mg/L, ACWD's running annual average TOC would *exceed 4.0 mg/L with 8% greater frequency*, requiring more treatment and higher ozone doses and associated costs.[377]

Initial_Assessment_6_2005.pdf; U.S. Environmental Protection Agency, Region IX, 2006, Conceptual Model For Organic Carbon In The Central Valley And Sacramento–San Joaquin Delta, prepared by Tetra Tech, Inc.

[375] *See* MWD 2004, Letter to R. Caikoski, County of Sacramento, from Stewart, M., Metropolitan Water District of S. Calif., Additional Information Relating to Comments on the Draft Environmental Impact Report for the Sacramento Regional Wastewater Treatment Plant 2020 Master Plan, Jun 21, 2004.

[376] *See* Water Agencies' 2007 Comments, 2007, *supra*, Exhibits 7 and 10.

[377] *Id.*, Exhibit 7.

Another DBP of particular concern to water agencies that use ozone for disinfection of Delta source water is bromate. Delta water is influenced by the salty waters of the San Francisco Bay and therefore contains bromide, which is oxidized by ozone to form bromate. Bromate is a regulated disinfection by-product and a known human carcinogen. When higher ozone dosages are required to counteract the added demand of increased TOC loading, including algae growth, bromate formation is increased,[378] and may jeopardize compliance with regulatory limits.

4. Excess Nitrogen Has Adversely Affected The Nutrient Balance And Changed the Aquatic Community

The Regional Board also considered the effect of nitrogen from the Plant's discharge on the N:P ratios in the Delta and the potential adverse consequences on the aquatic community.[379] Numerous studies in systems around the world have repeatedly demonstrated that the N:P ratio influences phytoplankton composition and the presence – or absence – of native species and vegetation. Studies in North Carolina, Hong Kong, Tunisia, Germany, Florida, Norway, Michigan, Spain, Korea, Japan, Washington DC (Chesapeake Bay), Tampa (Tampa Bay), and Denmark, as well as in the laboratory support this finding.[380] In addition, there are several examples of systems in Chesapeake Bay, Tampa Bay and coastal areas of Denmark where native species rebounded and invasive species declined following a restoration of N:P ratios through point source controls on nutrient loading.[381] Dr Glibert provides additional examples from the Potomac River, the Ebro River Estuary, the Dutch Delta, Lake Veere, and the Hawkesbury-Nepean River Estuary in Australia in her Declaration.[382]

Dr. Glibert explains the mechanism for the relationship between species composition and the ratio of nitrogen to phosphorus available in the aquatic environment as follows:

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[378] Issam N. Najm and Stuart W. Krasner, "Effects of Bromide and NOM on By-product Formation," in *Journal AWWA* 87 (1995): 106-115.

[379] Permit p. J-7; RTC p. 31.

[380] Water Agencies Comments on the Tentative Permit at 19-23.

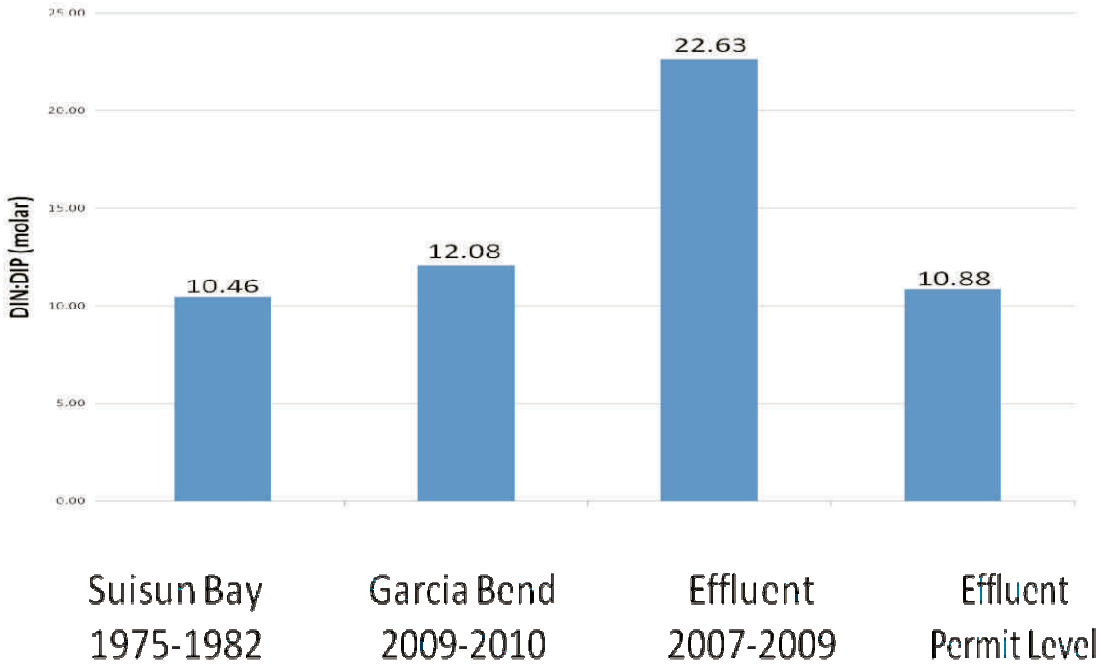
[381] Water Agencies Comments on the Tentative Permit at 23-24.

[382] Glibert at 44.

> "The relative balance of nutrients affects all aspects of behavior (i.e., in meeting nutritional demands), including growth rate, fecundity, and ultimately the success of different populations (Jeyasingh and Weidner 2005, 2007)…The different relative needs for nutrients can be better understood by understanding the elemental composition of different organismal structures. For example, there is a greater need for P in skeleton and bone than in skin, heart, kidney, muscle or brain (Sterner and Elser, 2002). The latter all have a high N:P content (Sterner and Elser, 2002). As emphasized by Sterner and Elser (2002, p. 254), 'as one ascends the pelagic food web...trophic groups grow increasingly nutrient and especially P rich...' Thus, fish community composition as well as fish size should change as a function of N:P ratio (Sterner and George, 2000; Sterner and Elser 2002).[383]

Thus, the nitrate limits set by the Regional Board are appropriate because reducing nitrate will help to restore the nutrient balance to the levels that were present when native, pelagic species were more abundant. Absent denitrification, the total ammonia nitrogen would be removed, but because the total ammonia nitrogen would be converted to nitrate nitrogen, the nutrient N:P ratios would not improve. In contrast, if the nitrate is also treated and reduced as in the new Permit, the nutrient ratios would move towards a healthier, un-impacted level.

Figure 2.



[383] Glibert at 43; *see also* Glibert 2010a.

As shown in Figure 2,[384] with the nitrate and total ammonia nitrogen limits, the nutrient ratios would approach a healthier, un-impacted ratio as found in Suisun Bay before the Treatment Plant was constructed – and as is observed upstream of the Treatment Plant. Specifically, here, the nitrate and total ammonia nitrogen limits set by the Permit would result in an N to P ratio of approximately 10.88. As such, the discharge would approximate the N:P ratio of 10.46 that was present in Suisun Bay *before* the Discharger began to impact the River and the Delta. That provides one clear benchmark by which this Board can confirm the validity of the Regional Board's 10 *m*g/L nitrate limit. Indeed, as detailed above, before the Treatment Plant began discharging tons of total ammonia nitrogen every day, there regularly were chlorophyll *a* blooms in Suisun Bay.[385] Indeed, the Discharger agrees, pointing to substantially higher chlorophyll *a* levels that pre-date the Treatment Plant.[386] These blooms are critical to a healthy estuary.

The reduced nitrate would likewise result in a nutrient ratio that approximates the nutrient N:P ratio (12.08) from Garcia Bend just upstream of the Treatment Plant. The nutrient balance upstream of the Plant – and therefore un-impacted by the Plant – provides yet another straightforward metric that confirms the correctness of the nitrate limit in the Permit. Indeed, using upstream water quality as support for the proper nitrate WQBEL would be fully consistent with the Basin Plan which provides that "[m]aintenance of the existing high quality of water

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[384] Figure 2 was presented by the Water Agencies at the Regional Board hearing, Slide 46. The Suisun measurements are from the California Department of Water Resources EMP dataset 1975-1982, Nitrate + nitrite 0.293 mg/L, total ammonia 0.043 mg/L and ortho-phosphate 0.071 mg/L. The Garcia Bend data from Foe et al 2010: nitrate 0.116, nitrite 0.002, total ammonia 0.024, phosphate 0.026. The effluent data are from the Discharger's nitrate, total ammonia and total phosphorus data for years 2007-2009 as provided to interested parties by Ms. Kathy Harder of the Regional Board. Based on differences in total phosphorus and ortho-phosphate concentrations at Hood and at Garcia Bend from Foe et al 2010, we assume that most of the total phosphorus reported by the Discharger is inorganic ortho-phosphate and therefore comparable to the DIN:DIP calculations for the other locations. If this assumption is false, then the effluent DIN:DIP would be even higher than what is shown here.

[385] *See, e.g.,* Ball, M. and J. Arthur, Planktonic Chlorophyll Dynamics in the Northern San Francisco Bay and Delta, in T. Conomos, San Francisco Bay: The Urbanized Estuary. Pacific Division, American Association for the Advancement of Science, San Francisco at 265-285 (1979); Dugdale Report, *supra*, at ¶ 5.

[386] Pet. at 85-86 and SR Figure 4 (graphing chlorophyll *a* data).

means maintenance of 'background' water quality conditions, i.e., the water quality found upstream or upgradient of the discharge, unaffected by other discharges."[387]

Dr. Glibert confirms the need to reduce total nitrogen levels through both total ammonia nitrogen effluent limits and nitrate effluent limits,

> without a rebalancing of the N:P ratios, the food web cannot recover to one supportive of higher pelagic production. Without rebalancing of the N:P ratios, the benthic food web, driven by invasive weed production and invasive bivalves will continue to thrive. Without rebalancing the N:P ratio, fish communities will continue to be dominated by predators. The N:P balance can and should be lowered and this can be accomplished without driving the system to severe nitrogen limitation. Removal of a significant amount of nitrogen (both ammonium and nitrate) through the requirements of the new permit is a move in the right direction and can be accomplished without developing severe nitrogen limitation in the system. Examples from the Potomac River and elsewhere support the conclusion that the food web will be altered favorably if and when nitrogen loads are reduced.[388]

5. The Regional Board Appropriately Set the Nitrate Limit in Consideration of All Adverse Impacts to Beneficial Uses

The Regional Board set the nitrate limit at 10 mg/L, disallowing a human health mixing zone, "because elevated nitrogen discharges from the Facility have been shown to be negatively affecting the receiving water far downstream of the discharge within the Delta, not just the areas defined by the requested mixing zone. The allowance of the requested mixing zone for nitrate would compromise the integrity of the entire water body, adversely impact biologically sensitive or critical habitats, and produce undesirable or nuisance aquatic life."[389]

The Discharger objects, arguing that the Regional Board based its finding on the SIP criteria for mixing zones when it should have used the Basin Plan.[390] The SIP criteria for mixing zones is only for priority pollutants, the Discharger says, and nitrate is not a priority pollutant.[391]

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[387] *See* Basin Plan at IV-17.00.

[388] Glibert at 46.

[389] Staff report, p. 7; Permit pp. F-44 – F-45.

[390] Petition, p. 129.

[391] *Id.*

The Discharger admits that the Regional Board "considered the Basin Plan policy and TSD procedures and guidelines," which it says is the correct criteria for consideration of mixing zones for nitrate.[392] But the Discharger says that doesn't matter because the Regional Board specifically referenced the SIP criteria.[393] One problem with the Discharger's hypertechnical argument is that the SIP and the Basin Plan criteria are effectively one and the same. The Basin Plan criteria state that a mixing zone shall not be granted unless "the discharger has demonstrated to the satisfaction of the Regional Board that the mixing zone will not adversely impact beneficial uses." As the Regional Board found and the record shows, the downstream beneficial uses clearly would be impacted. Specifically, the integrity of the entire water body would be compromised, biologically sensitive or critical habitats would be adversely impacted and undesirable or nuisance aquatic life would be produced.

The Regional Board's denial of a mixing zone for nitrate based on SIP criteria of adverse effects on biologically sensitive species and undesirable and nuisance conditions follows well established past practice. In a recently issued permit to Placer County Sewer Maintenance District 1, the Regional Board denied a mixing zone for the WQBEL of 10 mg/L nitrate on similar grounds as found in the Discharger's permit. Having reviewed the mixing zone study provided by the discharger, the Regional Board denied the mixing zone finding that the mixing zone requirements as found in the SIP were not fulfilled. The Regional Board stated, "[e]xcess nutrients in the receiving water can have many detrimental effects on beneficial uses, including municipal and domestic supply, contact recreation, and aquatic life," and denied a mixing zone based on the lack of analysis from the discharger, "demonstrating that granting a mixing zone would not adversely impact biologically sensitive aquatic resources or critical habitats, or produce undesirable or nuisance conditions."[394] Thus, the Regional Board in establishing the nitrate WQBEL and denying the Discharger a mixing zone was consistent with past permitting practices

[392] *Id.*

[393] *Id.*

[394] Order No. R5-2010-0092 (Placer County Sewer Maintenance District No. 1), p. F-29 to F-31.

protecting human health as well as preventing adverse effects to aquatic life and nuisance conditions.

In sum, the Regional Board properly found that the discharge of nitrate above 10 mg/L would violate primary water quality standards and standards for biostimulation, taste and odor, and adversely affect many of the Delta's designated beneficial uses. Far-reaching effects would adversely impact the River, the Delta, Suisun Bay, designated critical habitat for various listed species, distant water supply reservoirs, and municipal water treatment plants. Numeric nitrogen limits, at least as stringent as those in the permit, are mandated by these impacts. An acute mixing zone under these circumstances would be an abuse of agency discretion.

VIII. TERTIARY TREATMENT IS REQUIRED TO PROTECT PUBLIC HEALTH

As stated previously in the Water Agencies' comments on the Tentative Permit[395], while many of the Water Agencies provide drinking water and subject their supplies to advanced drinking water treatment to ensure that the water provided to their customers meets or exceeds all drinking water standards, maintaining high quality water at the source is an essential barrier in protecting customers from contaminants. The California Department of Public Health (CDPH) recognizes that multiple barriers are fundamental for ensuring water that is reliably safe to drink in light of real and potential threats to source water quality. The multi-barrier approach recognizes that while each individual barrier may not be able to completely remove or prevent contamination, and therefore protect public health, together the barriers of source water protection, multiple drinking water treatment processes, and protection of water quality in the distribution system, work to provide greater assurance that the water will be safe to drink. The Regional Board also recognized the importance of the multi-barrier approach to protecting public health in Resolution R5-2010-0079, Establishment of a Central Valley Drinking Water Policy for the Sacramento-San Joaquin Delta and Upstream Tributaries. Requiring the Discharger's effluent to meet tertiary treatment requirements is an important step in providing the first barrier to pathogens in drinking water supplies.

[395] *See* Water Agencies' October 8, 2010 Comments at 37.

In its Petition, the Discharger argues that in requiring tertiary treatment standards for pathogens, the Regional Board "departed from its own precedent; employed an unreasonable standard; made findings that are inconsistent with the Water Code or are completely without evidentiary support (or both); misconstrued or mischaracterized evidence; ignored relevant evidence altogether; and failed to respond to comments submitted by the District."[396] More specifically, the Discharger asserts that the Regional Board: (1) failed to conduct a Reasonable Potential Analysis (RPA) as needed to support imposition of tertiary treatment requirements; (2) ignored and re-characterized its "typical" practice of requiring tertiary treatment only where dilution of the discharger's effluent is less that 20 to 1; (3) mischaracterized the results of a risk assessment performed by Dr. Charles Gerba which, in the Discharger's view, shows that the risk of illness from exposure to pathogens in its effluent falls within acceptable levels; (4) failed to engage in a "balancing of factors," as required under Water Codes sections 13241 and 13263(a); and (5) erred in concluding that tertiary treatment represents BPTC for the Treatment Plant.[397]

None of these arguments has any merit and all have been addressed before at length by the Regional Board, the Water Agencies and others stakeholders.[398] The claims regarding the RPA and BPTC are ones that the Discharger makes with respect to several aspects of the Permit and, for that reason, are addressed globally in Sections IV and VI.C of this Response. The Discharger's claims concerning the applicability of the 20:1 dilution ratio, the import of Dr. Gerba's risk assessment and the need for a balancing of factors are addressed below.

A. The Discharger's Reliance On The 20:1 Dilution Ratio Is Misplaced

According to the Discharger, "Daily dilution of SWRTP effluent is always greater than 20:1, and ordinarily it is considerably much greater. It is not disputed that the average dilution of the SRWTP effluent is over 50:1."[399] The Discharger therefore believes that it should not be

[396] Petition, p. 26.

[397] *Id.*, pp. 25-55.

[398] *See, e.g.*, Permit, Attachment F (Fact Sheet), pp. F-72 to F-80; Staff RTC, , pp. 4-105; Water Agencies' Comments on Tentative Permit, pp. 37-41.

[399] Petition, p. 29.

required to implement tertiary treatment at its facility.[400] For the reasons discussed below, the Discharger's reliance on the 20:1 dilution ratio is misplaced.

1. The Discharger Mischaracterizes the Available Level of Dilution

At the outset, it should be noted that the Discharger's characterization of the available level of dilution is both false and misleading. First, the Discharger ignores the fact that under the Permit it is allowed to discharge effluent at a 14:1 dilution ratio on a rolling one-hour basis.[401] Only where the dilution ratio drops below this level is the Discharger prohibited from discharging into the Sacramento River.[402]

Second, while it is true that there are times when the available level of dilution is much more than 20:1 (typically in the winter and spring), historical data indicates that when low river flows are present they often persist for an extended period of time. For example, flows on the Sacramento River (Freeport Station) in April 1977 and in April, May and October 1992 were such that the available level of dilution for the Treatment Plant's effluent would have been less than 20:1 most of the time.[403] More recently, the available level of dilution was between 20:1 and 30:1 for several weeks in January 2009, from mid-November to mid-December 2008, all of October 2008 and most of May 2008,[404] which is far less than the average dilution cited by the Discharger.

Third, operating at these lower river flows and dilution ratios for extended periods significantly increases the likelihood that effluent from the Treatment Plant will be diluted less than 20:1 at one or more times during the day. This is especially true given that the Permit allows the Discharger to discharge effluent at a 14:1 ratio on an hourly basis. This situation is

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[400] *Id.*, pp. 29-32.

[401] See Permit, p. 13, Discharge Prohibition III.F.

[402] *Ibid.*

[403] See Flow and River Discharge Data for Sacramento River at Freeport, found at http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=FPT.

[404] *Ibid.*

exacerbated by the fact that "[t]he Sacramento River at the point of discharge experiences tidal flows that slow the river flow, and at times cause flow reversals."[405] Reverse flow events can occur throughout the year,[406] and when the river returns to flowing downstream, the Treatment Plant's ongoing discharge "double doses" the river with pollution.[407]

Support for the conclusion that the Treatment Plant's effluent is not being consistently and adequately diluted at all times comes from a dye study conducted by Brown and Caldwell in November 2007, after diffusers at the Treatment Plant were modified in an effort to provide better mixing of the effluent.[408] According to the study report, "The dates and times were selected to correspond to predicted low river flows (under 3000 cubic feet per second (cfs)), during daylight hours such that discharge plume measurements could be obtained prior to required effluent diversion."[409] This study revealed dilution ratios at or below 5:1 at locations 30 feet and 60 feet downstream of the Treatment Plant's diffusers and at or below 10:1 at locations 100 feet and 175 feet downstream of the diffusers, including at the surface of the river.[410]

2. The Discharger Misconstrues the Department of Public Health's Guidance Concerning Application of the 20:1 Dilution Ratio

In addition to mischaracterizing the available level of dilution, the Discharger also misconstrues guidance issued by the California Department of Health Services (DHS) (the predecessor to CDPH), regarding use of the 20:1 dilution ratio. Specifically, the Discharger cites a letter dated July 1, 2003, in which the DHS indicated that a 23 most probable number (MPN) standard (i.e., secondary treatment only) could be applied to wastewater discharges into receiving

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[405] See Permit, Appendix F (Fact Sheet), pp. F-32, F-82; see also SRCSD 2003, Sacramento Regional Wastewater Treatment Plant 2020 Master Plan Draft EIR, prepared by EDAW, Inc., August 2003, p. 7-18 [hereafter "Master Plan Draft EIR"].

[406] Permit, Appendix F (Fact Sheet), pp. F-32, F-82; Master Plan Draft EIR, p. 7-19.

[407] Permit, Appendix F (Fact Sheet), pp. F-32, F-82.

[408] See Brown and Caldwell, November 2007 Data Report Effluent Discharge Dilution And Velocity Profiling Field Study In The Sacramento River.

[409] *Id.*, p. 1-1.

[410] See *id.*, Appendix A.

waters that are used for food crop irrigation or body contact recreation provided those discharges are diluted at least 20:1.[411] However, as the subject line of this letter makes clear, DHS was merely providing *recommendations* to the Regional Board for disinfection of wastewater discharges and simply stated that the 23 MPN standard was *acceptable* where the dilution of the effluent is greater than 20:1.[412] Nowhere in the letter does DHS suggest that the Regional Board could not or should not impose a more stringent treatment standard based on factors specific to the facility being permitted.[413]

Furthermore, in that letter DHS was not responding to inquiries from the Regional Board about a particular facility or permit. Rather, DHS was addressing general questions regarding the applicability and use of its uniform guidelines for disinfection of treated wastewater discharges.[414] As with the 2003 DHS letter, nothing in these guidelines indicates that they are binding when determining whether a discharger should be required to implement tertiary treatment.[415]

Had DHS been focused on a particular facility or specific set of facts (as CDPH was in this case), its recommendations may have been very different. For example, the Discharger notes that the 2003 DHS Letter states, "For wastewater discharges into streams that experience tidal influences, an instantaneous DR [dilution ratio] of less than 20:1 is acceptable as long as the average for each day exceeds 20:1."[416] But clearly, the Sacramento River is not a "stream" and nothing suggests that this guidance from DHS was intended to apply to a very large river whose flow drops dramatically or reverses entirely on a relatively frequent basis.

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[411] Petition, p. 29 [citing Letter from David P. Spath, Chief, Division of Drinking Water and Environmental Management, DHS, to Thomas R. Pinkos, Executive Officer, Regional Board, dated July 1, 2003 (hereafter "2003 DHS Letter")].

[412] 2003 DHS Letter, p. 1.

[413] *Id.*, pp. 1-2.

[414] See *id*., p. 1 [citing "Uniform Guidelines for Disinfection of Treated Wastewater Discharges" (hereafter "Uniform Guidelines")].

[415] See Uniform Guidelines, pp. 1-4.

[416] Petition, p. 29.

Above all, the Discharger ignores the fact that the purpose of the recommendations and guidance provided by DHS is to ensure that human health is protected. DHS makes this purpose clear in yet another memorandum, which was issued to clarify the applicability of its Water Recycling Criteria versus its Uniform Guidelines to surface water discharges and to "help in assessing discharge proposals and making recommendations to the RWQCB's [sic] which the Department considers reasonable for public health."[417] In discussing how the Uniform Guidelines should be used, DHS stated:

> It is important to note that under these circumstances, we are not directly applying the nonrestricted, recreational impoundment requirements of the [Water Recycling] Criteria, but instead are simply making recommendations with supporting rationale for treatment and quality requirements *which we consider to be protective of public health, taking into account case specific issues* such as percent dilution.[418]

Finally, all of these points are reiterated by Carl Lischeske, current Chief of CDPH's Northern California Drinking Water Field Operations Branch. He states:

> The Department developed the Uniform Guidelines nearly 30 years ago in order to provide general guidance and a rough assessment of health risks from a wastewater discharge. This was before the risks associated with *Giardia* and *Cryptosporidium* were fully understood. Also, the Uniform Guidelines were developed before modern microbial risk assessment methodologies based on monitoring data for pathogens were considered practical. While the Uniform Guidelines and subsequent interpretation of the Uniform Guidelines suggests that secondary treatment may be adequate if dilution is 20:1 or greater, it is important to understand that an actual risk assessment based on site-specific pathogen data is superior to old, general guidance. *The overarching purpose of the various recommendations and guidance provided by the Department has always been to ensure that human health is adequately protected, and in this respect site specific data and risk assessment studies will always trump the general guidance.*[419]

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[417] See Memorandum from Jeff Stone, Recycled Water Unit, to Regional/District Engineers, dated September 28, 2000 [hereafter "2000 DHS Memo"], p. 1.

[418] *Id.*, p. 3, emphasis added; see also Uniform Guidelines, p. 1 ["The Sanitary Engineering Branch, State DHS, has prepared guidelines for various wastewater discharge situations for health protection."].

[419] Declaration of Carl Lischeske, Chief, Northern California Drinking Water Field Operations Branch, California Department of Public Health, Drinking Water Program [hereafter "Lischeske Declaration"], ¶ 11, emphasis added.

As discussed more fully below, the Regional Board sought specific guidance from DPH on what level of pathogen treatment should be required as a condition of the new permit being issued to the Discharger.[420] After conducting an initial review of available information, DPH recommended that a formal risk assessment be conducted to determine the risks posed by the facility's effluent to swimmers and other beneficial users.[421] Two separate assessments were conducted[422], both of which indicated that the risks of infection and/or illness from Giardia and Cryptosporidium are above the levels that DPH considers acceptable (1:10,000), even when a dilution factor of 20:1 is taken into account.[423] Accordingly, the Permit appropriately requires the Discharger to meet a tertiary treatment standard for pathogens.

The Discharger is now trying to fall back on the general recommendations and guidance from CDPH and its predecessor, DHS, suggesting that secondary treatment is sufficient where a facility's effluent is diluted at least 20:1. But these recommendations and guidance are just that, and while it may be appropriate to use them when the risks from a discharger's effluent stream are not known, it is not appropriate to adhere to them in the face of actual data indicating that these risks are above acceptable levels.[424]

3. The Discharger's Treatment Facility is not Similar to Other Facilities Where the 20:1 Dilution Ratio Has Been Applied

The Discharger also argues the Regional Board ignored its "normal practice" of imposing a tertiary treatment standard only where a facility's dilution ratio is less than 20:1.[425] The

[420] See discussion Section VII.B.2; see also Permit, Attachment F (Fact Sheet), pp. F-72 to F-80; Lischeske Declaration, ¶ 3.

[421] *Ibid.*

[422] See Memorandum re: [Draft] Assumptions Used for Basic Risk Assessment, from Hope Taylor, Ph.D., Larry Walker Associates, to Robert Seyfried, Discharger, dated June 10, 2009 [hereafter "LWA Risk Assessment"]; Final Report, Estimated Risk of Illness from Swimming in the Sacramento River, prepared by from Charles Gerba, Ph.D., for the Discharger, dated February 23, 2010 [hereafter "Gerba Risk Assessment"].

[423] *Ibid*; see also discussion Section VII.B.2; Permit, Attachment F (Fact Sheet), pp. F-72 to F-80; Lischeske Declaration, ¶ 9

[424] Lischeske Declaration, ¶¶ 3-11.

[425] Petition, pp. 30-32.

Discharger cites to various permits where tertiary treatment is not required where the available dilution was at least 20:1 or, alternatively, has required tertiary treatment where the available dilution was not at least 20:1.[426]

As noted by the Regional Board, the 20:1 criterion is a "rule of thumb" and not a regulation.[427] Ignoring this common sense purpose of the 20:1 criterion, the Discharger tries to characterize it as rigid rule that is always followed, but which the Discharger itself acknowledges is not.[428] Indeed a closer look at the permits cited by the Discharger reaffirms the point that the 20:1 criterion is merely a guideline, not a rule.

The Discharger tries but fails to distinguish two POTWs where 20:1 is dilution available, but tertiary filtration was not required: City of Angeles (Order No. R5-2007-0031) and Iron House Sanitation District (Order No. R5-2008-0057.)[429] The Discharger attempts to distinguish these two POTWs on the basis that the decision to implement tertiary filtration was made by the POTW's themselves as a result of their CEQA analyses.[430] But that does not distinguish these permits; rather, it provides more evidence that the 20:1 criterion always gives way to better, site-specific data and analyses. In the case of these "exceptions," the better data just happened to be in the context of CEQA review proceedings as opposed to a subsequent NPDES permitting proceeding.

The Discharger next claims that it is similarly situated to the other permits where the available dilution is always greater than 20:1 and tertiary filtration has not been required.[431] First, as previously discussed, the Discharger does not always have 20:1 dilution available; it is permitted to discharge at 14:1 and in low river flow conditions can sometimes "double dose" the

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[426] *Ibid.*

[427] Permit, Attachment F (Fact Sheet), p. F-74; *see also* Lischeske Declaration ¶ 11..

[428] Petition, pp. 29-30.

[429] *Id.*, p. 31.

[430] *Ibid.*

[431] Petition pp. 30-31.

river. Second, as the Regional Board pointed out, many of these other POTW's have far greater than 20:1 dilution available.[432] Third, none of the other discharges are anywhere comparable to the Discharger's Treatment Plant in terms of volume of discharge or potential water quality degradation. These POTWs are orders of magnitude smaller, ranging in size from a permitted flow of 0.65 mgd (City of Rio Vista, Beach WWTO, Order No. R5-2009-0037) to 12 mgd (City of Chico, Order No R5-2010-0019). By contrast, the Discharger is permitted to discharge up to 181 mgd of treated wastewater into the middle of an extremely important ecological resource that is used for wide array of environmental, recreational, agricultural and domestic water supply purposes.

B. Filtration Is Required to Protect Recreational And Agricultural Beneficial Use

1. DPH's Recommended Risk Criterion Is Appropriate; The 1986 U.S. EPA Criteria Are Not

The Discharger argues that the risks posed by pathogens in its effluent fall below those that formed the basis of the Ambient Water Quality Criteria for Bacteria issued by the U.S. EPA in 1986 ("1986 EPA Criteria").[433] In those criteria, U.S. EPA indicated that mean levels of E. coli and enterococci in freshwater bodies used for full contact recreation should not exceed 126 or 33, respectively, per 100 ml sample, which corresponded to an estimated illness rate of 8 per 1,000 swimmers.[434] The Discharger repeatedly refers to this risk level as one that is "recommended" by or "acceptable" to U.S. EPA, implying that this is the standard against which the need for tertiary treatment should be measured.[435] But that is not the case.

As noted in the Forward to the 1986 EPA Criteria, "The bacteriological water quality criteria recommended in this document are based on an estimate of bacterial indicator counts and gastrointestinal illnesses *that are currently being accepted, albeit unknowingly in many instances*,

[432] Permit, p. F-74.

[433] See Petition, pp. 34-35, 37-39.

[434] 1986 EPA Criteria, pp. 9, 16.

[435] See Petition, pp. 34-35, 37-39.

by the States."[436] Similarly, on page 10 it states, "The levels displayed in Table 4 depend not only on the assumed standard deviation of log densities, but also on the chosen level of acceptable risk. *While this level was based on historically accepted risk, it is still arbitrary insofar as the historical risk was itself arbitrary.*"[437] Clearly, the 1986 EPA Criteria do not constitute a gold standard, but rather represent the *minimum* level of bacterial control recommended by U.S. EPA. In this regard, the 1986 EPA Criteria expressly notes, "Wherever bacteriological indicator counts can consistently be calculated to give illness rates lower than the general estimate, or when the State desires a lower rate indicator bacteria levels commensurate with the lower rate should be maintained in State water quality standards."[438]

That "risk levels from the [1986 EPA Criteria] have been used in recent U.S. EPA regulations adopting *regulatory* criteria for various states"[439] misses the point. What is relevant is that CDPH has stated emphatically that it does *not* consider the 1986 EPA Criteria to be adequate for protection of public health:

> Federal Standards for water quality where recreational bathing may occur were developed for freshwaters which are not directly influenced by sewage discharges (treated or untreated). Under these situations, a bathing standard for fecal coliform was established at 200 mpn/100 ml based on not less than five samples collected over not more than a 30 day period. *The Department has taken the position that this standard is not adequately protective of public health for water that receive all, or a large portion, of the flow from treated municipal discharges.*[440]

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[436] 1986 EPA Criteria, p. iii, emphasis added.

[437] *Id.*, p. 10, emphasis added; see also *id.*, p. 9.

[438] *Id.*, p. iii.

[439] Petition, p. 38. Specifically, the Discharger cites the Beaches and Environmental Assessment and Coastal Health Act of 2000, Pub.L. No. 106-284 (Oct. 10, 2000) 114 Stat. 870 [codified at 33 U.S.C. § 1313(i)], and 2004 Water Quality Standards for Coastal and Great Lakes Recreation Waters, 40 C.F.R § 131.41. The former required states to adopt criteria and standards *at least* as stringent as those set forth in the 1986 EPA Criteria for coastal recreation waters [see 33 U.S.C. § 1313(i)(2)], whereas the latter imposed such criteria and standards on certain states that had failed to do so.

[440] 2000 DHS Memo, p. 2, underscoring in original, italics added; see also Lischeske Declaration, ¶ 7.

The focus of the 1986 EPA Criteria and the standards that have been adopted by U.S. EPA and states to implement the 1986 EPA Criteria is on *ambient* levels of pathogens,[441] which may come from a number of sources and be impacted by a variety of factors. These standards are not effluent limitations, which necessarily must be more stringent in order to ensure compliance with such standards. This point was aptly addressed by the Regional Board in its Permit Fact Sheet, which stated:

> If a controllable sewage treatment plant discharge is allowed to add pathogens to a receiving water such that the health risk is at the USEPA Beach Standard [1986 EPA Criteria], the uncontrollable sources and contribution of pathogens from wildlife, non-point source pollution, and the recreationalists, will cause the overall health risk to exceed the 8 illness per 1000 exposures. If the Beach Standard is applied to the SRCSD discharge, under the most critical river conditions, the SRCSD discharge would cause nearly 1 of every 100 people ingesting river water during recreation to become ill from pathogens in the SRCSD discharge, which is in addition to any contribution of health risk from other sources.[442]

The Discharger takes issue with these statements asserting, "[T]he U.S. EPA acceptable risk level was developed with specific attention to waters affected by wastewater discharge. The U.S. EPA freshwater recreational criteria are values developed to assist states in the development of bathing standards, and the criteria are intended to represent an acceptable rate of illness."[443]

As discussed, the risks levels in the 1986 EPA Criteria are ones that were "historically accepted," not ones that are ideal, and U.S. EPA has expressly encouraged states to maintain lower risk levels where possible. Furthermore, while it is true that the health risk studies that formed the basis of the 1986 EPA Criteria focused on water bodies that were impacted by point sources, it is not clear that all of these were sewage treatment plants.[444] More importantly,

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[441] *See, e.g.*, 1986 EPA Criteria, p. iii ["Water quality criteria associated with specific ambient water uses when adopted as State water quality standards under section 303 become enforceable maximum levels of a pollutant in ambient waters."].

[442] Permit, Appendix F (Fact Sheet), pp. 76-77; see also Lischeske Declaration, ¶ 5 [stating that "not only should health standards be met, but also, when lower exposure levels can be reasonably achieved, those lower levels should be used"].

[443] Petition, p. 37.

[444] See 1986 EPA Criteria, pp. 3-4 [describing study design]. Ironically, the 1986 EPA Criteria notes that for the marine studies conducted in New York City and Boston Harbor, the "barely

whether these studies were focused on point sources or nonpoint sources does not alter the fact the 1986 EPA Criteria and their progeny establish *ambient* limits on the amount of bacteria present in waters affected by discharges, not *effluent* limits on the amount of bacteria present in those discharges. The Discharger essentially concedes this point when it states that 1986 EPA Criteria were intended "to assist states in developing bathing standards," in other words, water quality standards.[445]

The Discharger tries to skirt around the distinction stating, "The District has *not* contended that the U.S. EPA recommended risk level should be the water quality objective or that the SRWTP disinfection requirements should be changed to allow discharge that would precisely result in this risk level in the Sacramento River; the District has consistently pointed out that under all conditions, the actual risks in the river are dramatically lower than the acceptable risk level used by U.S. EPA and many states."[446] But this statement conflates water quality standards with effluent limitations, which might result in unlawfully avoiding the obligations associated with the latter.

In this case, the requirement for tertiary treatment is an effluent limitation[447] that is appropriately based on reducing the risk of infection to 1 in 10,000 or less as recommended by DPH.[448] The Discharger cannot avoid that effluent limitation on the basis that its discharges may

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acceptable" beaches selected for analysis were ones that "were contaminated with pollution from multiple point sources, *usually treated effluents that have been disinfected*." 1986 EPA Criteria, p. 3, emphasis added.

[445] Petition, p. 37.

[446] Petition, pp. 38-39.

[447] See Permit, § IV.A.1.g.

[448] See letter from Gary Yamamoto, CDPH to Ken Landau, dated June 15, 2010 [recommending that Discharger provide "additional treatment sufficient to reduce the additional risk of infection posed by exposure to its discharge to as close to 1 in 10,000 as can be achieved by a cost-effective combination of using filtration and/or a disinfection process that effectively inactivates *Giardia* cysts and *Cryptosporidium* oocysts"]; see also Section VII.B.2, *infra* [discussing DPH recommendations]; Lischeske Declaration, ¶¶ 3-11.

already meet the ambient water quality standard for pathogens.[449] It must comply with *both*, and that is exactly what is being required in the Permit.[450]

Finally, the Discharger asserts that the tertiary treatment requirements are inappropriate because they are based on Title 22 regulations pertaining to the direct use of recycled water for irrigation of food crops, unrestricted contact recreation and other purposes.[451] The Discharger notes that these regulations apply only where there is no intervening discharge of the recycled water into waters of the State and, as such, they "have no application or relevance here."[452]

In the Permit Fact Sheet, the Regional Board acknowledged that Title 22 was not directly applicable to surface waters.[453] But it then went on state:

> The Central Valley Water Board finds it is appropriate to apply an equivalent level of treatment to that required by the Department of Public Health's reclamation criteria because the receiving water is used for irrigation of agricultural land and for contact recreation purposes. The stringent disinfection criteria of Title 22 are appropriate since the partially diluted effluent may be used for the irrigation of food crops and/or for body-contact water recreation.[454]

Thus, the Regional Board did *not* directly apply the Title 22 reclamation criteria, but instead required "an equivalent level of treatment." The Regional Board then devoted six single-spaced pages to explain why that level of treatment is needed at the Treatment Plant.[455]

This exact argument was raised in a State Board petition filed by the City of Woodland in

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[449] This standard is found in the Basin Plan's water quality objective for bacteria in inland surface waters which provides, "In waters designated for contact recreation (REC-1), the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200/100 ml, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400/100 ml." (See Basin Plan, Chapter III, p. III-3.)

[450] See Permit, § IV.A.1.g [total coliform effluent limitation] and § V.A.1 [bacteria receiving water limitation].

[451] Petition, p. 26.

[452] *Id.*, p. 28.

[453] See Permit, Attachment F (Fact Sheet), p. 73.

[454] *Ibid.*

[455] *Id.*, pp. F-73 to F-78.

April 2003.[456] As in this case, Woodland asserted it should not be required to implement tertiary treatment for control of pathogens at its Water Pollution Control Facility.[457] Among other things, Woodland argued that the requirement for tertiary treatment was "illegally based on the Department of Health (Department) reclamation criteria."[458] The State Board rejected this argument stating:

> The Regional Board did not illegally apply the Department's reclamation criteria, found in Title 22 of the California Code of Regulations, to Woodland discharge. The permit recognizes that the criteria govern the reuse of wastewater and are not directly applicable to a surface water discharge. Nevertheless, the Regional Board found that the treatment level and total coliform effluent limit prescribed in Title 22 for wastewater reused for spray irrigation of food crops, parks and other publicly-accessible areas were appropriate to protect Tule Canal's agricultural irrigation and contact recreation uses. *In reaching this conclusion, the Regional Board properly applied its judgment, guided by the Department's recommendation, to the facts specific to the Woodland discharge.*[459]

Here, too, the Regional Board has properly exercised its discretion, guided by DPH recommendations and facts specific to this case, in requiring the Discharger to implement tertiary treatment at the Treatment Plant. That discretion should be respected.

2. The Discharger's Recreational Use Risk Assessment Was Not "Overly Conservative"

The conclusion in the Gerba Risk Assessment that pathogens in the Discharger's effluent do not pose a risk to human health was based on a comparison of the computed risks with the risk levels set forth in 1986 EPA Criteria.[460] In June 2010, CDPH reiterated its prior position that these criteria are not appropriate stating, "In the case of the SRCSD discharge, the CDPH does not consider conformance with the EPA's Recreational Water Quality Criteria (Criteria) to

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[456] See State Board Order WQO 2004-0010.

[457] *Id.*, pp. 2-4.

[458] *Id.*, p. 9.

[459] Id., p. 11, emphasis added.

[460] See Gerba Risk Assessment, pp. 3-4, 9-10.

provide adequate public health protection."[461] Yet, when CDPH restated that the acceptable risk level of 1 in 10,000 was the appropriate one to use, the Discharger started recasting the assumptions used in the Gerba Risk Assessment as being too conservative.

Indeed, the Discharger now claims that the assumptions used in the Gerba Risk Assessment were overly conservative and that changing only one assumption would reduce the risk to below the CDPH level.[462] But this ignores the reality that these assumptions were agreed to by the Discharger, CDPH and Regional Board staff as reasonable and appropriate for the risk assessment, and the report was reviewed and finalized based on these agreed-upon assumptions.[463] As discussed in the following paragraphs, the assumptions used in the Gerba Risk Assessment were not overly conservative.

Another consultant hired by the Discharger concluded that the risk was substantially higher than Dr. Gerba concluded based on the same Discharger data, the same risk assessment methodology, and assumptions that better protect public health.[464]

CDPH requested a formal risk assessment be conducted after a rough assessment of the Discharger data.[465] As stated previously, CDPH uses an acceptable risk level of 0.01% or 1 in 10,000.[466] The Discharger contracted with Larry Walker Associates to conduct a risk assessment and Larry Walker Associates concluded there was a 0.07% to 0.72% chance of becoming infected with *Cryptosporidium*.[467] This corresponds to 7 in 10,000 to 72 in 10,000 swimmers becoming infected and is substantially higher than the CDPH acceptable risk level

The Discharger then contracted with Dr. Gerba to conduct a risk assessment. The Gerba

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[461] See letter from Gary Yamamoto, CDPH, to Ken Landau, Regional Board, dated June 15, 2010.

[462] Petition, p. 36.

[463] Lischeske Declaration, ¶¶ 3, 6.

[464] *See* LWA Risk Assessment.

[465] Lischeske Declaration, ¶ 3.

[466] *Ibid*.

[467] *See* LWA Risk Assessment, p. 5.

Risk Assessment shows that the average risk of infection (which is roughly twice the risk of illness that he reported in his report) exceeded the CDPH guidance of 1 additional illness in 10,000 in 20:1 diluted effluent and at River Mile 44, 3 miles downstream of the discharge.[468] As stated previously, the assumptions used by Dr. Gerba were agreed to by the Discharger, CDPH, and Regional Board staff.[469] We review these assumptions here to provide perspective on how reasonable or conservative they really were.

Efficiency of Analytical Method – Dr. Gerba based his assumptions on efficiency of the analytical methods on a study that was conducted by the Department of Water Resources (DWR) with Delta water.[470] Dr. Gerba, the Discharger, CDPH, and the Regional Board agreed to use an efficiency of 25% for *Giardia* and 54% for *Cryptosporidium* based on the average efficiencies from the DWR study. Four sites were analyzed in the DWR study (Sacramento River at Hood, Barker Slough, Bethany Forebay, and the San Joaquin River at Vernalis).[471] The Hood site is approximately 8 miles downstream of the Discharger's discharge location and represents the site that is most similar to the discharge location. This site had the lowest recoveries for *Giardia* (0.5%) and *Cryptosporidium* (36%).[472] Rather than use the percent recoveries most applicable to the discharge location, the Gerba Risk Assessment rationalizes using the average recoveries from

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[468] Gerba Risk Assessment, p. 13-16. The Gerba Risk Assessment shows that the average risk triples from upstream of the discharge (Freeport) to downstream of the discharge (River Mile 44). Neither of the upstream sites that were evaluated in the Gerba Risk Assessment is truly representative of upstream conditions. The Veteran's Bridge site is too far upstream. The high quality American River enters the Sacramento River between Veteran's Bridge and the discharge location so Veteran's Bridge data are not useful for comparing pathogen risks upstream and downstream of the discharge. Freeport is immediately upstream and is impacted by the discharge due to reverse flows that occur during high tides, so it does not reflect conditions that are truly upstream of the discharge. The next section on drinking water impacts contains more information on the impact of the discharge on Freeport.

[469] Lischeske Declaration, ¶¶ 3, 6.

[470] *See* DiGiorgio, C., *et al.*, December 2002, *Crytosporidium* and *Giardia* Recoveries in Natural Waters by Using Environmental Protection Agency Method 1623, *App. Environ. Micro*, vol. 68, pp. 5952-55.

[471] *Id*. pp. 5952-53.

[472] *Id*. p. 5952.

all four sites evaluated in the DWR study by conducting an analysis of turbidity data and claiming that the turbidity was generally much lower than the turbidity found at Hood during the DWR study. The DWR report clearly states, "Recoveries of 50% or less occurred in low- and high-turbidity waters, suggesting that the nature of the turbidity or the background matrix of the water was as important to recovery as was an absolute turbidity value. In the case of oocyst recoveries, turbidity was unable to account for recovery differences between sites, while for cyst recoveries, turbidity could explain inter-site differences."[473] Apparently the Discharger did not provide Dr. Gerba with data on the percent recovery for each of the District's samples (a common practice among laboratories conducting testing for *Giardia* and *Cryptosporidium*), so assumed recoveries had to be used. Despite the poor recoveries at Hood, the only sample collected during the DWR study that was positive for *Cryptosporidium* came from this site. A conservative assumption would have been to use the recoveries from the Hood site (0.5% for *Giardia* and 36% for *Cryptosporidium*).[474]

Percent of Cysts that are Infectious – Dr. Gerba, the Discharger, CDPH, and the Regional Board agreed to use an assumption that 24% of the *Giardia* cysts and *Cryptosporidium* oocysts are viable in treated wastewater. This assumption was based on one study that showed that 40% of the *Cryptosporidium* oocysts are viable in untreated sewage. The 40% was "adjusted" to 24% to reflect decreased viability after treatment. The most conservative assumption would have been to assume that 100% of the cysts were viable.

Infectivity of Pathogens – Dr. Gerba, the Discharger, CDPH, and the Regional Board agreed to use an assumption that the probability of infection is 2% from ingestion of one *Giardia* cyst and 0.4% from ingestion of one *Cryptosporidium* oocyst. The 0.4% was originally used as the infectivity constant a number of years ago. More recently, U.S. EPA reviewed infectivity/dose response data for the Long Term 2 Enhanced Surface Water Treatment Rule and

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[473] *Id*. p. 5954.

[474] In fact, Dr. Gerba used a more conservative assumption of 17% (rather than 25%) for *Cryptosporidium* in a *draft* of his report.

produce a more realistic range of infectivity constants of 7 to 10% with an upper range of 16% for *Cryptosporidium*. The infectivity used in the Gerba Risk Assessment is a factor of 4 lower than the upper value of 16%. A conservative assumption would be that the probability of infection is 16% and the most conservative assumption, since the Gerba Risk Assessment adjusted for infectivity of oocysts (see previous paragraph), would be that the probability of infection from ingesting one cyst or oocyst is 100%.

Risk Assessment with more Conservative Assumptions – If the more conservative assumptions are used, the risk increases by a factor of 1000. When evaluating a 20:1 dilution of the effluent, the risk of infection from *Cryptosporidium* from a single swimming event increases from 0.005% (Gerba Risk Assessment) to 7.6% at the 95 percentile level. The average risk increases from 0.003% to 4.7%. The true risk probably lies somewhere between the risk estimated in the Gerba Risk Assessment and the risk calculated with conservative assumptions. The point is that the Gerba Risk Assessment did not use overly conservative assumptions as the Discharger is currently claiming. This is substantiated by the fact that the District's other consultant, Larry Walker Associates, employed more conservative assumptions that those used in the Gerba Risk Assessment.

C. Filtration is Required to Protect Municipal Use

The Discharger's discharge is impacting the drinking water beneficial use of the Sacramento River. The CDPH and Regional Board position was that protecting the recreational beneficial use would also protect the drinking water beneficial use.

The entire Sacramento River is designated as a source of drinking water under State Water Board Resolution 88-63 and the high quality of that source must be maintained under State Water Board Resolution 68-16. There are currently no drinking water intakes immediately downstream of the Discharger's discharge location; however, there may be intakes on the Sacramento River downstream of the discharge in the future. The Bay Delta Conservation Plan is evaluating up to five intakes between Freeport and Courtland. The entire Sacramento River must be protected as a high quality source of drinking water.

While there are currently no receiving water quality objectives for pathogenic protozoans such as *Cryptosporidium* and *Giardia,* there are drinking water treatment requirements that are based on source water levels of these organisms. The Interim Enhanced Surface Water Treatment Rule (http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/ieswtrfr.cfm) requires all water treatment plants that treat surface water and serve more than 10,000 people to provide 2-log (99 percent) reduction/inactivation of *Cryptosporidium*. Water treatment plants are classified in one of four bins based on monitoring for *Cryptosporidium* required by the Long-term 2 Enhanced Surface Water Treatment Rule (http://www.epa.gov/fedrgstr/EPA-WATER/2006/February/Day-06/w004.htm) as shown in Table 5. If the monitoring results place a water treatment plant in Bins 2 through 4, additional reduction/inactivation of *Cryptosporidium* is required. This rule established a "microbial toolbox", which contains various methods of achieving the additional treatment requirements including watershed management, pretreatment, additional treatment, and optimizing existing treatment processes.

Table 5. LT2ESWTR Bin Classification and Action Requirements

Bin Classification	Maximum Running Annual Average (oocysts/L)	Action Required (log)
1	<0.075	none
2	0.075 to <1.0	1
3	1.0 to <3.0	2
4	≥3.0	2.5

Discharger data collected upstream of the discharge in the Sacramento River at Freeport Marina (R1), 4,200 feet downstream of the discharge at Cliff's Marina (R3), and in the SRWTP effluent were analyzed to determine the bin levels that water treatment plants would fall into if an intake was located upstream and downstream of the discharge. Table 6 shows that water upstream of the discharge is high quality, requiring no additional treatment to remove/inactivate *Cryptosporidium*. At the minimum 14:1 dilution of the effluent during normal operations, a water treatment plant would be required to provide an additional two log (99.99 percent) reduction/inactivation of *Cryptosporidium*. At 20:1 dilution and 50:1 dilution of the effluent, one

additional log reduction/inactivation would be required. The data collected from the Sacramento River 4,200 feet downstream of the discharge show that one additional log removal would be required at R3. The R3 data were collected under a variety of flow and discharge conditions between December 2002 and April 2006 and are therefore representative of many different dilutions of effluent and receiving water.

Table 6. Impacts of Current Discharger Discharge on Drinking Water Treatment Requirements

Location	Highest 12-month Mean[a]	LT2ESWTR Bin Classification	Additional Log Removal
R1 (upstream)	0.05	1	None
14:1 Dilution of Effluent	1.02	3	2
20:1 Dilution of Effluent	0.73	2	1
50:1 Dilution of Effluent	0.30	2	1
R3 (0.5 mile downstream)	0.18	2	1

[a] Based on Discharger data collected between December 2002 and April 2006

The Discharger's *Cryptosporidium* data clearly indicate that the discharge is degrading water quality and affecting the potential future use of the Sacramento River as a drinking water supply downstream of the discharge. Requiring the Discharger's effluent to meet the recycled water criteria will protect municipal water supplies as well as agricultural water supplies and recreational use of the Sacramento River.

The discharge has already had impacts on the MUN beneficial use of the Sacramento River. The Freeport Regional Water Authority intake is 6,000 feet upstream from the discharge location. During high tides and low Sacramento River flows, the Sacramento River reverses direction and flows upstream. Water cannot be diverted at the intake during reverse flows due to concerns about the discharge adversely affecting water quality at the intake.[475] In addition, the

[475] Regional Board, NPDES Permit Renewal Issues Drinking Water Supply and Public Health Issue Paper re Sacramento Regional County Sanitation District Sacramento Regional Wastewater Treatment Plant (December 14, 2009) at p. 4 (stating: "The nearest drinking water intake to the SRWTP discharge to the Sacramento River is the East Bay Municipal Utility District's (EBMUD) Freeport Intake, approximately 1 mile upstream of the District's discharge. Under low river flow and high tides, effluent could move up river to the vicinity of the Freeport Intake. An operational agreement between SRCSD and EBMUD requires the diversion at the intake to cease during

North Bay Aqueduct Contractors have decided to pursue an intake upstream of the discharge rather than a less costly one downstream of the discharge.[476]

D. The Regional Board Was Not Required To Adopt 13241 Findings

The Discharger contends, among other things, that the Permit is problematic because the Regional Board gave only "cursory and superficial attention to its obligations under [California Water Code] section 13241."[477] When applicable, Section 13241 requires a regional board to consider six factors in the promulgation of new Water Quality Objectives ("WQO"), including the beneficial uses of the water, environmental characteristics of the hydrographic unit, water quality conditions that could be reasonably achieved, economic considerations, the need for developing housing, and the need to develop and use recycled water. In particular, the Discharger argues that the Regional Board's alleged failure to adequately consider the costs of treatment under Section 13241 has resulted in permit requirements that place an unjustified economic burden on the Discharger.[478]

When the Discharger commented on the Regional Board's initial absence of findings under Section 13241, the Regional Board responded by providing an analysis of each of the six Section 13241 factors.[479] Although the Discharger contends that this analysis was insufficient, its argument is without merit because the Regional Board performed a Section 13241 analysis, and the method by which the Regional Board performed the analysis was within its discretion.[480] The only "economic considerations" that a Regional Board must consider under Section 13241 is the

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these conditions . . . .").

[476] *See* Hearing Transcript, p. 270.

[477] Petition, p. 9.

[478] *Id*., pp. 50-51.

[479] Permit, Attachment F, at pp. F-77 to F-78.

[480] *City of Arcadia v. State Water Resources Control Board*, 135 Cal. App. 4th 1392, 1415 (2006) (Section 13241 "does not . . . specify a particular manner of compliance, and thus . . . the matter is within a regional board's discretion").

"cost of compliance," which was clearly considered by the Regional Board here.[481]

In any event, the Regional Board did not need to engage in any Section 13241 analysis because the Regional Board's permitting action was not a promulgation of a WQO. Rather, it was merely the implementation of an already-existing objective in the Basin Plan.[482] Water boards engage in a consideration of Section 13241 factors at the time they create a basin plan, and thus, need not repeat the analysis each and every time they institute a permit under that plan. Because the tertiary treatment limits set by the Regional Board in the Permit are not separate WQOs, the Regional Board had no obligation to conduct a Section 13241 analysis.

The Discharger argues alternatively that the Section 13241 requirements apply because the Permit contains Waste Discharge Requirements ("WDR") governed by Section 13263, which exceed federal Clean Water Act standards. Section 13263 requires that a regional board consider certain factors in the implementation of WDRs, including those outlined in Section 13241. This statute, however, is pre-empted by federal law—in particular, the Clean Water Act—where the permit does not set standards more stringent than those required by the Clean Water Act.[483] Section 13377 of the Porter-Cologne Act (implementing the Clean Water Act) specifies that WDR permits must comply with federal standards, which in effect "forbids a regional board's consideration of any economic hardship on the part of the permit holder if doing so would result in the dilution of the requirements set by Congress in the Clean Water Act."[484] Accordingly, allowing the Regional Board to weigh economic considerations in its Permit would conflict with the Clean Water Act's requirement that "publicly operated wastewater treatment plants . . . must

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[481] *City of Burbank v. State Water Resources Control Bd.*, 35 Cal. 4th 613, 625 (2005); Permit at F-77.

[482] *See In the Matter of the Petitions of Napa Sanitation District, et al., For Review of Waste Discharge Requirements,* Order No. 00-059, State Water Resources Control Board, Order No. WO 2001-16, at *45 (December 5, 2001) ("Regional Boards are not required to consider the Section 13241 factors when implementing an existing Basin Plan objective").

[483] *City of Burbank*, 35 Cal. 4th at 626 (internal citations omitted).

[484] *Id*.

comply with the act's clean water standards, regardless of cost."[485]

It is well-established that water boards need not address the factors in Sections 13241 and 13263 for a WDR/NPDES permit "unless the permit is more stringent than what federal law requires."[486] A permit is not more stringent than the Clean Water Act simply because it places numerical limits where the Basin Plan had only narrative requirements. The State Board elaborated on this concept in its review of the discharge limits in the general NPDES permit for storm water associated with construction activities:

> Federal law authorizes both narrative and numeric effluent limitations to meet state water quality standards. The use of [numeric effluent limits] to achieve compliance with water quality standards is not a more stringent requirement than the use of BMPs. Accordingly, the State Water Board does not need to take into account the factors in Water Code sections 13241 and 13263.[487]

Because the Permit at issue here is simply a numerical interpretation of the existing narrative WQOs (which themselves comply with but do not exceed Clean Water Act standards), and cannot be considered more stringent than what federal law requires, the Regional Board was prohibited from considering economic factors by the Clean Water Act. Finally, even assuming arguendo that the Permit is more stringent than the requirements of the Clean Water Act (which it is not), the Discharger's arguments are moot because, as discussed above, the Regional Board completed a fully sufficient Section 13241 analysis and issued corresponding findings.

IX. THE INTERIM TOTAL AMMONIA NITROGEN EFFLUENT LIMITS MUST BE RESCINDED

The Water Agencies request the State Water Board amend the Permit as follows:

- Revise the interim total ammonia nitrogen effluent limits to the lowest feasible limits. In no respect should the Facility be permitted to increase its total ammonia nitrogen

[485] *Id*.; *see also* 33 U.S.C. 1311(a), (b)(1)(B) & (C), 1342(a)(1) & (3).

[486] *NPDES General Permit for Storm Water Discharges*, State Water Resources Control Board, Order No. 2009-0009-DWQ, at *39 (September 2, 2009).

[487] *Id*. at *39-40.

concentration and loadings above the daily average and monthly average total ammonia nitrogen discharged over the past decade.

- Remove the interim total ammonia nitrogen effluent limits from the Permit setting the Waste Discharge Requirements and include them in an enforcement order.
- Revise the pollution prevention plan for total ammonia nitrogen to: (1) require an expedited evaluation of interim measures that would reduce the mass of total ammonia nitrogen loadings in the effluent until the full nitrification and denitrification are completed, and (2) expand and make certain that stakeholders will have the right to participate in a public process governing the development of the interim measures.

A. The Interim Total Ammonia Nitrogen Effluent Limits Are Higher than the Existing Discharge

The Permit set interim total ammonia nitrogen effluent limitations that exceed the Facility's current level of discharge. The Permit's interim total ammonia nitrogen effluent limits allow discharges that would further impair water quality, because the Order sets an interim daily average concentration limit for total ammonia nitrogen of 45 mg/L and a maximum daily total ammonia nitrogen loading limit of 67,929 lbs/day.[488] The Permit also sets an interim monthly average concentration limit for total ammonia nitrogen of 35 mg/L.[489] These limits allow the Discharger to discharge up to 140% more total ammonia nitrogen than the current average load until November 3, 2020.

These interim limits are too high because the Discharger can achieve significantly lower total ammonia nitrogen discharge levels during the interim period with the *existing* plant configuration. Indeed, the Permit's proposed interim daily total ammonia nitrogen concentration is close to double the plant's actual current discharge.[490] Further, the current discharge is not atypical. As demonstrated by the Discharger's own discharge monitoring data in the record

[488] Permit, at 16.

[489] Permit, at 16.

[490] Permit, at 16.

below, the Facility has consistently been discharging total ammonia nitrogen at levels lower than the interim limits. Indeed, as presented to the Regional Board at the December 9, 2010 hearing, over the past decade the Discharger has achieved a daily maximum total ammonia nitrogen concentration of less than 34 mg/L 99% of the time and a monthly average ammonia concentration of less than 30 mg/L 100% of the time.[491] Because these lower daily and monthly average total ammonia nitrogen concentrations can be achieved, the Orders should be revised to direct the Discharger to meet these lower daily and monthly average total ammonia nitrogen levels during the interim period.

To do otherwise would allow the Discharger another decade to exacerbate the impacts that the Regional Board found are being caused by the tons of total ammonia nitrogen discharged by the Discharger every day. The Water Agencies urge the Board to rescind the interim total ammonia nitrogen effluent limits. The overwhelming scientific evidence demonstrates that untreated total ammonia nitrogen is a key contributor to the decline of the food web that is essential to aquatic species in the Delta. Research by Richard Dugdale, Ph.D., and others indicates that until total ammonia nitrogen levels are lowered, the Delta's ecosystem will not be adequately protected and primary productivity will be impaired because ammonium from the discharge inhibits phytoplankton nitrate uptake and prevents phytoplankton blooms. Given these significant detrimental effects on the Delta ecosystem, interim total ammonia nitrogen effluent limits should not be set that allow an *increase* in total ammonia nitrogen loadings over the next ten years as increased levels of total ammonia nitrogen will necessarily result in increased harm to beneficial uses.

The interim limits violate federal antidegradation policy,[492] and California's Antidegradation Policy, State Water Resources Control Board Resolution No. 68-16 (Oct. 28, 1968). Any activity that can lower the quality of high quality waters must comply with waste

[491] Excerpt from December 9, 2010 slides accompanying "Water Agencies" Testimony (slides 47 and 48 titled "Interim Limits Are Too High And Lower Levels Can Be Attained").

[492] 40 C.F.R. § 131.12.

discharge requirements that "will result in the best practicable treatment or control of the discharge necessary" to prevent pollution and nuisance and to maintain "the highest water quality consistent with maximum benefit to the people of the State." BPTC certainly cannot be a *lesser* degree of treatment or control than is in place today.

For years, the Discharger has violated the narrative toxic objective established by the Water Quality Control Plan for the Sacramento and San Joaquin River Basins. Under the Permit, the Discharger will continue, for ten years or more, to discharge total ammonia nitrogen waste in violation of that objective, waste that will continue to cause serious harm to the Delta ecosystem and the fish that depend on it. The Water Agencies urge the Board, as they urged the Regional Water Board, to lower the interim total ammonia nitrogen limits to a level that does not allow any further increase over existing levels.

B. The Pollution Prevention Plan For Ammonia Is Not Rigorous Enough

The Permit includes a pollution prevention plan for total ammonia nitrogen that directs the Discharger to submit its plan to the Regional Board within one year after the Permit is final.[493]

The Water Agencies recommend that the plan's required activities be accelerated as much as possible. To that end, the Discharger should be directed to submit an Interim Measures Plan (recommended within 60 days of final approval of the Permit) that would propose measures to reduce the mass of total ammonia and nitrogen loadings in the effluent until full nitrification and denitrification treatment and control are completed. There may be options available to accomplish significant interim reductions, including side-stream treatment and expanded use of the Discharger's recycled water program, that should be considered expeditiously and fully. As the Permit is silent on the role of the public in the process, the Water Agencies request that this Board clarify and confirm that the plan to study interim measures be made available to the public for comment before any further decisions are made, but that the Discharger begin implementing a plan to implement interim measures within six months of final approval of the Permit.

[493] Permit, at 34.

X. THE PERMIT'S REQUIREMENTS FOR NUTRIENT REMOVAL ARE NECESSARY TO REDUCE UNAUTHORIZED TAKE OF LISTED DELTA FISH SPECIES, AND THE INTERIM LIMITS SHOULD BE REDUCED OR ELIMINATED

The adverse effect of the discharge on threatened and endangered fish species has not been authorized under either the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA), and has in fact resulted in a disproportionate regulatory burden being placed on the communities in the San Francisco Bay Area, the Central Coast, the San Joaquin Valley and Southern California. Without more stringent requirements, over the next decade the Discharger will continue to violate the ESA and CESA, because the ammonia nitrogen loadings and the thermal effects of the discharge will result in the "take" of protected species during the interim period. The Water Agencies recognize that the long delayed, advanced treatment facilities cannot be built overnight. However, the Board should include aggressive interim measures to mitigate the ongoing effects of the discharge to mitigate the impacts on protected species during development and construction. Accordingly, the Water Agencies urge the Board to revise the Permit and the Time Schedule Order to restrict interim discharges of total ammonia and nitrogen and require installation of full nutrient removal as soon as feasible. In addition, the Discharger must be required to take the steps needed to comply with the applicable Thermal Plan as soon as possible.

A. The Existing Discharge and the Proposed Interim Limits Cause "Take" in Violation of the ESA and the CESA

The Discharger is located within the designated critical habitat for five federally-listed fish species including winter- and spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Steelhead (*O. mykiss*), Delta smelt (*Hypomesus transpacificus*) and Green sturgeon (*Acipenser medirostris*). California State Species of Special Concern include the Sacramento Splittail (*Pogonichthys macrolepidotus*) and the Central Valley Fall/Late-Fall Salmon (*Oncorhynchus tshawytscha*).

However, scientific evidence in the record demonstrates that the levels of total ammonia nitrogen in the discharge, and temperature changes caused by the discharge, have contributed to

the decline of listed species listed under the federal ESA and/or CESA that are dependent upon the Sacramento River and the Delta. The high levels of total ammonia nitrogen in the discharge directly (through increased toxicity) or indirectly (through adverse habitat modification and degradation) injure or kill Delta smelt. The discharge causes temperature increases in the Sacramento River to levels that are near lethal or lethal to Delta smelt and multiple runs of salmon. This discharge violates section 9 of the ESA and section 2080 of the California Fish and Game Code (the take prohibition under the CESA).

Section 9 of the ESA makes it unlawful for any person to "take" a listed species.[494] "Take" means "harass, harm, pursue, hunt, wound, kill, trap, capture, or collect" any listed species, or "to attempt to engage in any such conduct."[495] Take is defined "in the broadest possible manner to include every conceivable way in which a person can 'take' or attempt to 'take' any fish or wildlife."[496] The term "harass" means "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering."[497] The term "harm" is any act "which actually kills or injures wildlife," including "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."[498] Therefore, the ESA is violated if "significant modification or damage to the habitat of an endangered or threatened species is likely to occur so as to injure that species."[499]

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[494] 16 U.S.C. § 1538(a)(1) (prohibiting take of endangered species); 50 C.F.R. §§ 17.21, 17.31(a) (applying same regulatory take prohibitions to threatened species).

[495] 16 U.S.C. § 1532(19).

[496] *Strahan v. Coxe*, 127 F.3d 155, 162 (1st Cir. 1997) (citations omitted).

[497] 50 C.F.R. § 17.3.

[498] 50 C.F.R. § 17.3; *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon*, 515 U.S. 687 (1995) (upholding regulation as reasonable).

[499] *U.S. v. Town of Plymouth*, 6 F. Supp. 2d 81, 90 (D. Mass. 1998) (citing *Tennessee Valley Authority v. Hill*, 437 U.S. 153, 172 (1978)); *see Environmental Prot. Info. Ctr. v. The Simpson Timber Co*., 255 F.2d 1073, 1075 (9th Cir. 2001) ("Eliminating a threatened species' habitat thus can constitute 'taking' that species for purposes of section 9 [of the ESA].")

Similar to the ESA, the CESA prohibits "take" of any State-listed threatened or endangered species.[500] The CESA defines take as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill."[501]

1. Total Ammonia Nitrogen Discharge Causes Unlawful Take

The record establishes that a growing number of scientific studies show that the Treatment Plant's historical and ongoing discharges, particularly of total ammonia nitrogen, are toxic to Delta smelt and cause significant habitat modification and degradation that is harming the Delta smelt's food sources and otherwise injuring and killing members of the species. The Permit, however, does not reduce those impacts during the interim period, and thus the Discharger would continue to discharge total ammonia nitrogen at levels that will result in "take" of Delta smelt.

Indeed, the record, including the work of Dr. Teh, demonstrates that, at current levels, the un-ionized ammonia in the Treatment Plant's discharges causes acute and/or chronic toxicity to Delta smelt.[502] Dr. Werner's research likewise demonstrates that the long-term average concentrations of un-ionized ammonia downstream of the Treatment Plant already exceed the acute to chronic toxicity ratios in the Sacramento River.[503] The extensive research of Johnson, Glibert, Kendall, Dugdale, Wilkerson, Parker, Marchi, Lehman, and others further demonstrates the impacts being caused by the current discharge. Yet, the Permit's interim limits would allow the level of total ammonia nitrogen in the discharge to more than double over the next ten years.

Further, unless restricted during the interim period, the Discharger would continue to cause "significant habitat modification or degradation" that will injure and/or kill members of the threatened Delta smelt species. The studies described above, and in Appendix J of the Permit, describe how the current total ammonia nitrogen discharge is adversely affecting the pelagic food web, which is a significant factor in the pelagic organism decline. The discharge substantially

[500] Cal. Fish & Game Code § 2080.

[501] *Id*. at § 86.

[502] *See* Permit, at App. J.

[503] *Id*. at J-2.

alters the ratio of nitrogen and phosphorus (the "N:P ratio") in the Sacramento River and the Delta. As described above, these discharges devastate the aquatic ecosystem that would otherwise exist and impair aquatic life-related beneficial uses throughout the Delta.[504]

The recent work of Dr. Glibert of University of Maryland, described above, highlights the relationship between the ammonium discharged from the Treatment Plant and actual injury to the smelt. Dr. Glibert found that variations in the nutrient composition of the Treatment Plant's discharges was highly correlated to the variation in nutrient concentrations in the receiving waters. These nutrient variations are, in turn, related to variations in the base of the food web, primarily the composition of algae, to variations in the composition of zooplankton, and to variations in the abundance of several fish species.[505]

The fact that nutrient ratios materially impact the underlying foodweb is not a novel proposition unique to Dr. Glibert's research here in the Sacramento River/Delta ecosystem. To the contrary, the N:P ratio has long been shown to influence phytoplankton composition and the presence – or absence – of native species and vegetation. Extensive studies, described above and elsewhere in the record, have repeatedly demonstrated this relationship in study after study across a range of systems in the United States – such as in Florida, Michigan, North Carolina, Tampa, and Washington DC – and around the world – in Denmark, Germany, Hong Kong, Japan, Korea, Norway, Spain, and Tunisia.

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[504] Specifically, increases in ammonium change the nutrient ratios and (1) inhibit phytoplankton primary production; (2) shift the speciation of algal communities from nutritious species to less desirable species; and (3) create conditions favorable for the spread of invasive species and unfavorable for native species. A growing body of scientific evidence demonstrates that these conditions will significantly impair essential behavioral patterns, such as feeding, and thus injure or kill individual delta smelt. Studies by Dr. Teh show that the total ammonia nitrogen from the SRTWP is causing acute and chronic toxicity to *Eurytemora affinis* and *Pseudodiaptomus fobesi*, which are an important food source for larval and juvenile delta smelt. (Permit, at J-2 n.3.) In addition, the shift in the algal community from nutritious species such as diatoms to less desirable forms like *Microcystis* is also disrupting the Delta smelt's behavioral patterns.

[505] The fact that nutrient ratios materially impact the underlying foodweb is not a novel proposition unique to Dr. Glibert's research here in the Sacramento River/Delta ecosystem. The N:P ratio has long been shown to influence phytoplankton composition and the presence – or absence – of native species and vegetation. Extensive studies, described above and elsewhere in the record, have repeatedly demonstrated this relationship in study after study across a range of systems in the United States and around the world.

Thus, changes in abundance of Delta smelt and several other fish species are ultimately related to changes in ammonium load from wastewater discharge in the upper Sacramento River which cause significant modification or degradation to the species' habitat. The discharge thus constitutes take under the ESA.[506] *Cf*., *e.g*., *Forest Conservation Council v. Rosboro Lumber Co*., 50 F.3d 781 (9th Cir. 1995) (allegations that proposed clearcutting was reasonably certain to injure Northern spotted owls by significantly impairing their essential behavioral patterns were actionable under the ESA).)

As described above, advanced nutrient removal has proven effective at restoring native systems in areas that had been impacted by nutrient discharges from large wastewater treatment plants, such as Tampa Bay and the Chesapeake Bay. As Dr. Glibert has concluded, reduction of the ammonium loading into the Delta "is essential to restoring historic pelagic fish populations," like the Delta smelt.[507] Given the recent declines in Delta smelt and other listed species, the State Board should take steps to reduce the discharge while the Treatment Plant is built and to require advanced nutrient removal as soon as feasible.

2. Temperature Impacts Cause Unlawful Take

Discharging pursuant to the Permit's exception from the Thermal Plan would result in unauthorized "take" of Delta smelt, salmon, steelhead and sturgeon. The Discharger has not satisfied its threshold burden of proof, justifying an exception by establishing that the Thermal Plan is, ". . . more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the

[506] Even if an action's affect on critical habitat will not jeopardize the survival of a listed species, the courts have held that it will still be a "take" under the ESA if it appreciably diminishes the value of critical habitat for the recovery of the listed species. *See Gifford Pinchot Task Force v. U.S. Fish & Wildlife Serv*., 378 F.3d 1059, 1069-70 (9th Cir. 2004); *Sierra Club v. U.S. Fish & Wildlife Serv*., 245 F.3d 434, 441-42 (5th Cir. 2001). The ESA is enacted not merely to forestall the extinction of species, but also to allow species to recover to the point where they can be delisted. (*Gifford Pinchot*, 378 F.3d at 1070.)

[507] *See* Glibert, P., "Long-term changes in nutrient loading and stoichiometry and their relationships with changes in the food web and dominant pelagic fish species in the San Francisco Estuary, California," Reviews in Fisheries Science (2010).

discharge is made. . . .[508] The Discharger has similarly failed to provide sufficient evidence to support a finding that the higher ESA standard of avoidance of "take" is satisfied.

The Discharger releases high-temperature water into the Sacramento River from a diffuser immediately downstream of Freeport.[509] Delta smelt, Chinook salmon, steelhead and sturgeon occupy critical habitat that includes the discharge location and mixing zone.[510] Ambient Sacramento River water temperatures downstream of the diffuser approach, and may exceed, levels that are lethal to Delta smelt, Chinook salmon, steelhead, and sturgeon.[511] Even where river temperatures are not immediately fatal, sublethal temperatures may cause harm to these species by increasing their susceptibility to predation, and by inducing harmful physiological changes that include advanced ageing and skin deterioration, elevated levels of heat shock proteins, hypercortisolemia, and acute thermal shock.[512] Impacts to sturgeon are also expected, particularly since the highest river temperatures are near the diffuser at the bottom of the river, where sturgeon are found.[513]

The Discharger provided no analysis of the effect of its thermal discharge on Delta smelt. The FWS agreed, specifically stating that the Discharger's Delta smelt analysis was insufficient.[514] For salmon and sturgeon, NMFS determined based on the thin record provided by

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[508] 40 CFR §125.70.

[509] Permit at p. 5.

[510] NMFS Letter to Regional Board, September 9, 2010, p. 1; FWS letter to Regional Board, Re: Recommendations on SRCSD State Thermal Plan Exception, August 18, 2010, p. 1.

[511] *See* Temperature section, below, for additional information; *see also*, Crammer (2010) and Thompson and Baldridge (2010).

[512] *Ibid*.

[513] At the lower elevations of the water column where sturgeon migrate, the Discharger reports, " A portion of the lower half of the water column could be elevated up to 7.5ºF, relative to background temperature, from October through March. . . ." (Thermal Plan Exception Justification for the Sacramento Regional County Sanitation District, July 2010, p. 34.) This raises concerns about the Dischargers' ability to comply with the permit limitation of not increasing water temperatures above ambient conditions by more than 4ºF. It also raises concerns about the effect of these dramatic temperature increases on sturgeon.

[514] FWS letter to Regional Board, Re: Recommendations on SRCSD State Thermal Plan Exception, August 18, 2010, p. 3.

the Discharger that these species are physically able to avoid the thermal plume, while also recommending code wire tagging studies to determine if these species are in fact avoiding the effects of the discharge.[515] In so doing, NMFS did not consider the results of prior tagging studies that indicate some salmon are not avoiding the thermal plume, and in fact are lingering for 8-10 hours in the mixing zone searching for cover (Burau et al. 2007).[516] NMFS also failed to recognize that the zone of passage is very small and primarily located on the western bank of the river.[517] The Discharger did not provide any evidence that salmon would, or even could, find that small passage zone. Interestingly, all of the state and federal fishery agencies are in agreement that the discharge is likely causing the attraction of predatory fishes to the Discharger's mixing zone, which would further increase mortality.[518]

The evidence supports the finding that operating the Discharge pursuant to the Permit's Thermal Plan exception will result in unauthorized "take" of several listed species.

B. The Board Should Revise the Permit and Address the Continued Take of Endangered Species

The Board should revise the Tentative Permit to address the continued take of endangered species. The Water Agencies urge the Board to remove the interim limits and 10-year compliance schedule from the Permit, and to remove the exemption from the Thermal Plan. Instead, the Permit should incorporate limits that are required to satisfy full nutrient removal, and contemporaneous with issuing Permit, the Board should issue a new Time Schedule Order, or a Cease and Desist Order, to address permitting and construction of nutrient removal and the

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[515] NMFS Letter to Regional Board, September 9, 2010, p. 3.

[516] Burau, Jon, Blake, Aaron, and Perry, Russell, Sacramento/San Joaquin River Delta, Regional Salmon Outmitration Study Plan: Developing Understanding for Management and Restoration, December 10, 2007, pp. C.4 – C.6; *see also* Temperature Section.

[517] *See* Temperature Section for discussion of zone of passage.

[518] Letter from FWS to Regional Board, Re: Recommendations on SRCSD Thermal plan exception request, NPDES Renewal, Sacramento Regional County Sanitation District, August 18, 2010; NMFS Letter to Regional Board, September 9, 2010; Letter from DFG to Regional Board, Re: Response to the proposed NMDES permit renewal for the Sacramento Regional County Sanitation District, Sacramento Regional Wastewater Treatment Plan, October 7, 2010.

interim limits that would govern until the work is completed. The Water Agencies further urge the Board to use the following framework in developing such an Order:

- An expedited schedule to construct full nutrient removal should be established. The Water Agencies submit that full nutrient removal can be accomplished more expeditiously (and at a lower cost) than proposed in Permit. We urge the most expedited schedule be adopted reflecting the ongoing take of species from the continued discharge.
- The dramatic increase in total ammonia nitrogen concentration and total ammonia nitrogen loadings above current levels authorized in the Permit must be rescinded. The Permit sets an interim daily limit of 45 mg/L and a mass limit of almost 68,000 pounds per day. The daily mass limit – which equates to almost 34 tons per day – would allow the Discharger more than double its current discharge, which is generally in the range of 14 tons per day. This limit was based on the maximum concentration measured on one single day out of nearly 1,000 measurements over the last 9 years. That is not a reasonable limit to govern this Treatment Plant for the next decade, when the daily average for total ammonia nitrogen over the same time period was 23 mg/L.
- There should be an Interim Measures Plan developed and approved by the Regional Board, with public input. The Discharger should be directed to submit an Interim Measures Plan within 60 days of final approval of the Permit that would propose interim measures to reduce the mass of total ammonia nitrogen loadings in the effluent each year until the full nitrification and denitrification are completed. The Plan should be made available to the public for comment. The Discharger should have the burden to show that it could not achieve the required reduction.
- Interim concentration and mass limits should be set that reflect the ongoing harm being caused by the discharge. The Board should impose interim limits that are the lowest feasible limits for total ammonia nitrogen and nitrate. In no respect should the Discharger be permitted to increase its mass total nitrogen and nitrate loadings beyond

the current monthly average discharge.

- Consistent with the Permit as issued by the Regional Board, the reduced interim limits should include weekly and monthly average mass loading and concentration limits for total ammonia nitrogen. It is common for dischargers to not only have a daily effluent concentration limit, but to also have either a weekly and/or 30-day average discharge limit. That affords some flexibility to the discharger in the event that an issue arises that causes an unforeseen change in the discharge on a particular day, but ensures that overall, the system is operated to ensure the maximum possible reductions. The maximum monthly average over last 9 years is 29 mg/L. The Board should set a monthly concentration that is as protective as possible for River and the Delta, but in all events the monthly concentration limit should not exceed the historic average.
- The interim limits should also specifically include daily, weekly and monthly mass loading and concentration limits for total nitrogen. The Permit only sets interim daily limits on total ammonia nitrogen. A mass loading limit on total nitrogen should be established to prevent further degradation of the N:P ratio in the effluent and thereby reduce the ongoing harm from the discharge.
- The Board should require sufficient monitoring of each total ammonia nitrogen and nitrate limit. Sufficient daily monitoring should be required to determine whether the Discharger is in compliance with the total ammonia nitrogen and nitrate loadings and concentration limits. Further, the monitoring should be representative of the discharge, which can vary at different times during the day.

The Board should include a schedule for implementing the required measures to address the temperature of the discharge. The Water Agencies urge the most expedited schedule be adopted reflecting the ongoing take of species from the continued discharge.

XI. BECAUSE THE DISCHARGER HAS A HISTORY OF VIOLATING THE TOXICITY STANDARD IN ITS PERMIT, THE REGIONAL BOARD SHOULD HAVE ENHANCED THE TOXICITY PROGRAM USING A SCIENCE BASED APPROACH

The Treatment Plant has an ongoing problem with acute and chronic toxicity, and a

history of permit violations. Toxic episodes have been occurring regularly since approximately 2004, with toxicity reaching as high as 50 toxicity units (TU), which is significantly higher than the 8TU trigger for heightened testing contained in the Sanitation District's existing permit.[519] The Regional Board has characterized the Discharger as being in violation of its permit's toxicity standards 15% of the time.[520]

However, the Discharger's WET testing is not the only evidence suggesting that the Treatment Plant has an ongoing toxicity issue. Weston, et al. (2010) observed mortality or immobility of at least 70% of the test organisms (*Hyalella azteca*) exposed in every sample of the Treatment Plant's effluent.[521] Weston concluded that pyrethroids were responsible for most, but not all of the observed toxicity.

Werner, et al. (2009) concluded that the long-term average concentrations of un-ionized ammonia downstream of the treatment plant already exceed the acute to chronic toxicity ratios in the Sacramento River.[522] As the Treatment Plant is the primary source of total ammonia downstream of the treatment plant, Dr. Werner's research indicates that the Treatment Plant is already causing chronic toxicity in Delta smelt, and possibly other important aquatic species. (See Total Ammonia Nitrogen discussion, above.) In addition, Connon et al. (2010) found "[e]xposure to water from Hood elicited significant transcriptional differences of genes involved predominantly in neuromuscular functions, suggesting that contaminants originating from the Treatment Plant effluent may impact on swimming performance, growth and development of

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[519] SRWTP TRE Status Report, August 23, 2007.

[520] NPDES Permit Renewal Issues, Aquatic Life and Wildlife Preservation, Sacramento Regional County SanitationDistrict, Sacramento Regional Wastewater Treatment Plan, 29, April 2010, p. 16.

[521] Weston, D. P and M.J. Lydy. 2010. Urban and agricultural sources of pyrethroid insecticides to the Sacramento-San Joaquin Delta of California. *Environmental Science and Technology,* doi:10.1021/es9035573

[522] Werner, I., L.A. Deanovic, M. Stillway, and D. Markiewicz. 2009. "Acute toxicity of ammonia/um and wastewater Treatment effluent-associated contaminants on Delta smelt. Final Report. April 3, 2009.

larval Delta smelt."[523]

Werner, et al. (2009) further concluded that the Treatment Plant effluent is more toxic than can be explained just by un-ionized ammonia concentrations.[524] In toxicity tests using un-ionized ammonia from effluent dilutions and un-ionized ammonia from ammonium chloride additions, the effluent was significantly more toxic than the ammonium chloride. Parker, et al. (2010) observed the same effect in algal enclosure experiments.[525] In the case of Parker, et al. (2010), the increased effects were observed at effluent concentrations commonly occurring in the Sacramento River well downstream of the treatment plant.[526] These findings indicate that additional contaminants are present in the Treatment Plant's effluent and are consistent with other research.[527]

The Discharger has apparently evaluated a range of possible causes of the toxicity, but has yet to resolve the problem. In the meantime, an alarmingly high level of toxicity has been originating from the Treatment Plant for nearly a decade. The Regional Board should provide more direction to the Discharger, perhaps hiring its own consultant to draft the Workplan required by the Permit and to develop more rigorous toxicity testing procedures. The Regional Board should also adopt a numeric toxicity standard instead of the existing narrative standard. This is the recommendation of U.S. EPA, which explained that:

> The Clean Water Act (CWA), NPDES regulations, and EPA's Technical Support Document for Water Quality- based Toxics Control (TSD, USEPA 1991a) all envision that effluent limits

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[523] Connon, Richard, Linda Deanovic, Inge Werner. 2010. Application of novel biomarkers to determine sublethal contaminant exposure and effects in delta smelt. Poster presented at Interagency Ecological Program 2010 Annual Workshop. Sacramento, CA, May 26, 2010.

[524] Werner et al., 2009, supra.

[525] Parker, A.E., A.M. Marchi, J.Drexel-Davidson, R.C. Dugdale, and F.P. Wilkerson. 2010. "Effect of ammonium and wastewater effluent on riverine phytoplankton in the Sacramento River, CA. Draft Final Report. March 17, 2010.

[526] *Ibid*.

[527] *See also* Teh Declaration.

> should be expressed numerically.[528]

And, citing the preamble to 40 CFR 122.44(d)(1), U.S. EPA stated:

> EPA requires [WET] limits where necessary to meet water quality standards. EPA does not believe that a whole effluent toxicity trigger alone is fully effective because it does not by itself, restrict the quantity, rate, or concentrations of pollutants in the effluent.[529]

The Water Agencies recommend making the current toxicity trigger of 8TU the new numeric standard, with 6TU as the trigger for additional analysis.

XII. THE CHRONIC MIXING ZONE MAY NOT PROTECT AQUATIC SPECIES

The Regional Board's decision to deny an acute mixing zone is based on substantial evidence in the record. The U.S. EPA, FWS, and DFG agree.[530] The disagreement arises with the granting of a chronic mixing zone for cyanide and chlorpyrifos, where no other regulatory agency supports the Regional Board's decision. Based on concerns for the fishery, the FWS stated, "The Service recommends that compliance with water quality criteria be met at the 'end-of-the-pipe' and that no dilution or mixing be permitted."[531] The FWS objected to dilution credits for cyanide and chlorpyrifos because, ". . .concentrations of these chemicals have potential impacts on aquatic life. . . ."[532] The Water Agencies share these concerns.

The Regional Board's primary justification for the granting of chronic mixing zone is that, "The zone of passage is small but at this time there is no evidence that aquatic life would not avoid the effluent plume."[533] The problem with this statement is that there is little or no evidence that the fish would, or even could, avoid the plume. The Discharger did not carry its burden of

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[528] Letter from EPA to Regional Board, Re: Tentative Order/NPDES Permit for Sacramento Regional County Sanitation District, Sacramento regional Wastewater Treatment Plant, October 7, 2010, p.2.

[529] *Ibid.*

[530] Staff RTC, p. 118, Response to Water Agencies Comment #45.

[531] FWS Letter to Regional Board, Re: Comments on the September 3, 2010, Tentative Waste Discharge Requirements Renewal for the Sacramento Regional County Sanitation District, October 6, 2010, p.4.

[532] *Ibid.*

[533] Staff RTC, p. 118, Response to Water Agencies Comment #45.

proof. For example, the Discharger has provided no analysis of the ability of Delta smelt to avoid the toxic plume. As the FWS has explained, "Delta smelt are not strong swimmers", thereby indicating that Delta smelt may not be able to avoid the plume.[534] This is particularly true for the Delta smelt larvae and eggs, which the sampling data suggests are in the mixing zone.[535]

The Dischargers' evidence of successful fish passage is similarly weak for salmon and steelhead. As explained in the temperature section, partially undiluted effluent accumulates along the eastern bank of the river, even after the diffuser modification. Moreover, even if salmon and steelhead could swim away from the diffuser, the Discharger has not provided any evidence that these fish would be able to find the "small" zone of passage along the western bank of the river. In fact, the results from code wired tagging studies show that salmon do not swiftly move through the effluent plume, rather some salmon maintain a holding pattern during the daylight hours searching for cover along the banks of the river (Burau et al. 2007).[536] These same studies further indicate that this holding pattern likely occurs along the eastern bank of the river, where there does not appear to be a zone of passage.[537] With this extended exposure, chronic effects would be expected.

The Regional Board's other evidentiary basis is the Dischargers' dynamic modeling.[538] However, as the Regional Board acknowledged, the Bureau of Reclamation (Reclamation) explained that the Dischargers' model uses the outdated version of CALSIM and the outdated

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[534] Letter from FWS to Regional Board, Re: Recommendations on SRCSD State Thermal plan exception request, NPDES renewal, Sacramento Regional County Sanitation District, August 18, 2010, p. 4.

[535] *See* Temperature Section for discussion of results of FWS beach seine surveys.

[536] Burau, Jon, Blake, Aaron, and Perry, Russell, Sacramento/San Joaquin River Delta, Regional Salmon Outmigration Study Plan: Developing Understanding for Management and Restoration, December 10, 2007, pp. C.4 C.6; *see also*, Temperature Section for detailed discussion of the results of the tagging studies.

[537] *See* Temperature Section for results of Discharger's mixing zone dye studies; *see also* Tetra Tech, Inc., Final Memorandum to Regional Board, Re: Review of the SRCSD dynamic modeling study for the SRWTP, June 30, 2008, pp. 9-10.

[538] Staff RTC, p. 118, Response to Water Agencies Comment #45.

version of Reclamation's temperature model, which raise serious questions about the validity of the Dischargers' dynamic modeling.[539] Reclamation further explained that the period of record used by the Discharger is inappropriate as it ignores the hydrologic record from 1992 to present.[540] The result is that the Dischargers' hydrodynamic model fails to capture existing conditions in the river. For example, the operational changes contained in the Central Valley Project Improvement Act (CVPIA), which affected flows, temperatures, and water quality in the Sacramento River, is not reflected in the Dischargers' dynamic modeling.[541] The Dischargers modeling also excludes the severe drought of 1991-1992.[542]

With unresolved questions regarding the source of the Dischargers' ongoing problems with toxicity, and the listing of the Delta for "unknown toxicity," the Water Agencies are concerned that the allowance of a chronic mixing zone may be harmful to aquatic life in and around the diffuser. Further studies are therefore needed on an expedited basis to ensure that aquatic species in the mixing zone are not impaired by the elevated levels of cyanide and chlorpyrifos originating from the Treatment Plant.

XIII. THE EXCEPTION FROM THE THERMAL PLAN MAY NOT PROTECT AQUATIC SPECIES

The Regional Board has enough information to reject the Discharger's request for an exception from the Thermal Plan. Nevertheless, the Regional Board's decision was to: 1.) reject the Discharger's request for an expanded exception; 2.) renew the prior exception; and 3.) require studies of the effects of the thermal discharge to determine if the renewed exception is sufficiently protective.

For a decade, the federal agencies have been advising that the Discharger that it needs a plan for coming into compliance with the Thermal Plan. As the FWS observed, "[t]here has been

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[539] Staff RTC, p. 119, Response to Water Agencies' Comment #47.

[540] *Ibid*.

[541] *Ibid*.

[542] *Ibid.*

a tendency for the SRCSD to request incremental increases in Thermal Plan exceptions with each permit request for the SWRTP. . . . A long-term plan is needed to address how the facility will minimize future thermal discharges and adequately protect beneficial uses. . . ."[543] Consistent with this recommendation, the Discharger should be required to develop a plan and schedule for coming into compliance with the Thermal Plan. At the same time, the studies already mandated by the Regional Board should be fast tracked so measures to protect the beneficial fishery uses in the Sacramento River can be identified and implemented as soon as possible.

A. Evidence Suggests That Delta Smelt Are Already Being Impacted by the Discharger's Thermal Plume

Delta smelt are present at the diffuser. The Regional Board's permit findings include evidence that Delta smelt are exposed to the discharge:

> Delta smelt enter the Sacramento River and Deep Water Ship Channel year round and specifically from later December to June to spawn . . . Pre-spawning adults could be expected in the vicinity of the City of Sacramento from the latter part of December through June. Some Larvae could be expected in the vicinity of the City of Sacramento during February through June. During the larval stage delta smelt are at their most vulnerable to zones of poor water quality or high water temperature due to their small size and limited mobility.[544]

The Water Contractors provided the Regional Board with the FWS' monitoring data that supports these findings. The Water Contractors presented data showing that Delta smelt are regularly found upstream (Garcia Bend) and downstream (Clarksburg) of the Discharger's diffuser from December to June.[545] The Water Contractors' also provided the FWS' sampling information for 2010, indicating that Delta smelt where identified in the most recent surveys as well.[546] This suggests that Delta smelt pass through the discharge area multiple times and may

[543] Letter from FWS, to Central Valley Regional Water Quality Control Board, Re: Recommendations on SRCSD State Thermal plan exemption request, NPDES permit renewal, August 18, 2010, p. 3.

[544] Permit at p. F-82 - F-86, *see also* CSPA at pp. 73-76.

[545] See, Graphs 1 and 2, p. 25, Water Contractor's Comments on the Regional Board's Aquatic Life and Wildlife Preservation Issues Paper.

[546] *Id*., *see also* http://www.fws.gov/ stockton/jfmp/datamanagement.asp.

also reside for period of time in the near field mixing zone.

There is further evidence in the record that temperatures in the near field mixing zone are sufficiently high as to affect Delta smelt. As the Regional Board observed in its findings, the thermal thresholds for Delta smelt are well established:

> The Critical Thermal Maxima (CTM) is the temperature for a given species above which most individuals respond with unorganized locomotion and is considered to be the lethal temperature, for juvenile and adult delta smelt it is reported as 25.4°C (77.7°F). Delta smelt egg survival decreases at temperatures above 15-16°C (about 60°F) and is greatly reduced by 20°C (68°F).[547]

The FWS further explained that, "It should be noted that adverse temperature effects occur to Delta smelt . . . [at] temperatures lower than their respective CTMs."[548]

The Discharger's 2010 Thermal Plan Exception Justification provides data on water temperatures immediately upstream of the diffuser, at Freeport. It is evident from the Discharger's Figure 1, p. 10 that background water temperatures are often at or near temperatures where Delta smelt survival (particularly egg survival) is diminished.[549] Thompson and Baldridge (2010)[550] summarized the Discharger's Figure 1, below:

Table 2 Sacramento River Temperature at Freeport from January 1, 1993 to October 31, 2009

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Mean Temp (F)[1]	47.9	49.9	53.9	58	63	67.1	69.2	69.4	67.1	61.6	55	49
Max Temp (F)[1]	52.9	56	63	68	74	74.2	74.7	75	72.6	69.2	61.8	56

[1] Temperature data from RBI (2010) Figure 1, p. 10.

The Discharger's 2010 Thermal Plan Exception Justification, Table 5, p. 27,[551] indicates

[547] Permit at p. F-82 - F-86.

[548] Letter from United States Fish and Wildlife Service, August 18, 2010, p. 2.

[549] Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant, prepared for the Sacramento Regional County Sanitation District, prepared by Robertson-Bryan, Inc., July 2010, p. 10, Fig.1.

[550] Thompson, Rosie, and Baldrige, Jean, Review of the Sacramento Regional Wastewater Treatment Plant (SRWTP), Impact of Tentative Order and Thermal Plan Exception on Delta Smelt, October 6, 2010, p.6.

[551] Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant, prepared for Sacramento Regional County Sanitation District, prepared by Robertson-Bryan, Inc., July 2010, p.27.

that the temperature differential between the effluent and the background river temperatures at the 14:1 dilution ratio are 28ºF in January; 25ºF in February and March; 20ºF from April through September; 25ºF in September and 28ºF from November to December.[552] Throughout the day, particularly in drier seasons and in drier years, the Discharger's discharge will be controlled by the 14:1 dilution ratio. It wetter years, at an assumed 46:1 dilution ratio, the Discharger predicts its temperature differentials are less than those reported above, being between 12.9ºF and 20.7ºF.[553]

The permit prohibits the discharge from creating more than a 4ºF rise in surface water temperatures at any place or time.[554] The permit also prohibits the creation of a zone that exceeds 25% of the cross section of the river that is 2ºF warmer than receiving water temperatures, when river temperatures are less than 65ºF.[555] It is evident based on the receiving water temperatures identified above that a 2ºF to 4ºF increase in water temperatures could affect Delta smelt.[556] These temperature increases already occur in the river downstream of the Discharger's diffuser. In fact, the Discharger is already having difficulty maintaining temperatures below the 2ºF

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[552] The Discharger's predicted temperature differentials in November and December violates Objective 5.A.(1)a of its exception, which raises questions about the Regional Board finding that the Sanitation District is currently able to comply.

[553] Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant, prepared for Sacramento Regional County Sanitation District, prepared by Robertson-Bryan, Inc., July 2010, p. 27.

[554] Central Valley Regional Water Quality Control Board, Central Valley Region, Order No. R-5-2010, NPDES No. CA0077682, Waste Discharge Requirements for the Sacramento Regional County Sanitation District, Sacramento Regional Wastewater Treatment Plant, Sacramento County, p. F-84.

[555] *Ibid*.

[556] The Permit's exception to the Thermal Plan imposes limits on thermal increases only, "outside the zone of initial dilution." (Thermal Plan Exception Justification, 2010,p. 3.) The EPA objected, stating, ". . .the receiving water limits in the new permit appear to allow for a temperature mixing zone. The exception, as quoted in the fact sheet, does not include any reference to a zone of initial dilution (mixing zone). As we were unable to identify a mixing zone provision in the Thermal Plan, it appears that allowance of a temperature mixing zone, in addition to the exceptions, conflicts with Thermal Plan requirements. The Regional Board should clarify how a temperature mixing zone is consistent with the Thermal Plan." (Letter from EPA, To Regional Board, Re Tentative Order/Draft NPDES Permit for Sacramento Regional County Sanitation District, p. 5.)

threshold, which is what promoted the Discharger's request for a more lenient Thermal Plan exception.[557]

The Discharger modeled the thermal mixing of its effluent plume. However, the Discharger's FLOWMOD model, which is used to estimate dilution and transport of the effluent in the near-field mixing zone, is unable to accurately predict mixing in the near field mixing zone. The Final Tetra Tech review of FLOWMOD states:

> Some phenomena were observed in the field that were not reproduced in the model, most notably a region of high dye concentration near the eastern river bank just downstream from the diffuser in the October 2005 dye release. The subsequent November 2006 dye release was conducted in an effort to further resolve this observed behavior, however the model failed in all cases to reproduce this high concentration region.[558]

The Discharger ultimately closed 25 ports on its diffuser in an attempt to direct effluent away from shore, but as illustrated below, the subsequent dye studies indicate that effluent continues to flow toward the eastern bank even though the model cannot reproduce it.

[557] The Discharger's diffuser modification makes it more difficult for it to comply with its existing exception from the Thermal Plan. (SRCSD. 2007. Analysis of water quality effects of modified diffuser scenarios, SRWTP, July 2007, p. 8.) This is not a new problem, however. The Discharger has had an increasingly difficult time meeting its Thermal Plan exception as the volume of its discharge has increased. (Letter from James R. Bybee (NMFS) to Mark Gowdy (CVRWQCB), February 18, 2000.)

[558] Final Memorandum, from Tetra Tech, to Central Valley Regional Water Quality Control Board, Re: Review of the Sacramento Regional County Sanitation District's dynamic Modeling Study for the Sacramento Regional Wastewater Treatment Plant, June 30, 2008, pp. 9-10.

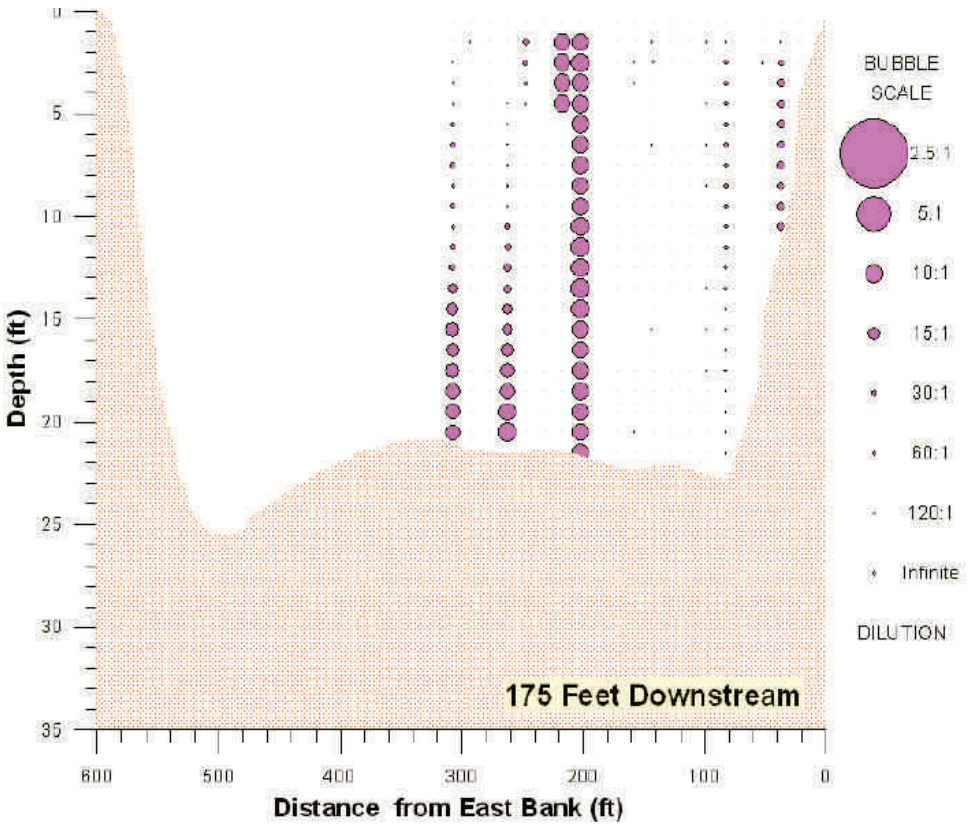

Figure 3. (November 2007 Data Report, Effluent Discharge Dilution and Velocity Profiling Field Study in the Sacramento River (Prepared for Flow Sciences, Inc.), by Brown and Caldwell, 2008, p. A-25.)

This is important as it suggests there isn't a zone of passage on the eastern bank of the river. Delta smelt would have to travel all the way to the western bank of the river to avoid the thermal plume. However, juvenile and adult Delta smelt are poor swimmers with a maximum swimming speed of approximately 28 centimeters/second (cm/sec) (0.9 feet/second) and swim in short bursts followed by a glide (rest period) at swim speeds below 10 cm/sec.[559] With such weak swimming abilities, individuals that come in contact with lethal temperatures may not be able to move away to cooler waters.

Unfortunately, the Regional Board has weak support for its conclusion that Delta smelt

[559] Thompson, Rosie and Baldridge, Jean, Review of the Sacramento Regional Wastewater Treatment Plant (SRWTP) Impact of Tentative Order and Thermal Exception on Delta Smelt, October 6, 2010, p. 5, *citing*, Swanson, C., P.S. Young, and J.J. Cech, Jr. 1998. Swimming Performance of Delta Smelt: Maximum Performance, and Behavioral and Kinematic Limitations on Swimming at Submaximal Velocities. J. Experimental Biology 201: 333-345.

will be adequately protected under the Discharger's renewed exception from the Thermal Plan. The Discharger did not evaluate the effect of its thermal discharge on Delta smelt in its 2010 Thermal Plan Exception Justification, rather focusing exclusively on salmon. The FWS advised that, ". . . the District's Thermal Plan Justification did not adequately address Delta Smelt."[560] The Discharger's prior Thermal Plan Exception Justification (2005) also failed to evaluate the thermal effect of the discharge on Delta smelt.[561]

The only evidence relied on by the Regional Board to support renewing the Discharger's Thermal Plan exception were communications with the FWS, an agency that expressed its own serious reservations about the continuation of the Thermal Plan exception. The FWS advised that, "The Service has concerns regarding fish and wildlife considerations in development of the draft . . . ("NPDES") permit . . .," and, "Fish passing through the discharge plume face reduced dissolved oxygen concentration, increased thermal stress and exposure to ammonia and copper. . . ."[562] The FWS ultimately agreed to the renewal of the Discharger's prior Thermal Plan exception, provided extensive studies were undertaken.[563] However, this acquiescence should not be interpreted as the FWS being satisfied that Delta smelt in the Sacramento River would be protected in the interim, as just the opposite is true. The FWS concluded that:

> The type of information needed to evaluate the effects of the proposed thermal exception on delta smelt is not present in the analysis, nor is any information about smelt behavior or its susceptibility to such conditions available on the existing body of

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[560] Regional Board Staff Response to Comments – Proposed NPDES Permit Renewal and TSO, Sacramento Regional County Sanitation District, Sacramento County, p. 69, Response to Question #63.

[561] Thermal Plan Exception Justification for the Sacramento Regional Wastewater Treatment Plant, prepared for Sacramento Regional County Sanitation District, prepared by Robertson-Bryan, 2005.

[562] FWS Comments on the NPDES Permit Renewal Issues: Aquatic Life and Wildlife Preservation, Sacramento Regional County Sanitation District, Sacramento Regional Wastewater Treatment Plant, June 15, 2010.

[563] Letter from the FWS to Regional Board, Re: Recommendations on SRCSD State Thermal plan exception request, NPDES permit renewal, Sacramento Regional County Sanitation District, Sacramento Regional Wastewater Treatment Plant, August 18, 2010, p. 4.

science.[564]

More specifically, the FWS' unresolved concerns include:

> 1) There has not been an analysis linking the synergistic effects of multiple pollutants, like chemical and thermal contamination, on aquatic organisms in the Sacramento River . . .
>
> 2) Thermal discharges have the potential to create winter thermal refugia for fish species that do better in warmer temperatures, specifically non-native predators…The anecdotal knowledge of the area around the outfall as a spot for good fishing reinforces the concern. Whether or not predators aggregate in the zone of elevated water temperature needs to be evaluated.
>
> 3) The assumption that near-field conditions provide adequate passage for delta smelt is not fully supported by Sacramento River-specific information. Our uncertainty about the thermal discharge is included with concerns about the effects of the discharge field and mixing zone overall…Site-specific information about the behavior of delta smelt and other fishes is needed to ensure that current and future thermal conditions are protective.[565]

The Regional Board has weak support for its decision to renew the Discharger's Thermal Plan exception. The Discharger must be held to a rigorous schedule of scientific investigation to ensure that Delta smelt are protected.

B. Evidence Suggests That Chinook Salmon Are Already Being Impacted by the Discharger's Thermal Plume

The Water Contractors provided evidence of the thermal tolerances of Chinook salmon. Cramer (2010) explained that the optimum range for growth of juvenile Chinook salmon is from 10°-16°C.[566] They begin to die from heat exposure at temperatures near 24°C.[567] While temperatures above 24°C are directly lethal, temperatures above 18°C accelerate other causes of

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

[565] *Id*. at pp. 3-4.

[566] Impact of Sacramento Regional Wastewater Treatment Plant Effluent Discharges on Salmonids, Technical Review Report, Cramer Fish Sciences, September 2010, p. 5.

[567] *Ibid*., *citing*, Baker, P.F., T.P. Speed., and F.K. Ligon. 1995. Estimating the influence of temperature on the survival of Chinook salmon smolts (*Oncorhynchus tshawytscha*) migrating through the Sacramento – San Joaquin River Delta of California. Can. J. Fish. Aquat. Sci. 52: 855-863.

mortality. A variety of studies indicate that, in a natural stream setting with competitors, predators and diseases, survival begins to decline as temperatures rise above 18°C.[568] As explained above, water temperatures upstream of the treatment plant are already close to these thresholds in some years. A 2ºF to 4°F Discharger induced increase in water temperatures could cause sublethal or lethal effects.

As explained by Cramer (2010), p. 8, the longer the exposure to elevated temperatures, the more likely it is that Chinook salmon will be adversely affected.[569] Cramer (2010) further reported that a minimum exposure time is required before fish exhibit adverse effects from thermal stress.[570] An exposure duration of approximately 30 minutes is required at 26° C (78.8°F), which is well within the range of both the expected temperature on the margins of the thermal plume associated with the effluent and the expected time of exposure (Cramer, 2010).[571]

Some Chinook salmon passing the diffuser would be exposed to the thermal plume for as long as 8 to 10 hours. The results of radio tagging studies in the Sacramento River immediately downstream of the diffuser, at Clarksburg, show that salmon have a definite migration pattern. Burau et al. (2007) observed that salmon move primarily at night; and during the day, salmon move to the sides of the river seeking cover.[572] They stated that:

> . . . even within a population with large variance in the over-all length of daytime holding period, there are predictable periods

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[568] *Ibid*., *citing*, Baker, P.F. and J.E. Morhardt. 2001. Survival of chinook salmon smolts in the Sacramento-San Joaquin Delta and Pacific Ocean. Contributions to the Biology of Central Valley Salmonids. Fish Bulletin 179(2): 163-182; Newman, K. B. 2003. Modeling paired release–recovery data in the presence of survival and capture heterogeneity with application to marked juvenile salmon. Statistical Modeling 3:157–177.

[569] Impact of Sacramento Regional Wastewater Treatment Plant Effluent Discharges on Salmonids, Technical Review Report, Cramer Fish Sciences, September 2010, p. 8.

[570] *Ibid*., *citing*, Coutant, C.C. 1973. Effect of thermal shock on vulnerability of juvenile salmonids to predation. J. Fish. Res. Bd. Canada. 30: 765-973, pp. 969-970.

[571] *Ibid*.

[572] Burau, Jon, Blake, Aaron, and Perry, Russell, Sacramento/ San Joaquin River Delta, Regional Salmon Outmigration Study Plan: Developing Understanding for Management and Restoration, December 10, 2007, pp. C.4 – C.6.

> when the vast majority of the population holds."[573]

And:

> If fish move into areas with either physical structures or velocity structures that facilitated holding they appear to stay in these areas for extended periods of time, often for the duration of their holding period [references omitted]. If holding fish do not encounter significant structure, they often continue to move about the edges of the river until holding behavior ends [references omitted].[574]

The location of the holding period is also dictated by the curvature of the river. Burau et al (2007) further concluded that:

> The overall distribution of fish shows a clear bias in fish distribution towards the outside of the bend . . . disaggregating this distribution into day and night periods reveals a very distinct difference between the spatial distribution of fish during the day and night. From this data it is very clear that fish are moving down the outside of the bend during dark and crepuscular periods, and holding in low velocity, near-bank areas on the inside of the bend during the day.[575]

Applying these principles, Chinook salmon would be located on the outside bend, along the west side, of the river immediately upstream of the Discharger and then holding for an extended period of time on the inside, or eastern side, of the bend in river near the diffuser for prolonged periods during the day.

This research strongly suggests that the most likely location of salmon in the mixing zone during the daylight hours is along the eastern bank of the Sacramento River. The eastern bank of the river near the diffuser is where the partially undiluted effluent was identified in 2006. As shown above, even after the resulting diffuser modifications, effluent would be expected at elevated concentrations along the eastern bank of the river.[576]

This prolonged exposure to the thermal plume would be expected to affect the overall

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[573] *Id.* at p. C.5.

[574] *Id.* at p. C.6.

[575] *Id*. at p. C.5.

[576] November 2007 Data Report, Effluent Discharge Dilution and Velocity Profiling Field Study in the Sacramento River (Prepared for Flow Sciences, Inc.), by Brown and Caldwell, 2008, p. A-25.

health of a salmon. Cramer (2010) stated that Chinook salmon:

> . . . that are exposed to the thermal plume for sufficient duration may experience significant consequences to their overall health. These may include advanced ageing and skin deterioration, elevated levels of heat shock proteins, hypercortisolemia, and acute thermal shock (Quigley and Hinch 2006, p.429). In addition, the stress response evident from elevated levels of cortisol (i.e. hypercotisolemia) can be delayed by 30 minutes or longer (Donaldson et al. 1984), leaving the fish vulnerable to predation even after they have left the immediate vicinity of the thermal plume. Thus, exposure to the thermal plume would be expected to reduce the probability of survival for some of the juvenile salmonids migrating past the SRWTP diffuser.[577]

Based on the above, there is little evidence to support the finding that Chinook salmon would move away from the Discharger's discharge plume. The more compelling evidence, which is based on actual radio tagging studies in the river immediately downstream from the Treatment Plant, is that some Chinook salmon are exposed for many hours to the Discharger's partially diluted discharge plume.

NMFS is in agreement with the FWS that the Discharger must complete additional studies of the effect of the Discharger's discharge on salmon in the near field mixing zone.[578] More specifically, NMFS shared the FWS concern about the fact the discharge appears to be attracting fish, including predators of Chinook salmon, to the area.[579] These studies must be completed quickly so measures to protect Chinook salmon may be adopted as soon as possible. The Discharger must also develop a plan for coming into compliance with the Thermal Plan.

XIV. ANTIDEGRADATION POLICY REQUIRES NUTRIENT REMOVAL AND TERTIARY FILTRATION

The Discharger asked the Regional Board to issue a NPDES Permit allowing it to increase its discharge of secondarily treated sewage from approximately 141 mgd to 181 mgd, a 28% increase. As a result, the Discharger's preferred Permit would also have increased its discharge

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[577] Impact of Sacramento Regional Wastewater Treatment Plant Effluent Discharges on Salmonids, Technical Review Report, Cramer Fish Sciences, September 2010, p. 8.

[578] Letter from National Marine Fisheries Service to Regional Board, September 9, 2010.

[579] *Ibid.*

of a number of pollutants, including total ammonia nitrogen (already at 14 tons per day), waste pathogens, and toxins into the Sacramento River and Delta—critical habitat for listed fish species and the largest single source of fresh water supply in all California.[580] Before the Regional Board can issue, reissue, amend, or revise a water quality permit in this manner, however, federal and state Antidegradation Policy require it to determine whether any water quality degradation that will result is permissible when balanced against the benefit to the public from issuing the permit.

The Regional Board properly determined that Antidegradation Policy applied to the Discharger's Permit request, competently performed the analysis, and determined that such degradation to the Sacramento River and Delta were not warranted. Accordingly, it issued the Discharger a Permit with discharge limits requiring nutrient removal, tertiary filtration, and disinfection as Best Practicable Treatment or Control (BPTC) to assure that neither pollution nor nuisance will occur and to maintain the highest water quality consistent with maximum benefit to the people of the state.[581]

The Discharger contends its 28% discharge increase is exempt from the application of Antidegradation Policy or, alternatively, that the Regional Board erred in its antidegradation analysis.[582] On these points, the Discharger is wrong. Key points supporting that an antidegradation analysis was warranted and properly performed include:

- *A 28% increase in wastewater discharge is significant, and antidegradation analysis is clearly warranted because this large increase is likely to further degrade the Delta*. Increasing the Treatment Plant's discharge from approximately 141 mgd to 181 mgd will cause a large influx of new waste to the Delta. This new waste, if not properly treated, will in turn cause a huge increase in the amount of pollutants in the Delta. It is

[580] Permit at F-93.

[581] 63 Fed. Reg. 36741 *et seq.* [July 7, 1998]; Permit at F-93 to F-99 [citing SWRCB Res. No. 68-16].

[582] *See* Petition at 133:1 ["Renewal of the District's Permit Did not Trigger State or Federal Antidegradation Review"]; 134:8-11 ["the requirement of an antidgradation analysis under the state and federal antidegradation policies has not been triggered"]; 141:9-10 ["assuming the antidegradation policies apply, there are additional reasons they were misapplied here"].

plain that an increase of this magnitude has the potential to degrade water quality, and thus, triggers the need for an antidegradation analysis.

- *The Discharger's solution to address increased pollutants released into the Delta is partial nitrification, but this too triggers the need for an antidegradation analysis*. The Discharger proposes to avoid the need for an antidegradation analysis by turning one waste into another, as partial nitrification will create a discharge that contains nitrate instead of total ammonia nitrogen. Even if this were a viable plan for the Delta, which it is not, the Discharger cannot use this to avoid an antidegradation analysis. Antidegradation is triggered for the discharge of nitrate because there has never been an antidegradation analysis performed for nitrate associated with the Treatment Plant.
- *An antidegradation analysis is needed for the Permit because a full antidegradation analysis has never been completed*. The Discharger has had six previous NPDES permits.[583] The first three permits did not mention antidegradation, while the three most recent permits make only passing reference to antidegradation. The Discharger argues this brief treatment of antidegradation in its prior permits eliminates any current need for an antidegradation analysis. To the contrary, in no way can a four sentence reference to antidegradation be considered a proper antidegradation analysis. In fact, the Regional Board has never previously performed an antidegradation analysis for the Treatment Plant, making it a necessity during this permit proceeding.
- *There is a wealth of new information and science available since the last permitting cycle, making antidegradation analysis appropriate at this time*. Because the Delta is the state's most important water resource, and one of the most important water resources in the nation, it is also one of the most studied water resources. As discussed throughout this brief and as demonstrated in the record, since the last permit

[583] *See* Regional Board Order No. 77-137; Regional Board Order No. 84-077; Regional Board Order 85-245; Regional Board Order No. 90-285, ¶ 17 at 3; Regional Board Order 94-006, ¶ 21 at 4; Regional Board Order No. 5-00-188, ¶ 34 at 11. To the extent a request is necessary, the Water Agencies request that the State Board take official notice of the orders of the State Board and Regional Board cited herein, in accordance with 23 Cal. Code. Regs. section 648.2.

proceeding for the Treatment Plant, a wealth of scientific research has formed a new understanding of what degradation in the Delta means. Because of this new understanding, even if there had been a prior antidegradation analysis, which there was not, performance of a new antidegradation analysis would be appropriate and necessary in this permit proceeding.

- *Because the treatment required by the permit has not undergone a CEQA analysis, a complete antidegradation analysis is required*. State Board guidance indicates that where a complete environmental review has been performed under CEQA, a simple antidegradation analysis may be appropriate. No CEQA analysis has been performed to evaluate the Discharger's proposed 28% increase in wastewater discharge (from approximately 141 mgd to 181 mgd), so a simple antidegradation analysis is inappropriate. Furthermore, the Discharger's 2020 Master Plan EIR was found to be deficient by a Sacramento Superior Court Judge in 2007, and remains on appeal.
- *The subject discharge is into a high quality water, and this is a strong indicator that antidegradation analysis is required*. The Delta, as a vital resources for fish propagation, recreation, agricultural water supply, and municipal water supply, is a high quality water. Before degradation of a high quality water is allowed, certain findings must be made as part of an antidegradation analysis. This is yet another reason that an antidegradation analysis is required.

For the reasons stated above, the Regional Board recognized that an antidegradation analysis was required for this permit proceeding, and ably completed that analysis. Furthermore, the Regional Board's antidegradation analysis properly concluded that the treatment required in the Permit constitutes "best practicable treatment or control" and is affordable.

A. The Applicable Antidegradation Policy Stems From State Law Which Implements Federal Antidegradation Policy

1. Federal Antidegradation Policy

Federal regulations require that states develop and adopt antidegradation policies that

meet minimum requirements set out in the regulations.[584] For all waterbodies, a state's implementation plan shall, at a minimum, protect existing uses in the waterbody.[585] For "high quality" waters where the quality exceeds that necessary to support the propagation of fish, shellfish, and wildlife, and recreation in or out of the water,[586] the state Antidegradation Policy shall prevent degradation of that water quality, except where lowering water quality is necessary to foster economic development in the area.[587] Finally, for "outstanding national resources waters," the regulations prohibit any new or increased discharges that would lower the quality of the waterbody.[588] Further guidance regarding these regulations aids to interpret them and helps to guide development and implementation of state policies like California's.[589]

2. State Antidegradation Policies

California's Antidegradation Policy is best summarized by a 1990 Administrative Procedures Update ("APU") from the State Board, which was meant to "provide guidance for the Regional Boards for implementing State Board Resolution No. 68-16 . . . and the Federal Antidegradation Policy, as set forth in 40 C.F.R. § 131.12."[590] As such, the APU is designed to help the Regional Boards implement both federal policy (40 C.F.R. § 131.12) and the State Board's Antidegradation Policy (Resolution No. 68-16).

For high quality waters, Resolution 68-16 mandates that the water quality must be

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[584] 40 C.F.R. § 131.12(a).

[585] 40 C.F.R. § 131.12(a)(1).

[586] U.S. EPA *Water Quality Standards Handbook: Second Edition* (*Water Quality Handbook*), at § 4.5. (The *Water Quality Handbook* was originally published in 1994, but certain provisions, including Chapter 4, were updated in July, 2007. The original version is available in .pdf form, and the updated versions are available in .html form, at http://www.epa.gov/waterscience/standards/handbook/. This Response refers to the updated version.)

[587] 40 C.F.R. § 131.12(a)(2).

[588] 40 C.F.R. § 131.12(a)(3).

[589] *See Water Quality Handbook*, Chapter 4.

[590] *Administrative Procedure Update* 90-04, (July 1, 1990) ("APU 90-04"), at p. 1.

maintained—unless the Discharger can prove that lowering the water quality: (1) will provide "maximum benefit" to the state; (2) will not impair present or anticipated beneficial uses of the receiving water; and (3) will not violated water quality objectives. [591] Additionally, discharges which increase the volume or concentration of waste in high quality waters must comply with discharge limits based on the "best practicable treatment or control," which ensures that no pollution or nuisance will occur and that the highest water quality will be maintained. [592]

The APU implements this policy and instructs Regional Boards on: (1) when an antidegradation analysis is required; (2) whether a "simple" or "complete" analysis is required; and (3) the procedure for performing a complete antidegradation analysis. The APU also instructs Regional Boards as to which factors are to be considered at each step in the analysis and decision-making process.

In the instant case, the Regional Board followed the instructions of the APU, properly determined a complete antidegradation analysis was warranted, performed that analysis to determine the level of protection needed in the Permit, and appropriately set those limits in the Permit.

B. The Regional Board's Consideration Of The State's Antidegradation Policy In The Permit Proceedings Was Necessary

Regional Boards must apply the state's Antidegradation Policy "when issuing, reissuing, amending, or revising an NPDES permit."[593] An Antidegradation Policy compliance finding may be avoided only in two instances: (1) when the discharge is prohibited by law; or (2) where there is "no reason to believe that existing water quality will be reduced due to the proposed action." [594] A discharge which is illegal does not require an antidegradation analysis because no discharge would be allowed. [595]

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[591] SWRCB Reso. No. 68-16.

[592] *Id.*

[593] APU 90-04 at p. 1.

[594] *Id*. at p. 2.

[595] *Id*.

The record contains ample evidence that the quality of the River and Delta would be significantly reduced by the discharge contemplated by the Discharger's requested permit, as demonstrated by prior discussion of the impacts caused by the Discharger's waste. Considering all of these impacts, the Regional Board could not reasonably conclude that there is "no reason to believe that existing water quality will be reduced due to the proposed action." Therefore, application of the state's Antidegradation Policy applies to this Permit.

C. The Regional Board Properly Determined That A Complete Antidegradation Analysis Is Required For The Permit

1. None Of The Circumstances Which Allow For A "Simple" Antidegradation Analysis Are Present Here

A Regional Board must determine what level of antidegradation analysis is appropriate: the "simple" analysis, or the "complete" analysis.[596] A "simple" analysis is only appropriate if: (1) reduction of water quality will be spatially localized; (2) reduction of water quality will be temporally limited; (3) the action will only result in minor effects; or (4) the action was "adequately subjected to the environmental and economic analyses in an environmental impact report (EIR) required under the California Environmental Quality Act (CEQA)."[597]

Here, as discussed elsewhere in this brief, the effects of the Treatment Plant's discharge and the commensurate reduction of water quality will be neither spatially nor temporally limited. Also, the effects associated with the discharge, including changes to the food web of the critical habitat of endangered species and the stimulation of nuisance growth, are significant effects. Finally, this action has not undergone a CEQA analysis. To the contrary, in 2007 the Discharger's 2020 Master Plan EIR was found deficient by a Sacramento Superior Court Judge.[598] Accordingly, because none of the circumstances that would allow the Regional Board

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[596] *Id.*

[597] *Id.*

[598] *Contra Costa Water District v. Sacramento Regional County Sanitation District, et al*., Sacramento Superior Court Case No. 05CS00909, Judgment (February 5, 2008). The Discharger has appealed this decision, and the case remains pending on appeal. *Contra Costa WaterDistrict v. Sacramento Regional County Sanitation District*, Third District Court of Appeal Case No. C058460 (filed March 19, 2008).

to conduct a "simple" analysis were present here, the Regional Board properly conducted a "complete" antidegradation analysis.

2. Several Circumstances Which Explicitly Require A "Complete" Antidegradation Analysis Are Present Here

A Regional Board must conduct a complete antidegradation analysis when a proposed discharge would cause either: (1) a substantial increase in mass emissions of a pollutant, even if the receiving waters are not polluted by the discharge; or (2) mortality or reproductive effects to resident species.[599] A complete analysis must also be conducted when the terms of a reissued or modified permit would allow a significant increase in the amount of pollutants discharged.[600]

The record contains ample evidence that demonstrates that the discharge already causes mortality, significant nuisance growth, and reproductive impairment of resident species. Allowing the discharge to increase to 181 mgd would significantly increase mass emissions and loadings, and would result in further harm to resident species. Because several of the circumstances that require a complete analysis were present here, a complete antidegradation analysis was required for the Permit.

D. The Regional Board Followed The Correct Procedure For A Complete Antidegradation Analysis And Made The Proper Findings

The APU specifies a procedure for Regional Boards to follow when conducting a complete antidegradation analysis. This procedure includes: (1) a determination of the baseline; (2) a balancing of the proposed action against the public interest; and (3) a consideration of factors relevant to the balancing of the proposed action against the public interest. The Regional Board went through each of these steps correctly, and as such, the Regional Board complied with the required procedure for a complete antidegradation analysis.

1. The Regional Board Considered The Appropriate Baseline

"The baseline quality of the receiving water determines the level of water quality

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[599] APU 90-004 at p. 3.

[600] *Id.*

protection."[601] Setting the proper baseline is important because, "[r]epeated or multiple small changes in water quality can result in significant water quality degradation. To prevent such cumulative adverse impacts, a baseline of water quality must be established for each potentially affected water body."[602] The Discharger has long sought to evade an antidegradation analysis by gradually increasing its discharge and presenting the increments as individually insignificant—even though the cumulative impact of its discharge on receiving water quality and beneficial use is significant and adverse. Now that its discharge is subject to an antidegradation analysis, the Discharger contends that the appropriate baseline is the maximum discharge allowed under its last Permit (181 mgd)—even though the Discharger has never actually discharged at anywhere near that maximum level.[603] The Discharger's baseline argument is wrong.

The state's Antidegradation Policy sets out the proper method for determining the baseline:

> Baseline quality is defined as the best quality of the receiving water that has existed since 1968 when considering Resolution No. 68-16, or since 1975 under the federal policy, *unless subsequent lowering was due to regulatory action consistent with State and federal antidegradation policies*. If poorer water quality was permitted, the most recent water quality resulting from permitted action is the baseline water quality to be considered in any antidegradation analysis.[604]

Here, while the Discharger has subsequently lowered the water quality of the Delta, that lowering was not "due to regulatory action consistent with State and federal antidegradation policies" because no antidegradation analysis has ever been conducted for the Treatment Plant. None of the Discharger's first three permits (issued in 1977,[605] 1984,[606] and 1985[607]) mention

[601] *Id.* at p. 4.

[602] *Id*. at p. 6.

[603] Petition at 135-136.

[604] APU 90-04 at p.4 (emphasis added).

[605] Regional Board Order No. 77-137.

[606] Regional Board Order No. 84-077.

[607] Regional Board Order No. 85-245.

State or federal Antidegradation Policy. The Discharger's fourth through sixth permits (issued in 1990[608], 1994[609], and 2000[610]) all contained only four sentences on the Antidegradation Policy. At no time was an actual antidegradation analysis conducted. Likewise, the subsequent lowering of the Delta's water quality by the Discharger is of no moment when considering the applicable baseline. That the lowering of water quality caused by the Discharger was not consistent with State and federal antidegradation policies leads to the appropriate baseline being set at either the conditions present in 1968 or 1975, depending on whether state or federal Antidegradation Policy is considered. The Discharger has degraded the quality of the Delta using either baseline, ever since it started operation in 1983, and this degradation is readily apparent in total ammonia nitrogen concentration data collected over time in the Sacramento River, near the confluence with the San Joaquin River, downstream from the Treatment Plant.[611] Additional data in the record demonstrate that the Discharger has also caused consistent degradation through its discharge of other pollutants, including waste pathogens.[612]

Furthermore, even assuming that the poorer water quality was "permitted" does not support the Discharger's argument to use 181 mgd as the baseline. Under APU 90-04, "if poorer water quality was permitted, the most recent water quality resulting from permitted action is the baseline water quality to be considered in any antidegradation analysis."[613] Accordingly, the baseline would be the Discharger's approximately 141 mgd discharge, not the 181 mgd limit in its prior permit.[614]

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[608] Regional Board Order No. 90-285, ¶ 17 at 3.

[609] Regional Board Order No. 94-006, ¶ 21 at 4.

[610] Regional Board Order No. 5-00-188, ¶ 34 at 11.

[611] *See* Water Agencies' Comments on Tentative Permit at pp. 75-76 (showing ammonium concentrations in lower Sacramento River before and after start of Treatment Plant discharge).

[612] *Id*.

[613] APU 90-04 at p.4.

[614] Notably, this statement from APU 90-04 comports with CEQA, which does not permit the use of a permit upper limit to be used as the baseline if actual discharge is lower than that maximum permitted level. *See Comm. For A Better Environment v. South Coast Air Quality Mgt. Dist.*

Finally, the Discharger's baseline argument contradicts fundamental principles of water quality law. It is well-established that a discharger has no vested right to discharge waste.[615] Yet the Discharger's argument that the proper baseline is its maximum permitted discharge suggests just that. Waste transport and assimilation are not beneficial uses of the Sacramento River and Delta,[616] but suggesting that the baseline for consideration of the discharge is the maximum permitted amount puts this discharge above beneficial uses in the pecking order of beneficial use of the River. Applying the state's Antidegradation Policy here is essential to achieving the federal Clean Water Act's objectives "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters," and to eliminate "the discharge of pollutants into the navigable waters."[617]

2. The Regional Board Properly Balanced The Permit Against The Public Interest

Once a baseline is established, the final step in a complete antidegradation analysis is to balance the proposed action against the public interest to ensure that any degradation to a high quality water is warranted by achieving the maximum public benefit to the people of California.[618] The Regional Board cannot permit the action unless all of the following conditions are met:

- The proposed action is necessary to accommodate important economic or social development in the area;
- The reduction in water quality is consistent with maximum public benefit;
- Neither actual nor potential beneficial uses will be unreasonably affected; and
- Water quality will not fall below the water quality objectives in the Basin Plan.[619] |

(2010) 48 Cal. 4th 310, 320-321.

[615] Water Code § 13263(g).

[616] 40 C.F.R. § 131.10(a).

[617] 33 U.S.C. § 1251(a)(1).

[618] APU at 4.

[619] APU at 4.

State Antidegradation Policy also provides factors to consider when determining whether the discharge is necessary to accommodate social or economic development and is consistent with the public benefit. These factors include:

- The past, present, and probable beneficial uses;
- The economic and social costs;
- The environmental aspects of the proposed discharge; and
- Whether feasible alternative control measures can be implemented which might eliminate the negative impacts of the proposed action.

Here, the record demonstrates that the Regional Board adequately considered all of the required conditions and factors, and made the appropriate determination that the discharge would be allowed, but only with the implementation of "best practicable treatment or control."

E. State Antidegradation Policy Requires The Discharger To Maintain And Improve Receiving Water Quality Through Best Practicable Treatment Or Control

State Antidegradation Policy requires that any activity that produces and discharges waste into high quality waters must meet waste discharge requirements that will result in the best practicable treatment or control (BPTC).[620] In identifying BPTC, the Regional Board must assure that: (a) a pollution or nuisance will not occur, and (b) the highest water quality consistent with maximum benefit will be maintained.[621] The current quality of receiving waters in the Delta falls below water quality objectives in the Regional Board's Basin Plan. The Discharger's new Permit must therefore prescribe effluent limits that will maintain or *improve* receiving water quality to a level that achieves all applicable numeric and narrative objectives as explained below.

The Regional Board properly determined that BPTC for the Discharger required nutrient removal and tertiary filtration for all discharges. In response, the Discharger complains that state Antidegradation Policy cannot require improvement to the existing quality of receiving waters. This is directly contradictory to well-established state policy:

[620] SWRCB Reso. No. 68-16.

[621] *Id*.

> If baseline water quality is equal to or less than the quality as defined by the water quality objective, *water quality shall be* maintained or *improved* to a level that achieves the objectives. Baseline water quality should be compared to all numerical and narrative objectives that protect the actual and potential beneficial uses which would be affected by the proposed discharge. . . .[622]

The record shows that the Treatment Plant, which was not brought on line until 1983, contributes up to 90 percent of the total ammonia nitrogen that makes its way into the Delta.[623] This discharge has contributed to the deterioration of water quality in the Delta and impairs beneficial uses, even at current levels. This deterioration has resulted in the Delta failing to meet water quality standards in the Basin Plan, and therefore, the Regional Board properly set Permit limits to help improve water quality and help remedy the water quality objective violations that the Discharger helped to create.

1. Nitrification/Denitrification And Tertiary Filtration Are Best Practicable Treatment Or Control

The Regional Board properly determined that total ammonia nitrogen removal is BPTC necessary to prevent significant impairment of aquatic life beneficial uses, including acute and chronic toxicity, depletion of dissolved oxygen, production of harmful nitrosamines, and detrimental impacts to the Delta food web.[624] Ample record evidence shows that the Treatment Plant's total ammonia nitrogen discharge is significantly degrading aquatic life beneficial uses due to changes in the nutrient balance, which have adversely affected the entire aquatic food web of the Delta, resulting in conditions more favorable to non-native and invasive species and less favorable to native species, particularly the threatened Delta smelt.[625]

The Regional Board properly determined that denitrification is BPTC necessary to remove nitrate produced by the treatment processes. If the Regional Board had only required removal of

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[622] APU 90-004 at p. 4 (emphasis added).

[623] Jassby, 2008, *supra*.

[624] Permit at p. F-95.

[625] The Water Agencies submit that the food web impacts from the discharge of ammonium alone justify total ammonia nitrogen removal as necessary and BPTC, and this water quality impact should be specifically listed among the factors shown on pages F-94 and F-96.

total ammonia nitrogen through nitrification, it would have significantly increased nitrate loading in the Treatment Plant's discharge, causing a significant increase in the concentration and mass emission of nitrate. The Discharger concedes that its "current discharge utilizes zero percent of assimilative capacity for nitrate."[626] The state's Antidegradation Policy prohibits the sudden and very significant discharge of nitrate into the Sacramento River and Delta, and denitrification appropriately alleviates this problem.

The record demonstrates that total nitrogen removal, including total ammonia and nitrate removal, is necessary to prevent water quality degradation and adverse impacts on aquatic life caused by degraded N:P ratios. In addition, total ammonia removal by nitrification, without also requiring denitrification, would exacerbate existing nuisance conditions from algal growth in the reservoirs, conveyance systems, and treatment plants that receive Delta water, including those owned and operated by the Water Agencies. Total ammonia removal without denitrification would also increase the potential for developing eutrophic conditions in the Delta and more frequent *Microcystis* outbreaks and consequent public health impacts. Denitrification would reduce overall levels of nitrogen, improving water quality by restoring proper N:P ratios and preventing nuisance conditions and toxic algae blooms.

2. Tertiary Filtration Is Necessary To Protect Human Health And To Avoid Water Quality Degradation

The Regional Board properly determined that Title 22 or equivalent filtration and disinfection, or "tertiary filtration" as used herein, is BPTC necessary to prevent significant water quality degradation to beneficial uses, including swimming, municipal drinking water use and agricultural irrigation use. Tertiary filtration is necessary for the protection of human health and to avoid water quality degradation due to the discharge of pathogens, particularly the protozoa *Giardia* and *Cryptosporidium*.

Removing pathogens from the Treatment Plant's discharge is necessary to maintain and restore existing designated uses of the Delta as well as for downstream drinking water uses.

[626] Petition at 139:3-5 [citing Permit, Table F-18].

Drinking water treatment plants above and below the discharge rely on multiple barriers to ensure public health protection. Controlling sources of contamination, like the Treatment Plant's discharge, is the very first barrier.

The Discharger contends that the municipal drinking water beneficial use designation is a "red herring," because "[t]he nearest drinking water intake . . . is approximately 40 miles downstream of the discharge."[627] That argument must be rejected because it contradicts the state's Antidegradation Policy, which not only protects present beneficial uses, but also "anticipated beneficial uses" of receiving waters, and requires BPTC to prevent pollution and to assure "the highest water quality consistent with maximum benefit to the people of the State will be maintained."[628] The River and Delta are designated for municipal drinking water use, which indicates that this is at least an "anticipated beneficial use." The state's Antidegradation Policy requires the Discharger to incorporate tertiary filtration as BPTC, so that drinking water providers do not have to design or operate their systems around this Discharger's secondarily treated sewage.[629]

As identified in the Permit, there are ancillary water quality benefits to providing tertiary filtration, in that other pollutant concentrations will be reduced. In addition, providing tertiary treatment will result in an effluent quality that is suitable for reuse. In 2009, the Discharger produced less than 1 mgd of recycled water.[630] The Discharger has a goal of increasing water recycling by 30 to 40 mgd by 2024.[631] If the Regional Board requires the Discharger to treat the entire effluent flow to tertiary levels, the Discharger will have an incentive to provide its treated

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[627] Petition at 47:18-19.

[628] SWRCB Reso. No. 68-16.

[629] While the Freeport Regional Water Diversion's agreement to shut down during certain reverse flow events is a poignant example of how the Discharger is impairing the municipal drinking water beneficial use, impairment also arises from the Discharger's nutrient loading, which contributes to nuisance algae impacts in SWP and CVP diversion, conveyance and terminal reservoir facilities.

[630] SRCSD. 2009. State of the District Report.

[631] See http://www.srcsd.com/water-recycling-environemnt.php.

effluent as a source of supply to meet non-potable water demands in the Sacramento region. This would result in less effluent being discharged to the Sacramento River, further protecting the beneficial uses of the Sacramento River and Delta by reducing the load of all pollutants in the discharge.

3. Nitrification/Denitrification And Tertiary Filtration At Other Wastewater Treatment Plants Throughout The Central Valley, State And Country Supports The Regional Board's BPTC Determination

a. Wastewater plants in the Central Valley require nitification/ denitrification and tertiary filtration

An examination of similarly situated treatment plants in the region, around the state, and across the country reveals that the requirements in the Permit are BPTC. In determining what discharge limitations are needed to achieve BPTC, it was reasonable and appropriate for the Regional Board to take note of the large number of wastewater treatment plants in the Sacramento River and Delta region that already are required to provide advanced treatment (tertiary filtration and nitrification/denitrification). The Regional Board has required nitrification/denitrification and tertiary filtration plus disinfection for most wastewater treatment plants in the Central Valley. In fact, 24 other treatment plants in the Central Valley, with discharges ranging from 1.0 to 55 mgd, and a total discharge of 228 mgd, have all been required to employ nitrification/denitrifiation and tertiary filtration.[632] The Regional Board has specifically found nitrification/denitrification and tertiary filtration to be BPTC for these existing plants in many cases. The beneficial uses the Regional Board has previously protected by mandating BPTC at other plants are the same beneficial uses that are designated for the Sacramento River at and downstream of the Treatment Plant's discharge.

b. Wastewater plants around the state and across the country require nitrification/denitrification and tertiary filtration

Wastewater treatment plants around the state and across the country employ the same BPTC required by the Regional Board in the Permit. For example, the Chesapeake Bay TMDL program limits the discharge of nitrogen and phosphorous by municipal (including 402

[632] See Attachment 2

wastewater facilities) and industrial sources from Maryland, Virginia, Delaware, West Virginia, Pennsylvania, New York, and Washington, D.C. to address excessive nutrient loading to Chesapeake Bay.[633]

Just as the Sacramento River and Delta is the largest estuary on the west coast, the Potomac River and Chesapeake Bay is the largest estuary on the east coast. Both ecosystems support a wealth of plants and animals, as well as recreation and other important uses. The Blue Plains WWTP is comparable to the Treatment Plant here, because both are the largest POTWs in their respective watersheds. The Blue Plains facility employs nitrification/denitrification technology to remove and limit nitrogen as a nutrient from its 370 mgd discharge and it employs tertiary filtration.[634] As part of the Chesapeake Bay program, Blue Plains is undergoing a major upgrade to further reduce the plant's nutrient loading.[635] The Discharger contends, without merit, that it should not be subject to the exact same standards already in place across the country for similarly situated plants. On the contrary, these standards should have been implemented years ago.

In addition, treatment plants in other parts of California also use nitrification/denitrification and tertiary filtration as BPTC. For example, treatment plants in the Santa Ana watershed use tertiary treatment, including all Santa Ana Watershed Project Authority member agencies. This level of treatment is BPTC to protect the beneficial uses of the Santa Ana River, which is the source of over 50% of Orange County's drinking water.

4. Nitrification/Denitrification And Tertiary Filtration Can Be Implemented At A Reasonable Cost

The Discharger's principal complaint about the BPTC set forth in the Permit is that it costs too much.[636] Although the Discharger overstates the legal relevance of compliance costs to

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[633] U.S. EPA, Region 3, "Progress on Reducing Pollution from Wastewater Facilities," *available at* http://www.epa.gov/reg3wapd/npdes/index.htm (last visited April 18, 2011).

[634] U.S. EPA Final Fact Sheet, NPDES Permit Reissuance, NPDES Permit No. DC0021199 at 7 (Aug. 31, 2010).

[635] *Id.*

[636] *See* Petition at 9:12-20 (claiming failure to give Permit compliance cost "required"

the lawful determination of the Permit's discharge limits, cost does play a certain role under the state's Antidegradation Policy. Specifically, "antidegradation policy allows States to lower water quality in high-quality waters only if it is necessary to accommodate important economic and social development," so that lower water quality may be allowed in those "extraordinary cases where the benefits of the economic and social development unquestionably outweigh the costs of lowered water quality."[637] This is not one of those "extraordinary" cases.

The record shows that the Discharger dramatically overstated the cost to comply with the Permit, failed to acknowledge the significant past, current, and future socioeconomic impacts of lowered water quality within and beyond the Discharger's service area, and failed to meet its burden of demonstrating specific important benefits of local socioeconomic development that unquestionably outweigh those costs.

a. The $2 billion cost estimate developed by the discharger is nearly double other estimates

The Discharger developed an estimated Permit compliance cost that it contends will reduce socioeconomic development in its local service area. The Discharger claims it will have to invest more than $2 billion to update its Treatment Plant to comply with the Permit—a big number that the Discharger has translated into hypothetical rate increases it says are too much for the local service area to bear. But the actual compliance cost is projected to be about half the Discharger's estimated figure. The hypothetical rate increases publicized by the Discharger are so vastly overstated that the Discharger's own economic expert questioned the validity of using them to estimate local economic effects of Permit compliance.[638]

The Permit cites a total compliance cost for BPTC (including nitrification/denitrification and tertiary filtration) of $2.066 billion.[639] That cost estimate was developed by the Discharger's

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consideration); *see, e.g.,* Petition at 19:4 (citing compliance cost as "overriding" Permit issue).

[637] U.S. EPA. 1995. Interim Economic Guidance for Water Quality Standards Workbook (EPA-823-B-95-002).

[638] Hearing Transcript at pp. 258-260.

[639] Permit at p. F-96.

engineering consultant, Carollo, and is detailed in an August 19, 2010, memorandum as one of four advanced treatment trains investigated.[640] The $2.066 billion estimate corresponds to "Treatment Train C", which consists of nitrifying trickling filters, fluidized bed reactors, microfiltration, and UV disinfection.[641] The Discharger's consultant estimates the nitrification/denitrification component will cost $783 million.[642] The cost for the filtration and disinfection component is the difference—$1.283 billion.[643]

Given the Discharger's surprisingly high cost estimate, the Regional Board obtained separate analyses by two independent wastewater treatment plant engineering firms familiar with the Permit's requirements. PG Environmental, LLC analyzed the proposed waste treatment process changes (i.e., treatment trains) and their associated costs and concluded that significant costs savings could be achieved by substituting granular filtration for the Discharger's proposed microfiltration, which would reduce the Permit's overall compliance cost to $1.346 billion — about two-thirds of the compliance cost claimed by the Discharger.

Trussell Technologies, Inc. (Trussell), reviewed the Tentative Permit and the Discharger's cost and engineering documents to assess the reasonableness of the Discharger's claimed compliance costs. Trussell conservatively based its analyses upon a treatment train with the greatest probability of achieving a discharge quality complying with the Permit's limits, including removal of ammonia and pathogens, while consistently meeting Title 22 requirements for unrestricted use of reclaimed wastewater and oxidizing (i.e., neutralizing) many constituents of emerging concern.[644] Trussell concluded that the most appropriate upgrades for the Treatment

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[640] Carollo Engineers 2010a, *supra*. See also Carollo Engineers 2010b. Memo from Elisa Garvey to Bob Seyfried, Vyomini Pandya, "Clarification of base construction costs and construction cost factors as presented in the 'Advanced Treatment Alternatives for the Sacramento Regional Wastewater Treatment Plant' (Carollo Engineers, March 2009)" (August 25, 2010).

[641] *Id.*

[642] *Id.*, Table 1 (from Treatment Train B).

[643] PG Environmental. 2010. Memo to Kathleen Harder, Regional Board, "Technical Review of Estimated Costs for Propsed Changes to the Sacramento Regional Wastewater Treatment Plant" (August 18, 2010).

[644] Trussell Technologies, Inc. 2010b, p. 2. Letter to Adam Kear, Metropolitan Water District,

Plant required to achieve BPTC would cost up to $1.173 billion—about half the compliance cost claimed by the Discharger.[645]

During the Regional Board's December hearing, the Discharger contended that the $1.173 billion compliance cost required certain adjustments that would make it higher, and more comparable, to the Discharger's $2 billion estimate.[646] Trussell subsequently analyzed those proposed adjustments and concluded that inflation of their estimated costs to reflect assumptions made by the Discharger's consultant is unjustified and inappropriate.[647] The Discharger's consultant, Carollo Engineers, increased Trussell's estimates to reflect a higher plant peaking factor based on a truncated historical flow data set of 1994 through 2002, which is inconsistent with the peaking factor Carollo used itself in its prior work for the Discharger based on 1994 to 2004 data.[648] Carollo apparently also adjusted Trussell's estimates by adding additional contingencies, when those estimates already contained appropriate multipliers for project soft costs and contingencies (40% to 67% additions to base construction costs).[649]

Based on these independent assessments, the record demonstrates that the Discharger's compliance costs will be much lower than it claims they will be, and the local economic effects will be far more modest than the Discharger has publicized in its campaign to scare the Water Boards into acquiescing with its unreasonable and unsupportable wish to avoid the Permit.

b. Nitrification/denitrification process and costs

The administrative record shows that the Modified Ludzack-Ettinger (MLE) process may

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"Summary of Preliminary Findings in Response to the Tentative SRCSD NPDES Permit" (October 1, 2010); Trussell Technologies, Inc. 2011a. Technical Memorandum No. 1, Summary of Findings in Review of SRCSD NPDES Permit (April 29, 2011), pp. 9-10.

[645] Trussell 2010b, p. 3; Trussell 2011a, p. 13.

[646] Petition at 21-22 (citing Hearing Transcript at pp. 170-174).

[647] *See* Declaration of Shane Trussell, ¶ 16 (Trussell 2011c).

[648] *Id.,* ¶¶ 4-6.

[649] *Id.,* ¶¶ 8-11.

be the best approach to accomplish nutrient removal as BPTC for the Treatment Plant.[650] This conclusion stems from an analysis that initially examined seven potential treatment alternatives. The two most viable alternatives—nitrifying biofilters and converting to the MLE process—were selected for further analysis. Trussell showed that the MLE process would provide both total ammonia nitrogen removal and nitrate removal, thus achieving BPTC, and would have the added benefit of reducing some biological oxygen demand. Conceptual designs for both options were developed and construction costs estimated. The analysis showed that conversion to MLE process would involve constructing a retrofit of the existing High Purity Oxygen Activated Sludge process to anoxic conditions, aeration units, blower and power building, pump station, lime storage and feeding facility, and rail spur at a capital cost of $432.3 million, or about 1.6 cents per pound removed. The analysis acknowledged that the MLE options would increase power costs and increase costs due to required lime addition, but would reduce other costs by decreasing sludge production by approximately 25 percent. Trussell estimated that nitrification/denitrification with an MLE process would cost $663.2 million—$120 million less than the BPTC compliance cost claimed by the Discharger.[651]

c. Tertiary filtration and disinfection process and costs

Granular filtration is an appropriate and cost-saving filtration process, but the Discharger and Water Agencies both have demonstrated that membrane filtration would be the most prudent filtration approach for the Treatment Plant. Granular media filters are not the best alternative here, because they would require pretreatment and significant chemical addition.[652]

Although Trussell concurred with the Discharger's process choice, it demonstrated that the Discharger's estimated costs for membrane filtration were unreasonably conservative and inappropriately based on much smaller plants constructed during the past 10 years. The record

[650] Trussell Technologies, Inc. 2010a. Ammonia Removal Cost Alternatives for the Sacramento Regional Wastewater Treatment Plant (May 31, 2010), pp. 13-22.

[651] Trussell 2010b, p. 3 (citing Carollo 2005); Trussell 2011a.

[652] Trussell 2010b at p. 2; Trussell 2011a.

shows that, based upon more recent and larger capacity membrane filtration projects, a far more realistic cost for installed membranes would be between $1/gal[653] and $2/gal[654]—less than half the cost claimed by the Discharger.

For disinfection, Trussell concurred with PG Environmental's recommendation to replace the UV system with an ozone system, but determined that adding hydrogen peroxide was unnecessary. Ozone is a highly effective disinfection system with well documented costs, which also provides ancillary benefits by reducing other constituents of concern, including many EDCs. Ozone alone has been shown destroy estrogen and pharmaceuticals.[655]

The membrane filtration and ozone cost estimate were estimated based upon a recently awarded large wastewater construction project for CCWRD, which is more comparable in size than projects previously used for points of reference. Trussell's estimated project cost for microfiltration and ozone is $510 million, and the total estimated costs for the full BPTC treatment train described above is $1.173 billion—nearly a 50 percent reduction from the Discharger's estimated cost of $2.066 billion.[656]

5. The Cost To Accomplish BPTC Is Reasonable

The Discharger argues that for the Permit's BPTC determinations to pass muster, the state's Antidegradation Policy requires that "the *Regional Board* . . . find that the proposed requirements do not unduly impact social and economic development . . . ."[657] Discharger's argument must be rejected, because it would disregard the *Discharger's* burden of proving the extraordinary case where a lower water quality is demonstrated to be necessary to accommodate

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[653] Trussell 2010 b; Trussell 2011a at p. 11 (Membrane costs for a 86 mgd being installed at the Orange County Water District's [OCWD] Groundwater Replenishment System).

[654] *Id.* (Membrane costs for a 30 mgd under construction at Clark County Water Reclamation District [CCWRD]).

[655] Trussell 2011a at p. 11.

[656] Trussell 2010b; Trussell 2011a at p. 13.

[657] Petition at 150:5-7 (emphasis added).

important socioeconomic development. The burden of proof is on the Discharger, and the administrative record demonstrates that the Discharger has failed to meet its burden.

While it is not the Regional Board's burden to prove an absence of substantial socioeconomic impacts associated with the Permit, it had a wealth of socioeconomic analyses before it that did just that. The Regional Board itself at looked costs per capita to implement tertiary treatment at the Treatment Plant and for other similarly situated POTWs and found that even using the Dischargers inflated costs, costs per capita were similar.[658] The Water Agencies submitted economic analyses using the official U.S, EPA Guidance, which showed compliance costs were affordable and with negligible impacts on the regional economy.[659] The Regional Board also considered economic and soicioeconomic studies provided by the Discharger, the North State Building Industry Association, and the University of the Pacific (UOP).[660]

U.S. EPA has prescribed guidance for states to apply in assessing whether the economic impacts of preventing water quality degradation are so large as to justify the lowering of water quality (where all applicable water quality objectives still would be met). That guidance is set forth in the U.S. EPA's March 1995 Interim Economic Guidance for Water Quality Standards Workbook ("U.S. EPA Economic Guidance"), and degradation of high quality waters is allowed "in only a few extraordinary cases where the benefits of the economic and social development unquestionably outweighs the costs of lowered water quality."[661] To this end, the discharger must demonstrate that it "would face *substantial financial impacts* due to the costs of the necessary pollution controls (substantial impacts or would interfere with development).[662]

The U.S. EPA Economic Guidance prescribes a multi-step process for assessing whether

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[658] Permit, p. F-96.

[659] See Water Agencies' Comments on Tentative Permit.

[660] Permit, p. F-97.

[661] U.S. EPA. 1995. Interim Economic Guidance for Water Quality Standards Workbook (EPA-823-B-95-002) at pp. 1-3, 4.

[662] *Id.* at p. 1-5.

the economic impacts of pollution control (i.e., treatment) are substantial. For public agencies (like the Discharger), the multi-step process to assess whether impacts are "substantial" includes:

- Estimating capital and operation and maintenance costs of the pollution controls.
- Identifying the area and number of households affected by the increased cost of pollution control and calculating annual pollution control costs per household.
- Performing a primary economic test by dividing the annual pollution control cost per household by the median household income to develop a screening value.[663]
- Performing a secondary economic test by evaluating (1) community bond ratings, (2) net debt as a percentage of market value of taxable property, (3) the unemployment rate, (4) median household income, (5) property tax revenue as a percent of full market value of taxable property, and (6) property tax collection rate.
- Comparing the results from the primary and secondary tests with U.S. EPA's "Substantial Impacts Matrix" to determine if the economic impacts are substantial.[664]

If the tests indicate that economic impacts may be substantial, a series of additional steps may be appropriate to determine if the impacts are widespread. Those steps include assessing how the pollution control costs would affect such factors as median household income, the community unemployment rate, overall net debt as a percent of full market value of taxable property, tax revenues, development opportunities, and relocation of businesses resulting from the increased costs.[665]

The U.S. EPA Economic Guidance employs a screening test to ascertain whether the ratio of total annual pollution control costs per household (including both existing costs and those which ascribed to the proposed project) over the median household income exceeds a threshold value. If the ratio is less than 0.01 (1.0 percent of median household income), the project is not

[663] If the screening value is less than 1 percent of the median household income, the economic cost is presumed to not represent an unreasonable economic hardship.

[664] *Id.* at pp. 2-1 to 2-13.

[665] *Id.* at pp. 4-1 to 4-7.

expected to impose a substantial economic hardship, or as stated by the Guidelines, that "the community can clearly pay for the project."[666] If the cost exceeds 2.0 percent of median household income, the project may place an unreasonable financial burden on ratepayers. Mid-range impacts are expected when the ratio falls between 1.0 and 2.0 percent. It is assumed that ratios well below 1.0 percent indicate that dischargers will be able to pay for the pollution control project without substantial economic impacts. Readings above 1.0 percent may be used as an indication that a Secondary Test should be applied.

a. The Cost For Nitrification/Denitrification Alone Is Reasonable

The impacts on sewer rates from the nitrification/denitrification treatment train recommended by Trussell are reasonable. As demonstrated in the record, the sewer rate for current residential users would increase by an estimated $9.39 per month (or $112.68 per year), which is in addition to charges for collection and conveyance of wastewater.[667] The total sewer fee would vary based on provider of collection and conveyance services. On a monthly basis, total sewer fees would range between $34.33 and $45.29, and between $411.96 and $543.48 annually.

Table 7. Sewer Rate Impacts (Nitrification/Denitrification Alternative)[668]

Contributing Agency	Sewer Fee (Treatment and Disposal)		Sewer Fee (Collection and Conveyance)	Total Sewer Fee	
	Existing Monthly Rate	Monthly Increase [2]		Monthly	Annual
Sacramento Area Sewer District	$19.75	$9.39	$15.00	$44.14	$529.68
City of Sacramento			$11.10	$40.24	$482.88
City of West Sacramento			$5.19	$34.33	$411.96
City of Folsom			$16.15	$45.29	$543.48

[666] Water Agencies' Comments on Tentative Permit at 91 (Oct. 8, 2010) (citing U.S. EPA Economic Guidance).

[667] Entrix 2010. Technical Memoranda by Paul, Duane and Steve Pavich, "Economic Analysis of the Advanced Treatment Trains in the Tentative NPDES Permit. October 8, 2010.

[668] Water Agencies' Comments on Tentative Permit at p. 91.

Applying the U.S. EPA Economic Guidance demonstrates that the nitrification/denitrification alternative would not impose a substantial economic hardship on the community and that the community can clearly pay for the project. Based on the assumptions previously outlined, the nitrification/denitrification alternative has an annualized cost of $69.7 million, the current residential share of the project is $39.0 million, and the number of existing households in the region is 477,804 ESD.[669] Because the U.S. EPA Economic Guidance focuses on the local households' ability to pay for the project, only current residential costs are considered. The total annualized pollution control cost per household for this scenario is $112.68. This value must be added to the baseline costs of $417 per year (within the Discharger's service area), resulting in a total annual cost of $524.83 per household. According to data from the U.S. Census Bureau, the median annual household income for Sacramento County in 2008 was $56,882. This value was adjusted to 2009 levels using the Consumer Price Index (CPI) to be consistent with project costs, which are estimated in 2009 dollars; the 2009 figure is $56,706. Dividing $529.68 by $56,706 results in a preliminary "screener" value of 0.93 percent, which is below the threshold value of 1.0 percent up to which a "community can clearly pay for the project." With project costs spread out over a growing number of households, the preliminary screener value would be lower still. Because the preliminary screener value is less than 1.0, there is no need to implement the secondary test in the U.S. EPA Economic Guidance, and the cost for implementing nitrification/denitrification is reasonable.

6. The Cost For Tertiary Filtration And Nitrification/Denitrification Together As Full BPTC Is Reasonable

The estimated impacts on sewer rates for full BPTC (nitrification, denitrification and filtration) recommended by Trussell and PG Environmental, respectively, are reasonable. The Discharger's sewer rate for current residential users would increase by an estimated $16.13 to $22.18 per month when full BPTC is implemented. The total sewer fee would vary based on the provider of collection and conveyance services. On a monthly basis, total sewer fees would range

[669] LWA 2009 at p. 6-10.

between $41.07 and $58.08, and between $492.89 and $696.96 annually.

Table 8. Sewer Rate Impacts of Full BPTC - Trussell Assumptions[670]

Contributing Agency	Sewer Fee (Treatment and Disposal)		Sewer Fee (Collection and Conveyance)	Total Sewer Fee	
	Existing Monthly Rate	Monthly Increase [2]		Monthly	Annual
Sacramento Area Sewer District	$19.75	$16.13	$15.00	$50.88	$610.61
City of Sacramento			$11.10	$46.98	$563.81
City of West Sacramento			$5.19	$41.07	$492.89
City of Folsom			$16.15	$52.03	$624.41

Table 9. Sewer Rate Impacts of Full BPTC - PG Environmental Assumptions[671]

Contributing Agency	Sewer Fee (Treatment and Disposal)		Sewer Fee (Collection and Conveyance)	Total Sewer Fee	
	Existing Monthly Rate	Monthly Increase [2]		Monthly	Annual
Sacramento Area Sewer District	$19.75	$22.18	$15.00	$56.93	$683.16
City of Sacramento			$11.10	$53.03	$636.36
City of West Sacramento			$5.19	$47.12	$565.44
City of Folsom			$16.15	$58.08	$696.96

Applying the U.S. EPA Economic Guidance as previously described for the total annual cost of $119.7 million to $164.6 million estimated in the Trussell and PG Environmental BPTC scenarios, respectively (current residential allocation of $67.0 to $92.2 million) results in preliminary screener scores just above the threshold of 1.0%. The preliminary screener score for BPTC as recommended by Trussell is 1.08%, and the score for BPTC as recommended by PG Environmental is 1.2%. Where the preliminary screener score falls above 1.0 percent, the U.S. EPA Economic Guidance calls for a second test to determine if "substantial" economic impacts would be incurred in order to avoid lowering water quality.

[670] Water Agencies' Comments on Tentative Permit at p. 92.

[671] Water Agencies' Comments on Tentative Permit at p. 93.

The secondary test established by U.S. EPA focuses on the community's ability to obtain financing and the socioeconomic health of the community. Six indicators are used to develop a composite score for the community: (1) bond rating; (2) overall net debt as a percent of full market value of taxable property; (3) unemployment rate; (4) median household income; (5) property tax revenue as a percent of full market value of taxable property; and (6) property tax collection rate. The application of these indicators to Sacramento County is presented below.

- Bond Rating: The bond rating in Sacramento County as rated by Moody's is A3. Bond ratings above Baa (Moody's) are considered "strong" and receive a rating of 3 for this indicator.
- Overall Net Debt as a Percent of Full Market Value of Taxable Property: Overall net debt (repaid by property taxes) in Sacramento County in Fiscal Year 2009 was $1.4 billion. The full market value of taxable property in the county is unknown; however, a conservative estimate can be obtained using the total assessed value of taxable property, which was $138.7 billion in Sacramento County in 2009. Based on these values, this parameter is estimated at 1.02 percent. Values below 2 percent are considered "strong" and receive a rating of 3 for this indicator.
- Unemployment Rate: This parameter considers the unemployment in the affected community to the national rate. In 2009, the average annual unemployment rate in Sacramento County was 11.3 percent compared to 9.3 percent for the U.S. The unemployment rating in the county is more than 1 percent above the national average. This indicator is considered "weak" and receives a rating of 1. |List Paragraph
- Median Household Income: This parameter considers the median household income in the affected community relative to the income levels in the state where it is located. Using census data (adjusted to 2010 levels), the median household income in Sacramento County is $58,039 compared to $62,258 in California. The median household income level in the county is within 10 percent of the state level. Therefore, this indicator is considered "mid-range" and receives a rating of 2.

- Property Tax Revenue as a Percent of Full Market Value of Taxable Property: This parameter is excluded from the analysis because property taxes in California are subject to a statutory limit per Proposition 13. The EPA Economic Guidance states that there is no appropriate substitute in these cases, and that this indicator should be dropped and the other five factors are assigned equal weights.
- Property Tax Collection Rate: The property tax collection rate in Sacramento County is 96.2 percent. The collection rate falls between 94-98 percent, which is considered "mid-range" and receives a rating of 2.
- The total composite score for all five applicable indicators is 11 and the average is 2.2. The average score (2.2) is the secondary score under the U.S. EPA Economic Guidance.

To determine whether a community would incur substantial economic impacts, both the preliminary screener value and secondary score are considered in the "assessment of substantial impacts matrix" shown as Table 11 and Figure 8 in the Water Agencies' comments on the Tentative Permit. For BPTC, the preliminary screener value is 1.1 to 1.2 percent and the secondary score is 2.2.

The U.S. EPA Economic Guidance has provisions if both the screener value and secondary score are borderline, which is the case here, and indicates that the community should move into the category closest to it. Here, the preliminary screener value is close to being less than 1 percent and the secondary score is close to being greater than 2.5 (particularly if full market value of property is considered). As a result, the project would fall into the "able to pay category," which indicates that the impact is not likely to be substantial. This is particularly true for the BPTC using the process and cost assumptions recommended by Trussell.

7. Regional Economic Impacts Of BPTC Are Minimal

Applying the U.S. EPA Economic Guidance shows that achieving BPTC will not result in substantial economic impacts on households in the Discharger's service area. Economics Professor David Sunding, University of California Berkeley, evaluated the regional economic

impacts of the compliance costs of implementing BPTC and testified to the Regional Board on his findings.[672] As part of his evaluation, Dr. Sunding considered a study by Jeffrey Michael and Thomas Pouge of the University of the Pacific (UOP) that was prepared at the request of the request of the Discharger.[673] This UOP study used the IMPLAN model and found, based on the District's $2 billion cost estimate and the modeling assumptions used, that although construction would generate jobs and income, the overall impact would result in an annual income loss of $246 million and an annual job loss of 976. The UOP study also determined that higher connection fees resulting from the facility upgrade would delay economic recovery in the region.[674]

Dr. Sunding, however, found that the implementing the Treatment Plant compliance upgrades would have a stimulus effect, *increasing* rather than decreasing regional income and employment, and have only a small effect, if any, on the economic recovery underway in the Sacramento area.[675] He also found that the Discharger's proposed wastewater rate increase structure is inefficient, imposing too little burden on existing ratepayers and too much on new ones, which places a needless potential drag on new construction.[676] Dr. Sunding explained that much of the differences between his finding and those in the UOP study can be explained by a

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[672] Hearing Transcript, pp. 282-288; Water Agencies' Hearing presentation, slides 25-32; Declaration of David L. Sunding, May 4, 2011 (Sunding 2011).

[673] Michael, J. and Thomas Pogue, "Assessing the Impact of the Tentative Discharge Permit for the Sacramento Regional Wastewater Treatment Plant on Sacramento Area Income and Employment," Eberhardt School of Business – Business Forecasting Center, University of the Pacific, November 10, 2010. ("Michael and Pogue 2010b", also referred to as the "second UOP Study" in the Petition [p. 151, fn 592].)

[674] Sunding 2011, pp. 1-2. The record contains two additional regional economic impact studies: one, conducted by Larry Walker Associates for the Discharger (Larry Walker Associates "Antidegradation Analysis for Proposed Discharge Modifications for the Sacramento Regional Wastewater Treatment Plant, Administrative Draft" (May 20, 2010)), and the other conducted by Entrix for the Water Agencies (Entrix 2010.) The Entrix analysis used the framework of the Larry Walker study but with appropriate inputs and concluded that regional economic impacts of implementing BPTC is negligible. All of the regional economic studies have used IMPLAN, an economic modeling program commonly used to conduct regional economic analyses.

[675] Sunding 2011, p. 2.

[676] *Id*., ¶ 5, p. 2.

unconventional and improper modeling technique used by the UOP researchers.

As an initial assessment of the Discharger's claim that its customers will face "unprecedented rate increases,"[677] Dr. Sunding looked at the Discharger's existing wastewater rates in comparison to other communities.[678] The Discharger has offered the following comparison of several sewer collection and wastewater treatment agency rates in California depicting their rates to be primarily mid-range.[679]

Table 10.

Agency	Monthly Rate**		
	Collection	Treatment	Total
Union Sanitary District	*	$24.15	$24.15
City of Fresno	*	$25.75	$25.75
Central Contra Costa County Sanitation District	*	$25.92	$25.92
City of West Sacramento + SRCSD	$6.01	$20.00	$26.01
Fairfield-Suisun Sewer District	*	$26.82	$26.82
City of Stockton	*	$27.07	$27.07
Dublin San-Ramon Service District	*	$27.40	$27.40
City of Roseville	*	$29.00	$29.00
City of Vacaville	*	$34.53	$34.53
City of Sacramento + SRCSD	$14.74	$20.00	$34.74
City of Folsom + SRCSD	$16.15	$20.00	$36.15
Orange County Sanitation District	$17.33	$20.33	$37.66
City of Oakland + East Bay Municipal Utility District	$22.24	$17.05	$39.29
Sacramento Area Sewer District + SRCSD	$19.85	$20.00	$39.85
City of Woodland	*	$40.00	$40.00
City of Davis	*	$44.00	$44.00
City of Berkeley + East Bay Municipal Utility District	$27.99	$17.05	$45.04
Placer County (Granite Bay)	*	$48.12	$48.12
City of San Diego	*	$66.95	$66.95

* These agencies have combined collection and treatment rates which are totaled in the "Treatment" column.
** These are current monthly rates and do not address future rate increase projections.

Recently, the American Water Works Association (AWWA) and Raftelis Financial

[677] Petition, p. 152.

[678] Sunding 2011, ¶¶ 14-16, pp. 5-6.

[679] *Id.*; SRCSD, Notice of Proposed Rate Adjustment and Public Hearing Date (2010) http://www.srcsd.com/pdf/218-mailer.pdf.

Consultants, Inc. (RFC) released their 2010 Water and Wastewater Survey, providing wastewater rate data for 228 utilities from across the country. The Discharger's rates are shown below with the rates of utilities in the survey similar to the District (i.e. with a total population service area of 1 million or greater).[680]

Table 11.

Utility Name	Total Monthly Bill
Clark County Water Reclamation District	$18.17
Orange County Sanitation District	$20.33**
City of West Sacramento + SRCSD	$26.01
San Antonio Water System	$27.81
Phoenix Water Services Department	$34.42
City of Sacramento + SRCSD	$34.74
City of Folsom + SRCSD	$36.15
Sacramento Area Sewer District + SRCSD	$39.85
City of Houston	$45.45
Pima County Regional Wastewater Reclamation Department	$45.95
Philadelphia Water Department	$48.09
City of Los Angeles Bureau of Sanitation	$49.05
City of Baltimore Department of Public Works	$49.78
Miami-Dade Water and Sewer Department	$50.23
Dallas Water Utilities	$51.57
City of Columbus, Dept. of Public Utilities	$53.98
District of Columbia Water and Sewer Authority	$54.15
Group A Systems Average (>70mgd Treated)	$55.63
Northeast Ohio Regional Sewer District	$61.13
New York City Department of Environmental Protection	$62.25

[680] *Id.* (citing 2010 Water and Wastewater Rate Survey Interactive Database (American Water Works Association and Raftelis Financial Consulting, Inc., rel. 2011).

Utility Name	Total Monthly Bill
Washington Suburban Sanitary Commission	$70.74
City of San Diego Water Department	$71.78
Atlanta Water Department	$172.94

*Total Bill represents a combination of treatment and collection costs, although some of these dischargers do not perform collection and is thus not included in the total.
**Total does not include sewer collection costs.

As the table shows, the Discharger's wastewater rates are nearly the lowest amongst other similarly situated dischargers who were surveyed. The Discharger, in its challenges to the permit requirements, claims that these requirements will raise the rates to unreasonable levels, but fails to recognize that across the nation it currently charges drastically lower rates than other similarly situated dischargers.[681]

As previously detailed, the District's compliance cost estimates are at the upper bound of the various cost estimates prepared and nearly double the costs estimated by Trussell. Modeling a lower project cost reduces revenue requirements and thereby the rate increases required to cover them. This smaller impact on rates, in turn, reduces the negative impact on household spending.[682] (But lower costs also reduce the stimulus effect of job creation during the construction and operating phases.) Dr. Sunding found that by incorporating a lower project cost estimate into the model, expected rate increases do not impose a particularly high burden on ratepayers in comparison to rates elsewhere in California, and the Discharger's rates would still remain relatively low by nationwide standards.[683]

With respect to the regional economic impacts of capital expenditures to upgrade the Treatment Plant, the technique used in the UOP study to estimate net impacts is both unconventional and improperly executed. Rather than modeling the District's estimated $2 billion in upgrade costs as a new construction project, as is typically done when modeling the

[681] *Id.*, ¶ 15.

[682] *Id.*, ¶ 6.

[683] *Id.*, ¶ 6, 13.

impacts of capital expenditure, Dr, Sunding found that the UOP researchers improperly treated the project as a government program. By inappropriately using a modeling technique known as "institutional spending,: the UOP researchers failed to capture the full economic stimulus effects of construction. Applying the proper conventional method results in more job creation during the construction phase of the project and fewer job losses during the operating phase of the project.[684] Dr. Sunding also found that the District's rate treatment overstates the aggregate negative economic impact of compliance since it assumes that new connections would bear a substantial share of the compliance costs. Shifting this non-growth related rate burden back to existing households would eliminate any potential drag on new construction, and wastewater fees would still remain well with the range of similarly situated wastewater districts.[685]

By applying Trussell's more realistic costs estimates, the conventional modeling approach, and assigning rate increases to existing households, Dr. Sunding found that implementing the compliance upgrades would create a net 1,677 new jobs during the construction phase, and a net employment loss of only 382 jobs during the operating period.[686] Considering that the local employment base currently totals 830,130 jobs,[687] estimated job losses anticipated with implementation of BPTC is negligible, accounting for less than 0.05 percent of the local employment base. Even assuming the District's $2 billion cost estimate and its assumed rate treatment, net operating period job losses would total 852,[688] again a negligible impact.

F. The Discharger Failed To Account For The Socioeconomic Impacts That Its Discharge Is Causing

The Regional Board properly rejected the Discharger's bid to improperly shift the burden of proof by narrowly focusing on the purported socioeconomic cost of maintaining or improving

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[684] *Id.,* ¶¶ 17, 18.

[685] *Id.,* ¶¶ 12, 13

[686] *Id*., Figures 1 and 2

[687] *See* Entrix 2010 at p. 15.

[688] Sunding 2011, Figure 2.

receiving water quality. The Regional Board reasonably and appropriately recognized the socioeconomic costs of allowing the Discharger to continue degrading the receiving water quality of the River and Delta. The state's Antidegradation Policy requires the Discharger to assess the broader environmental and socioeconomic harm caused when secondarily treated sewage is discharged directly into the heart of California's water supply system.

Direct and indirect total ammonia impacts, impacts from other toxic pollutants (including additive toxicity impacts from copper, pesticides, etc.), temperature impacts, dissolved oxygen impacts and other water quality impacts of the Treatment Plant's discharge are contributing to the decline of federally protected fish species. The decline of these fish has caused dramatic reductions in SWP and CVP water availability, which the Discharger's proffered "Antidegradation Analysis" failed to consider.

The administrative record reveals no Discharger analysis assessing the specific socioeconomic impacts the Discharger is causing to the areas served by the Water Agencies. The record does contain a report, however, that considers the overall socioeconomic impacts from reduced water availability in 2009.[689] In that report, economists from U.C. Davis and the University of the Pacific concluded that in 2009, as a result of a relatively dry hydrology and water supply restrictions imposed on the SWP and CVP, the San Joaquin Valley population lost as many as 7,434 jobs, more than $278 million in income, and more than $368 million in overall economic output. The economists were able to estimate that the ESA-based restrictions alone caused the San Joaquin Valley to lose as many as 3,000 jobs, more than $111 million in income, and more than $318 million in overall economic output.[690] In testimony filed in federal court,

[689] Michael J., et al. 2009. A Retrospective Estimate of the Economic Impacts of Reduced Water Supplies to the San Joaquin Valley in 2009 (September 28, 2010) (U.O.P-U.C. Davis Report), Table 11 at p. 14.

[690] Those impacts do not begin to cover the full breadth and depth of socioeconomic costs because reduced SWP and CVP water availability harms more than the San Joaquin Valley. Ongoing SWP and CVP water delivery reductions arising from listed species regulations harm family households and businesses from the San Francisco Bay Area to San Diego every year. (See, e.g., California Department of Water Resources, 2009 State Water Project Delivery Reliability Report, Table 6.3-6.4 [projecting reduction in long-term average annual SWP water delivery reliability to 60 percent of contract Table A amounts).

U.C. Berkeley economics professor Dr. Sunding estimated that the 2009 water supply restrictions resulted in the loss of over 5,000 farm jobs in the San Joaquin Valley, which is equivalent to around 5 percent of the relevant workforce.[691]

Dr. Sunding has also measured economic losses suffered by the urban sector due to shortages of water from the Delta. These losses are significant. Dr. Sunding found that urban economic losses among all agencies exporting water from the Delta and its tributaries amount to $858 million per year for a 10 percent reduction in end water use, $2.6 billion per year for a 20 percent reduction, and $6.7 billion per year for a 30 percent reduction.[692]

Research and data demonstrate that the Discharger is harming aquatic species and materially contributing to the pelagic organism decline in the Delta. Nevertheless, the Discharger failed to address how its operations are redirecting environmental regulatory impacts to the 25 million Californians and 2 million acres of prime farmland served by the SWP and CVP.

The Discharger's failure to analyze and disclose the environmental and socioeconomic impacts of the degraded water quality caused by its discharge is a failure to meet the burden of proof that the state's Antidegradation Policy imposes before water quality may be lowered.

G. The State's Antidegradation Policy Requires Stronger Interim Measures

The Permit's compliance schedule for effluent limitations gives the Discharger ten years to achieve BPTC. Given the severe degradation of water quality and impairment of beneficial uses that will be caused by the discharge during that period, Trussell was asked to evaluate the compliance schedule for BPTC upgrades, as well as to identify interim measures that could reduce the extent of degradation and impairment in the intervening years.

With respect to the overall BPTC implementation schedule, Trussell concluded that a 10-year project schedule for completion of the entire upgrade program with traditional design, bid, build project delivery approach is aggressive.[693] However, Trussell identified measures that

[691] Sunding 2011, ¶ 31.

[692] *Id*., ¶¶ 28-30.

[693] Trussell Technologies, Inc. 2011a. Technical Memorandum No. 1, Summary of Findings in Review of SRCSD NPDES Permit (April 29, 2011) (Trussell 2011a).

could accelerate the schedule relative to the traditional delivery approach as well as achieve water quality improvements in advance of project completion. For example, the Discharger could implement alternative project delivery systems, like Construction Manager at-risk ("CM at-risk"), or Design-Build ("DB"), and alternative project approaches such as phased or modular construction could be employed. Phased or modular approaches to project construction may not expedite the overall schedule, but either alternative could achieve water quality improvements at much earlier milestones in the project schedule, and should have been considered as appropriate means to reduce water quality degradation while upgrading the Treatment Plant to fully achieve BPTC.[694]

The Regional Board should have considered the availability of interim measures designed to improve the effluent quality prior to project completion. Trussell investigated such interim measures,[695] which could begin achieving water quality improvements. Two such measures were identified, which can be implemented with minimal impact to the overall project duration or cost:

- **Sidestream treatment**: Treating in-plant recycle flows that are high in ammonia separately and putting treatment processes in for these streams as soon as possible could reduce the mass total ammonia loading to the Sacramento River in the interim. An example is the centrate flow generated from solids handling, which is high in ammonia and currently returned to the head of the plant.[696]
- **Reclaimed water:** The expanded use of the Discharger's recycled water program could also offset total ammonia discharges to the Sacramento River in the short-term.[697] The Discharger has completed the design for its Phase II Water Recycling Program ("WRP") expansion project and it is feasible that this project could be

[694] *Id.,* Trussell 2010b at p. 4-5; Trussell 2011a at p. 3.

[695] *Id.* at p. 4.

[696] *Id;* at pp. 1-4.

[697] *Id*.

constructed and operational within 12 to 24 months.[698] The Discharger's South Sacramento County Ag. & Habitat Lands Recycled Water Project is a long-term recycled water project that could dramatically increase the quantity of recycled water delivered by the Discharger. This project should also be pursued with urgency. With the addition of Phase II WRP capacity, the Discharger could distribute 3,750 acre-ft/year (3.34 mgd) of recycled water, reducing the total ammonia discharge by 1 to 3%.

The side-stream treatment concept was suggested in the Water Agencies' comments on the Tentative Order and was subsequently further developed by Trussell.[699] Trussell considered side-stream treatment solutions that could be used as part of the ultimate solution for ammonia reduction. Trussell identified nitrification treatment of the centrate produced from dewatering anaerobically digested biosolids as a promising interim measure. That centrate is currently returned to the plant and contributes to the total ammonia load currently discharged to the Sacramento River.[700]

Trussell selected the membrane bioreactor (MBR) technology to treat the digester centrate as this technology produces high quality effluent, has a relatively small footprint, can be constructed relatively quickly, and allows for pre-purchase of equipment, which can further accelerate the construction schedule. Trussell estimates that treating the centrate with a sidestream reactor would reduce the current ammonia loading to the Sacramento River by about 8%. This interim measure could be completed in 4.5 years at a total project cost (including planning and administrative costs) of $32.4 million.[701].

The interim measures described herein are not a long-term solution and are only examples

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[698] SRCSD 2010. "SRCSD Water Recycling Program." Presentation, June 24, 2010.

[699] Trussell Technologies, Inc. 2011b. Technical Memorandum No. 2, Sidestream Treatment to Reduce the Ammonia Discharge (April 29, 2011).

[700] *Id*.

[701] *Id*.

of where there is potential room for improvement which would give the Delta's food web some relief from the Discharger's discharge until the Treatment Plant fully incorporates nitrification/denitrification facilities to comply with the new Permits effluent limits and achieve BPTC as required under the state's Antidegradation Policy.

XV. THE PERMIT'S REQUIREMENTS FOR NUTRIENT REMOVAL AND TERTIARY FILTRATION AND DISINFECTION ARE CONSISTENT WITH CALIFORNIA'S FUNDAMENTAL WATER POLICY

The CSPA Petition argues that "[t]he granting of a mixing zone is an unreasonable use of water when proper treatment of the wastestream can be accomplished to meet end-of-pipe limitations."[702] The Water Agencies agree with CSPA on this point, to the extent that the Permit's treatment requirements, including full nutrient removal and microfiltration, square with long held California water policies set by the State Board, the State Constitution, and the State Supreme Court to protect state water resources. Additional requirements urged by the Water Agencies in their comments before the Regional Board, and in this Response, likewise are supported by these fundamental principles of California law.

Indeed, the State Board decided almost 40 years ago in the "Delta Water Rights Decision" that specifically protecting the Delta from pollution through the use of "stringent controls" was a "prime objective." As the State Board held:

> Recent state and regional board activity in the regulation of waste discharges demonstrates an intent to protect the Delta environment with stringent controls on waste discharges at the earliest reasonable date. Waste discharges will be managed and where possible reused with a view toward achieving these prime objectives. No one has a right to pollute the waters of the state regardless of the quality of water that may flow in the particular streams.[703]

The full nutrient removal and filtration requirements are also consistent with California's most fundamental declaration of water policy in Article X of the State Constitution to protect the full beneficial uses of our state's waters:

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[702] CSPA Petition, at 56; *see also id*. at 58, 85.

[703] State Board Decision 1379 at p. 40 (1971.)

> It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.[704]

Requiring the Discharger to stop its continued pollution of the Bay-Delta is also consistent with the California Supreme Court's holding that pollution of a water supply effects an invasion of a legal right. In *Wright v. Best* (1942) 19 Cal.2d 368, the Court held that an appropriator of water:

> is entitled to have the water at his point of diversion preserved in its natural state of purity and any use which corrupts the water so as to essentially impair its usefulness for the purposes to which he originally devoted it, is an invasion of his rights. Any material deterioration of the quality of the stream by . . . others without superior rights entitles him to both injunctive and legal relief.[705]

The Discharger's continued use of developed SWP and CVP storage releases to dilute its wastewater would violate these principles established by the California Legislature, the State Board, and the State Supreme Court and would directly harm the Water Agencies' legal rights and interests in the stored and released water. Indeed, the Discharger's continued use of SWP and CVP reservoir releases to dilute, transport and dispose of the Discharger's wastewater is precisely the unreasonable waste of water that the State Constitution declared should be prevented. That unreasonable use and waste of SWP and CVP stored water will be addressed, at least in part, by the State Board upholding the Permit's nutrient removal and filtration requirements, as well as the others terms and conditions set forth in the Permit or as requested in the Water Agencies' comments and in this Response.

XVI. CONCLUSION

For all the preceding reasons, the State Board should uphold and strengthen the discharge limits and related water quality protection conditions that the Regional Board imposed on the

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[704] Cal. Const., Art. X, § 2.

[705] *Wright v. Best*, 19 Cal.2d at 378.

Discharger's new Permit. Nothing less will protect listed Delta fish species and the largest single source of fresh water supply in all California.

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PROOF OF SERVICE

I, Do Gentry, declare:

I am a citizen of the United States and employed in Sacramento County, California. I am over the age of eighteen years and not a party to the within-entitled action. My business address is 400 Capitol Mall, 27th Floor, Sacramento, California 95814. On May 6, 2011, I served a copy of the within document(s):

ERRATA TO WATER AGENCIES' RESPONSE TO DISCHARGER'S PETITION FOR REVIEW

☐ by transmitting via facsimile the document(s) listed above to the fax number(s) set forth below on this date before 5:00 p.m.

☒ by placing the document(s) listed above in a sealed envelope with postage thereon fully prepaid, the United States mail at Sacramento, California addressed as set forth below.

☐ by placing the document(s) listed above in a sealed Federal Express envelope and affixing a pre-paid air bill, and causing the envelope to be delivered to a Federal Express agent for delivery.

☐ by personally delivering the document(s) listed above to the person(s) at the address(es) set forth below.

☐ by transmitting via e-mail or electronic transmission the document(s) listed above to the person(s) at the e-mail address(es) set forth below.

See attached Service List

I am readily familiar with the firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with the U.S. Postal Service on that same day with postage thereon fully prepaid in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 6, 2011, at Sacramento, California.

Do Gentry

Do Gentry

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