California Sportfishing Protection Alliance
"An Advocate for Fisheries, Habitat and Water Quality"
3536 Rainier Avenue, Stockton, CA 95204
T: 209-464-5067, F: 209-464-1028, E: deltakeep@me.com, W: www.calsport.org

28 July 2014

Mr. Ryan Wulff
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814
BDCP.Comments@noaa.gov

VIA: Electronic Submission
Hardcopy if Requested

RE: Comment Letter No. 2: Bay Delta Conservation Plan and Associated EIR/EIS Related to Water Quality

Dear Mr. Wulff,

The California Sportfishing Protection Alliance (CSPA) has reviewed the proposed Bay Delta Conservation Plan and associated Environmental Impact Report/Environmental Impact Statement (hereinafter, BDCP or EIR/EIS) and submits the following comments related to water quality. Our comments include the attached review from Dr. G. Fred Lee and Dr. Anne Jones-Lee and we request that both documents be considered and responded to as a single submittal.

CSPA worked closely with the Environmental Water Caucus (EWC) in developing their comments and incorporates by reference into these comments both submittals by the EWC on all issues related to BDCP. We also incorporate by reference the submittal by Michael Jackson on behalf of CSPA, California Water Impact Network and AquAlliance, as well as the individual comments submitted by AquAlliance. We further incorporate by reference the submittals by the County of San Joaquin, South Delta Water Agency, Central Delta Water Agency, Restore the Delta, Earth Law Center and Friends of the River.

CSPA asked Dr. Lee and Dr. Jones-Lee to review Chapter 8 and Chapter 25 of the EIR/EIS and evaluate whether the approach in analyzing potential impacts to water quality and public health was technically valid and reliable. Their assessment of Chapter 8 is that,

> *"The approach used does not adequately or reliably consider the range of water quality impacts caused by the wide variety of potential pollutants present in the various Delta channels, that can be expected to result from the removal of large amounts of high-quality Sacramento River water from the Delta by this project."* and *"As it stands now Chapter 8 of this EIR/EIS does not reliably inform the public or decision-makers about the magnitude of the errors in estimates and conclusions inherent in the BDCP analysis of the impact of the diversions on Delta water quality/beneficial uses."*

Drs. Lee and Jones-Lee's assessment of the technical validity of Chapter 25 is that the,

> *"...approach is not technically valid for identifying all the constituents that need to be considered in evaluating potential water quality and public health impacts of the proposed BDCP."*

Table 31-1, page 31-9, Summary of Significant and Unavoidable Adverse Impacts, identifies six impacts to surface water quality. Three (concentrations of bromide, chloride and electrical conductivity) result from facilities operations and maintenance (CM1) and three (concentrations of mercury, organic carbon and pesticides) result from implementation of CM2-CM22. Perhaps, nothing more graphically illustrates the fundamental inadequacy of the EIR/EIS than the fact that it only identifies three water quality adverse impacts resulting from the diversion of another 2.5 million acre feet of water from an estuary already grievously suffering from lack of flow.

Our specific concerns are enumerated below followed by our comments.

1. A Word of Caution

We offer a word of caution. The Delta is an incredibly complex estuarine ecosystem and only in our hubris do we believe we understand the intricacies of its hydrological, chemical and biological tapestry. Virtually every previous environmental document prepared for hydro-modification projects in this estuary have promised benign or beneficial results. All exacerbated existing conditions. Almost every significant physical change of the environment by humankind has been accompanied by unintended consequences. Adaptive management must be an integral component of any Delta Plan. But, adaptive management is difficult to implement. As the National Research Council put it:[1]

> *"Numerous attempts have been made to develop and implement adaptive management strategies in environmental management, but many of them have not been successful, for a variety of reasons, including lack of resources; unwillingness of decision makers to admit to and embrace uncertainty; institutional, legal, and political preferences for known and predictable outcomes; the inherent uncertainty and variability of natural systems; the high cost of implementation; and the lack of clear mechanisms for incorporating scientific findings into decision making."*

Adaptive management has a long and checkered history in this estuary. Taken together, the suite of water quality control plans and water rights decisions by the State Water Resources Control Board (SWRCB or State Water Board) from D-990 (1961) through D-1641 (2000) to the adoption of the present Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (2006) constitutes adaptive management. The array of biological opinions issued over the years by the U.S. Fish and Wildlife Service and National Marine Fisheries Service comprises adaptive management. CalFed was an elaborate structured water planning and adaptive management program, as is the Long-Term Operational Criteria and Plan (OCAP) for coordination of the State Water Project and Central Valley Project, with its Water Operations Management Team (WOMT) and various technical working groups.

All of the reasons identified by the National Research Council, as to why adaptive management frequently fails, presently exist in this estuary. Managers and decision makers have routinely rejected the "adaptive" recommendations made by scientists, biologists and technical review teams. Resource and regulatory agencies have failed to adopt and implement recommended criteria and failed to enforce existing criteria. Financial resources have been lacking. Adaptive management has not only failed to reverse the downward spiral of native species in the estuary, it has chaperoned them to the brink of extinction. For adaptive management to play a meaningful role, scientists must have the authority to "adapt."

We can find nothing in the thousands of pages of BDCP's plan or EIR/EIS that provides any evidence that adaptive management is likely to succeed. Adaptive management remains subject to political pressure and the approval of the state and federal contractors. If the reviewer of these

---

[1] National Research Council, *A Review of the Use of Science and Adaptive Management in California's Draft Bay Delta Conservation Plan*, 2011, p. 6.

comments has a different opinion, please provide some support for the view that "adaptive management" will be different this time.

Over mere decades, construction and operation of the Central Valley and State Water Projects have deprived the Delta estuary of half its flow; turned the natural hydrograph on its head, reduced temporal and spatial variability; eliminated crucial habitat, complexity and diversity and deprived the estuary of dilution necessary to assimilate increased pollutant mass loading. It is not surprising that an ecosystem that developed and prospered under a state of nature has been brought to the brink of destruction. No estuarine ecosystem in the world has survived this level of abuse. If the reviewer can identify an estuary somewhere in the world that is suffering from lack of freshwater flow and that has been restored by depriving it of additional millions of acre-feet of flow, please provide the information to us.

Water quality and quantity are flip sides of the same coin; changes in flow change assimilative capacity, residence time and the fate and transport of contaminants. Hydrologic changes modify constituent concentration and bioavailability, which in turn can adversely impact the aquatic ecosystem and other beneficial uses.

Water from the Sacramento River is significantly less polluted than water flowing into the estuary from other tributaries, especially the San Joaquin River. Sacramento River water drawn across the Delta to the export pumps is a major reason water quality in the South Delta is better than it would otherwise be. Diversion of approximately 2.5 million acre feet (MAF) of this relatively good quality water around the Delta will increase the concentration of existing constituents in the surface water remaining in the Delta. It will also increase the residence time of water in the Delta, thereby enhancing the opportunity for bioaccumulation and oxygen depletion to occur. This is exacerbated in tidal environments where pollutants tend to move back and forth with the tides. The EIR/EIS and Delta Plan fail to contain a technically defensible analysis and discussion of the likelihood and extent of degradation and adverse impacts to Delta water quality caused by alternative conveyance or increased exports.

Previous efforts to evaluate potential water quality impacts from proposed projects to modify the hydrology of the Delta have either ignored water quality, with the exception of salt, or relied upon models that track "particles" to evaluate water quality. However, the majority of pollutants identified as impairing the estuary are non-conservative dissolved forms of pesticides, mercury, nutrients or oxygen demand constituents. Conservative constituents like salt are unacceptable surrogates for the universe of chemical constituents and pathogens degrading and impairing Delta waters.

CalSim II and various particle-tracking models, like DSM2, are unable to model potential impacts to water quality from non-conservative constituents. Different constituents respond differently to changes in flow and residence time. Consequently, any credible environmental review should evaluate the impacts of potential hydrologic modifications on a pollutant-by-pollutant basis. Unfortunately, BDCP fails to avail itself of the many water quality models that are routinely employed in NPDES permitting and expressly designed to address the fate and transport of chemical constituents in the environment.

The pollutants identified as causing impairments on the 303(d) list are only the tip of the iceberg. There are water quality impairments in the Delta attributable to total organic carbon, nutrients and other contaminants for which there are no federal or state water quality criteria. In addition to a lack of promulgated water quality criteria for many common water pollutants, there are situations in which the current water quality criteria/standards are well recognized as not being protective of aquatic life resources. For example, the water quality criterion for selenium in the SJR and Delta is not protective of some aquatic life.[2]

Furthermore, existing water criteria fails to address many issues that must be considered in considering impacts on aquatic life. For example:

- Existing criteria fails to consider additive and synergistic properties of regulated chemicals that occur in concentration below criteria. For example, Delta water frequently contains a cocktail of as many as 15 pesticides, many of which interact additively or synergistically.
- Adverse impacts to sensitive species, such as zooplankton, were not included in the development of many criteria.
- There is limited information on chronic exposure to sublethal impacts of chemicals and mixtures of chemicals. Numerous studies in the scientific literature demonstrate adverse effects of chemical exposure well below water quality criterion.
- Water quality criterion fail to address the chronic effects of multiple stressors acting on an already weakened aquatic ecosystem.
- Chemical degradants (or products of chemical breakdown in the environment) are little understood but frequently are highly toxic.
- Water quality criteria have been developed for only a small subset of the chemicals found in these waters. Of the approximately 100,000 chemicals registered for use in the United States, only about 200 are regulated with respect to water quality. The Priority Pollutant List is an artifact of a legal settlement several decades ago, has never been peer-reviewed and is an inadequate surrogate for the maelstrom of chemicals found in waterways today. These include pharmaceuticals and personal care products, industrial chemicals and other potentially hazardous constituents that have been identified as carcinogens, reproductive toxins, endocrine disruptors and immune suppressors, etc.
- Criteria are frequently insufficiently protective for pollutants that bioconcentrate and/or bioaccumulate in tissue.
- Many drinking water criteria are economically based and not health risk based.

As noted above, relocation of export facilities to the Sacramento River will increase residence time in the Delta. This increased residence time may encourage the growth of toxic blue-green algae, which has become a serious problem in recent years. Bioaccumulating constituents like selenium and methyl-mercury or pollutants like DDT and dioxin will have more opportunity to work their way up the food chain. Increases in the concentration of mercury in fish tissue would

---

[2] US EPA, as part of endangered species consultations for the California Toxics Rule, agreed to have the US Geological Survey model the fate and transport of selenium in the Bay-Delta Estuary and the information would serve as the basis for revised water quality criteria. USGS completed the study in December 2010 and it indicated that the Bay-Delta standards should be lowered from 5 ug/l to 1 ug/l or less, depending on the residence time of selenium. The study can be found at: www.epa.gov/region9/water/ctr

further threaten the health of the Delta's large subsistence fishing community. Longer residence times will increase the timeframe for oxygen demanding constituents to reduce oxygen levels in channels already identified as impaired because of low dissolved oxygen.

An alternative conveyance facility and reduction in Sacramento inflow will impact dissolved oxygen levels in the Mokelumne River and Stockton Deep-Water Ship Channel. Presently, flow from the Sacramento is diverted through the cross-channel into the Mokelumne and San Joaquin River as it is drawn to the south Delta pumping facilities. The presence of better quality Sacramento River water in the central Delta and the reverse flows in the San Joaquin at Stockton served to somewhat ameliorate oxygen depletion in the reach below Stockton.

Presently, some part of the pollutant load in the San Joaquin River is drawn to the pumps via Old River, Middle River, Turner Cut and Columbia Cut and exported or "siphoned" south. Any reduction of this "siphon" mechanism would also affect nutrients and numerous other pollutants in the eastern and southeastern Delta. It would likely increase the spatial distribution of water quality impacts into the Central Delta. For example, it could increase nutrient loading to the ship channel exacerbating dissolved oxygen problems. Selenium concentrations might increase in the Delta to levels comparable to those found in wildlife in Suisun Bay. EC impairment might expand into the eastern Delta.

Alternative conveyance and reduction of dilution and outflow will significantly increase the concentration of salt in channels further impacting the yield of Delta agriculture. It will also reduce salinity variability and encourage the spread of certain undesirable invasive species. BDCP has been referred to as a habitat expansion plan for the overbite clam *Potamocorbula amurensis.*

To summarize, the Delta and its tributary streams are formally identified as impaired by a broad suite of pollutants. Water quality criteria have been developed for only a very small subset of the chemicals found in these waters. These criteria fail to adequately consider additive/synergistic, bioaccumulative and chronic/sublethal effects or multiple stressors acting on an already weakened aquatic ecosystem. Increased diversion or routing of good quality dilution flows around the estuary will result in increased concentration and residence time of pollutants. Increased residence time exacerbates the effects of toxic and bioaccumulative pollutants. Reduced diversion and increased Delta flow enhances flushing of pollutants and decreases pollutant concentration.

The BDCP and its EIR/EIS fail to comprehensively analyze and address potential impacts to fish, wildlife and human health from reduced water quality caused by loss of dilution, increased residence time and modified channel hydrology. They also fail to include a comprehensive antidegradation analysis required by the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act.

2. BDCP's Analysis of Water Quality is Technically Invalid and Inconsistent with Prevailing Standards.

"All Models are Wrong, Some are Useful." Statistician E. P. Box

The approach to identifying impacts to water quality is fundamentally and technically flawed. Properly calibrated and verified, comparative models are useful in distinguishing relative differences between alternatives. However, comparative models like CalSim II or DSM2 are not designed and are unable to make credible short-term predictions. There are a number of predictive water quality models that have been designed, peer-reviewed and approved for assessing water quality – but these readily available models were not used.

The BDCP misuses tiered comparative models in an attempt to evaluate potential exceedances of one-hour and four-day water quality criteria that are based upon a not-to-be-exceeded more than once-in-three years standard. More frequent occurrences could, in and of themselves, lead to 303(d) listings of impairment that would be significant impacts. This misuse of modeling appears to be an ill-disguised attempt to minimize and deflect attention from the obvious impacts of diverting 2.5 MAF of freshwater around a severely polluted Delta that is already suffering from a chronic lack of flow. As such, it seriously understates the number and magnitude of adverse impacts.

Models are complex simulations that, at their best, only represent an idealization of actual field conditions. Models can be a black box with a "trust us" outcome. They must be used with extreme caution to ensure that the underlying model assumptions hold for the site-specific situations being modeled. Subtle changes in coefficients, assumptions or input data can dramatically alter output. It is crucial that models be properly calibrated and verified. The design parameters, assumptions, input data, calibration and validation must be transparent in order to be able to meaningfully evaluate the ability to accurately project values.

A critical problem arises when decision makers attribute more precision to modeling results than is warranted and where a model's output is misused to make definitive comparisons and predictions. While models can be employed to inform analysis, they cannot provide near-certain conclusions that significant environmental effects will or will not occur or will or will not be mitigated, especially where common sense and existing knowledge indicate otherwise.

The EIR/EIS, Table 4-1. Overview of BDCP EIR/EIS Modeling Tools, shows that several models were used to simulate water quality projections for the various project alternatives:

- *Artificial Neural Network (ANN) for CALSIM II An ANN has been developed for CALSIM II that attempts to mimic the flow-salinity relationships in the Delta, as simulated in DSM2. The ANN attempts to statistically correlate the salinity results from a particular DSM2 model run to the various peripheral flows (Delta inflows, exports and diversions), gate operations and an indicator of tidal energy.*
- *CALSIM II simulates operations of the SWP, CVP and areas tributary to the Sacramento-San Joaquin Delta. The model, based on inputted priorities and constraints, determines monthly river flows and diversions, Delta flows and exports, reservoir storage, deliveries to project and non-project users, and controls on project operations. CALSIM II results are used to determine water quality, hydrodynamics, and particle tracking in the DSM2 model.*

- *Delta Simulation Model II (DSM2) DSM2 is a one-dimensional mathematical model that simulates hydrodynamics, water quality, and particle tracking throughout the Delta based on flow data generated from CALSIM II outputs. It describes the existing conditions in the Delta as well as performs simulations for the assessment of incremental environmental effects caused by facilities and operations. The model can be used to calculate stages, flows, velocities, mass transport processes for conservative constituents, and transport of individual particles. HYDRO provides the flow input for QUAL and PTM. QUAL simulates one-dimensional fate and transport of conservative water quality constituents given a flow field simulated by HYDRO. PTM simulates pseudo three-dimensional transport of neutrally buoyant particles based on the flow field simulated by HYDRO.*
- *Particle Tracking Model (PTM) PTM simulates fate and transport of conservative and non-conservative water quality constituents throughout the Sacramento-San Joaquin Delta given a flow field simulated by HYDRO. The model uses velocity, flow, and stage output from DSM2-HYDRO. Outputs are used to estimate the effects of hydrodynamic changes on the fate and transport of larval fish, other covered species, and toxics through the Delta, as well as entrainment of larval fish at various locations. It allows assessment of particle fate, transport, and movement rate from numerous starting points to numerous end points. It provides information on movement of planktonic larval fish, such as delta and longfin smelt, in a tidal environment and is used extensively in Central Valley fishery assessments.*
- *DSM2-HYDRO is a one-dimensional hydraulic model used to predict flow rate, stage, and water velocity in the Delta and Suisun Marsh at a 15-minute timestep.*
- *DSM2-QUAL simulates multiple conservative and non-conservative constituents including dissolved oxygen, carbonaceous BOD, phytoplankton, organic nitrogen, ammonia nitrogen, nitrate nitrogen, organic phosphorus, dissolved phosphorus, TDS and temperature. The model is used to predict water temperature, dissolved oxygen, and salinity in the Delta and Suisun Marsh at a 15-minute timestep.*

All of the DSM2 models require data provided by CalSim II.

The Review of the Draft BDCP EIR/EIS and Draft BDCP conducted by the Delta Independent Science Board (15 May 2014) observed,

> *"As noted for other chapters in the DEIR/DEIS, a concise and informative summary of the chapter would be extremely useful to readers and reviewers. This chapter, covering water quality impacts of the different Alternatives, is not very informative because of its reliance on a few modeling approaches, most notably CALSIM and DSM2, without an explanation of the limitations of these models. There is a noted lack of emphasis on validating model outputs with observational data, as well as a lack of any presentation or discussion of the uncertainties associated with the models."* Page B-22.
>
> *As stated above, there is an over-reliance on model outputs, both to describe existing conditions as well as to project the effects of Alternatives on water*

> *quality constituents. There do not seem to be either a) attempts to compare model outputs for existing conditions to existing water quality data, or b) calls for monitoring of future conditions in order to inform adaptive management of Draft BDCP implementation. Because models will always be incorrect, such observational data are obviously required. Moreover, models were run for only certain constituents and not others; this needs to be clarified and the reasons for selective applications of models should be explained.* Page B-23.

3. BDCP's Inappropriate Use of CalSim II.

CalSim II is like Aladdin's Lamp; it grants wishes to whoever rubs it. CalSim II can be manipulated to produce desired results. Even properly operated it is only as accurate as the data and assumptions that are plugged into the model. It has previously been used to project a false certainty that impacts will be minor. For example, it has been used to show that salmonid mortality will increase by a specific percentage and discussion of possible error or of ranges of possible outcomes has been entirely absent. The model cannot possibly produce such certainty. At best it can predict, given a certain set of data and assumptions, a range of possible outcomes, with some outcomes potentially more probable than other, and with all predictions limited by both known and unknown sources of error.

CalSim II is a highly complex simulation model of a complex system that requires significant expertise to run and understand. Consequently, only a few individuals concentrated in the Department of Water Resources, U.S. Bureau of Reclamation and several consulting firms understand the details and capabilities of the model. State Water Resources Control Board (SWRCB) staff cannot run the model. To the extent CalSim II is relied upon, the EIR/EIS must be transparent and clearly explain and justify all assumptions made in model runs. It must explicitly state when findings are based on post processing and when findings are based on direct model results. And results must include error bars to account for uncertainty and margin of safety.

As an optimization model, CalSim II is hardwired to assume perfect supply and perfect demand. The notion of perfect supply is predicated on the erroneous assumption that groundwater can always be obtained to augment upstream supply. However, the state and federal projects have no right to groundwater in the unadjudicated Sacramento River basin. Operating under this assumption risks causing impacts to ecosystems dependent upon groundwater basins in the areas of origin. The notion of perfect demand is also problematic, as it cannot account for the myriad of flow, habitat and water quality requirements mandated by state and federal statutes. Perfect demand assumes water deliveries constrained only by environmental constraints included in the code. In other words, CalSim II never truly measures environmental harm beyond simply projecting how to maximize deliveries without violating the incorporated environmental constraints.

As a monthly time-step model, CalSim II cannot determine weekly, daily or instantaneous effects; i.e., it cannot accurately simulate actual instantaneous or even weekly flows. It follows that CalSim II cannot identify real-time impacts to objectives or requirements. Indeed, DWR admits, "CalSim II modeling should only be used in 'comparative mode,' that is when comparing the results of alternate CalSim II model runs and that 'great caution should be taken when comparing actual data to modeled data.'"[3] Since CalSim II results are employed as boundary conditions by subsequent water quality models, like DSM2, those limitations undermine efforts by subsequent models to accurately evaluate specific exceedances of water quality criteria or impacts to water quality.

CalSim II assumes foresight and compliance by project operators. However, this cannot satisfy CEQA/NEPA's mandates to analyze and disclose the full spectrum of potential environmental impacts caused by a project vis-à-vis a no-project and other alternatives. A report produced by the National Heritage Institute summarizes this flaw by "call[ing] into question the use of CalSim II as a tool for environmental impact assessment, since it is changes in the environment associated with specific projects and the satisfaction of arbitrary constraints which is the critical focus of environmental review."[4]

A formal peer-review of CalSim II was highly critical and detailed numerous inadequacies in the model. Among these was the opinion that CalSim II "has not yet been calibrated or validated for making absolute prediction values."[5]

The Department of Civil Engineering University of California at Davis conducted a comprehensive survey of members of California's technical and policy-oriented water management community regarding the use and development of CalSim II in California. Detailed interviews were conducted with individuals from California's water community, including staff from both DWR and USBR (the agencies that created, own, and manage the model) and individuals affiliated with consulting firms, water districts, environmental groups, and universities.[6]

The results of the survey, which was funded by the CalFed Science Program and peer-reviewed, should serve as a cautionary note to those who make decisions based on CalSim II. The report cites that in interviewing DWR and USBR management and modeling technical staff: "*Many interviewees acknowledge that <u>using CALSIM II in a predictive manner is risky and/or inappropriate</u>, but without any other agency-supported alternative they have no other option.*" The report continues that: "All users agree that CalSim II needs better documentation of the model, data, inputs, and results. CalSim II is data-driven, and so it requires numerous input files, many of which lack documentation," and "There is considerable debate about the current and desirable state of CalSim II's calibration and verification," and "Its representation of the SWP and CVP includes many simplifications that raise concerns regarding the accuracy of results." It

---

[3] Answering Brief for Plaintiff-Intervenor-Appellee California Department of Water Resources, Appeal from the United States District Court for the Eastern District of California, No. 1:09-cv-407, Case: 11-15871, 02/10/2012, ID: 8065113, page 15.

[4] Payne, J. and Purkey, D. 2005. An Environmental Review of CalSim-II: Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model." Page 14.

[5] Close, A, et al. 2003. A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California, Submitted to the California Bay Delta Authority Science Program, Association of Bay Governments, Oakland, California. 4 December 2003. Page 9.

[6] Ferreira, Ines C., et al. 2005. Musings on a Model: CalSim II in California's Water Community, published in San Francisco Estuary & Watershed Science. March 2005. 13 Pages.

reported, "Many interviewees are concerned that CalSim II's monthly time step cannot capture hydrologic variability adequately and thus does not compute water exports and export capacity accurately, both of which are significant factors in system operations," and, "The model's inability to capture within-month variations sometimes results in overestimates of the volume of water the projects can export from the Sacramento- San Joaquin Bay-Delta and makes it seem easier to meet environmental standards than it is in real operations." The study concluded by observing, "CalSim II is being used, and will continue to be used, for many other types of analyses for which it may be ill-suited, including in absolute mode."

More recently, Walter Bourez of MBK Engineers made a presentation on BDCP operations modeling at the 17 January 2014 meeting of the Delta Independent Science Board.[7] The presentation concluded:

- *Incorporation of climate change contains errors and does not incorporate adaptation measures.*
- *BDCP's "High Outflow Scenario" is not sufficiently defined for analysis.*
- *BDCPs simulated operation of the dual conveyance, coordinating proposed North Delta diversion facilities with existing South Delta diversion facilities, is inconsistent with the project description.*
- *BDCP models do not accurately reflect anticipated changes in CVP and SWP operations with BDCP.*
- *Independent modeling of the BDCP revealed differences in CVP and SWP operations and water deliveries from the analysis disclosed for the Draft EIR/EIS. Total exports would increase about 200 TAF and Delta outflow would decrease approximately 200 TAF while the North Delta intake would divert 680 TAF more and the South Delta intakes would divert 460 TAF less than projected in BDCP modeling.*

A reduction of Delta outflow coupled with an even larger reduction in the inflow of better quality Sacramento River water into the Central Delta would exacerbate water quality problems. This reduction on outflow and increase in exports, plus the failure to accurately model climate change and CVP and SWP operations, undermines DSM2's assessment of water quality conditions and resulting impacts from operation of BDCP, since DSM2 relies on modeling results generated by CalSim II.

A consortium of water agencies including Contra Costa Water District, East Bay Municipal Utility District, Friant Water Authority, Northern California Water Association, North Delta Water Agency, San Joaquin River Exchange Contractors Water Authority, San Joaquin Tributaries Authority and Tehama Colusa Canal Authority asked MBK Engineers to review the CalSim II modeling studies performed as part of the BDCP. A 29-page report, supported by a 72 page technical appendix, summarized their analysis of the BDCP model. MBK Engineers found that:

---

[7] Can be found at, http://deltacouncil.ca.gov/sites/default/files/documents/files/BDCP_Review_ISB_2014_01_17Final_sent.pdf

> *"There are three basic reasons why the BDCP Model cannot be used to determine the effects of the BDCP: 1) the no action alternatives do not depict reasonable operations due to climate change assumptions, 2) operating criteria used in the BDCP Alternative 4 result in unrealistic operations, and 3) updates to CalSim II since the BDCP modeling was performed almost 4 years ago alter model results."* (P. 3)
>
> *"The CalSim II model is the foundational model for analysis of the BDCP, including the effects analysis in the Draft BDCP and the impacts evaluation in the Draft EIR/EIS. Results from CalSim II are used to examine how water supply and reservoir operations are modified by the BDCP, and the results are also used by subsequent models to determine physical and biological effects, such as water quality, water levels, temperature, Delta flows, and fish response. Any errors and inconsistencies identified in the underlying CalSim II model are therefore present in subsequent models and adversely affect the results of later analyses based on those subsequent models."* (P. 10)
>
> *"Hydrologic modeling of BDCP alternatives using CalSim II has not been refined enough to understand how BDCP may affect CVP and SWP operations and changes in Delta flow dynamics. Better defined operating criteria for project alternatives is needed along with adequate modeling rules to analyze how BDCP may affect water operations."* (P. 27)

Flow Science Inc., at the request of the Sacramento Regional County Sanitation District, reviewed documents and model results associated with the BDCP environmental review process in order to determine how the proposed BDCP alternatives might impact Sacramento River temperatures at Freeport. In a 23 April 2014 Technical Memorandum, they stated:

> *"As noted above, the corrections to the DSM2 temperature boundary conditions have a substantial effect on the temperatures at Freeport. In additions, the methodology for determining the temperature boundary conditions (for both the original and corrected boundary conditions) is questionable because the same set of temperature boundary conditions are used for all BDCP alternatives. Changes in boundary conditions between scenarios reflect only climate change effects and not different BDCP or upstream reservoir operations. That is, all ELT simulations used the same temperature boundary conditions for all BDCP alternatives, and all the LLT simulations used the same temperature boundary conditions for all BDCP alternatives. Clearly, with this approach the modeling will predict no (or minimal) impacts of the BDCP on the temperature at Freeport, since Freeport is located close to the boundary. However, the various BDCP alternatives are likely to result in substantially different river flows at different times of the year (e.g., whether or not Fall X2 is implemented may cause substantially different reservoir releases and river flows)."* (P. 2)

Flow Science recommended, *"that SRCSD comment the EIR does not contain information - and the modeling data upon the EIR is based are insufficient – to support any conclusions about how*

Sacramento River temperatures at Freeport may change in the future." (P. 7) The same flaws identified by Flow Science would extend to evaluating the potential impacts resulting from various BDCP temperature scenarios on water quality constituents and fisheries.

The Review of the Draft BDCP EIR/EIS and Draft BDCP conducted by the Delta Independent Science Board (15 May 2014) observed,

> *"The major analytical problem is the gap between CALSIM-II modeling of the water-supply system and actual operations. The State Water Project and Central Valley Project account for only a part of the water management decisions and impacts in this vast system. DWR and USBR modeling has improved considerably in recent decades but remains centered on the SWP and CVP. This limited modeling therefore largely ignores or oversimplifies most water management decisions in California, which are those taken by local and regional governments and water users. The limited modeling thus seems inadequate for impact analysis of a system governed largely by local agencies."* Page A-24.

4. BDCP's Inappropriate Use of DSM2

As described in the BDCP EIR/EIS (5A-A34), DSM2 is a one-dimensional hydrodynamics, water quality and particle tracking simulation model used to simulate hydrodynamics, water quality, and particle tracking in the Sacramento-San Joaquin Delta. It is a data-intensive DWR model that runs for a limited period (only 16 years) and has never been peer-reviewed. Several of its modules have only received limited validation and calibration. For example, its particle tracking module has been severely criticized.[8] The EIR/EIS describes its limitations, at 5A-A49-50, as:

> *DSM2 is a 1D model with inherent limitations in simulating hydrodynamic and transport processes in a complex estuarine environment such as the Sacramento – San Joaquin Delta. DSM2 assumes that velocity in a channel can be adequately represented by a single average velocity over the channel cross-section, meaning that variations both across the width of the channel and through the water column are negligible. DSM2 does not have the ability to model short-circuiting of flow through a reach, where a majority of the flow in a cross-section is confined to a small portion of the cross-section. DSM2 does not conserve momentum at the channel junctions and does not model the secondary currents in a channel. DSM2 also does not explicitly account for dispersion due to flow accelerating through channel bends. It cannot model the vertical salinity stratification in the channels.*
>
> *It has inherent limitations in simulating the hydrodynamics related to the open water areas. Since a reservoir surface area is constant in DSM2, it impacts the stage in the reservoir and thereby impacting the flow exchange with the adjoining channel. Due to the inability to change the cross-sectional area of the reservoir*

[8] Panel Review of the CA Department of Fish and Game's Quantifiable Biological Objectives and Flow Criteria for Aquatic and Terrestrial Species of Concern Dependent on the Delta, A2: Discussion of the DSM2 PTM, 2010, P. 17 - 19.

inlets with changing water surface elevation, the final entrance and exit coefficients were fine tuned to match a median flow range. This causes errors in the flow exchange at breaches during the extreme spring and neap tides. Using an arbitrary bottom elevation value for the reservoirs representing the proposed marsh areas to get around the wetting-drying limitation of DSM2 may increase the dilution of salinity in the reservoirs. Accurate representation of RMA's tidal marsh areas, bottom elevations, location of breaches, breach widths, cross-sections, and boundary conditions in DSM2 is critical to the agreement of corroboration results.

For open water bodies DSM2 assumes uniform and instantaneous mixing over entire open water area. Thus it does not account for the any salinity gradients that may exist within the open water bodies. Significant uncertainty exists in flow and EC input data related to in-Delta agriculture, which leads to uncertainty in the simulated EC values. Caution needs to be exercised when using EC outputs on a sub-monthly scale. Water quality results inside the water bodies representing the tidal marsh areas were not validated specifically and because of the bottom elevation assumptions, preferably do not use it for analysis.

The Review of the Draft BDCP EIR/EIS and Draft BDCP conducted by the Delta Independent Science Board (15 May 2014) observed,

"DSM2 used for salinity-flow analysis is a one-dimensional model having inherent limitations in simulating open water areas, flow in bends and small channel, inlet/outlets and three-dimensional turbulent mixing, particularly with sea level decimeters higher than today's." Page A-12

In other words, in an exceedingly complex Delta with myriad meandering small channels and constantly changing flows, DSM2 modeling output inadequately accounts for varying velocities and secondary currents, channel junctions and open waters, stratification, fluctuating channel beds, turbulent mixing, surface waves, sediment resuspension and agricultural inputs and diversions. And, as previously discussed, DSM2 is dependent on flawed CalSim II output data regarding flows and boundary conditions.

For example, fluctuating channel beds directly affect water quality. In the renewal of the NPDES permit for Sacramento Regional County Sanitation District's NPDES permit, it was found that the bed of the Sacramento River fluctuates as much as six feet near the outfall diffuser. Modeling revealed that bottom contours had a direct effect on whether constituent plumes from the diffuser exceeded water quality standards. Discharges from the Stockton Wastewater Treatment facility experienced a somewhat different problem. Because of an abrupt turn in the river below the outfall, pollutants tended to concentrate along one bank and had the potential to exceed water quality standards. Consequently, Stockton was unable to qualify for a mixing zone. Another example is the relatively recent sediment buildup blocking flow into the head of Steamboat Slough, which has reduced the depth of the entrance from approximately nineteen feet to ten feet. While not hindering boating navigation, the underwater barrier certainly affects fish migration, flow and potentially water quality. Sediment buildup and scouring in channels is a constant in the Delta. The failure to continually update information on channel bathymetry undermines DSM2's ability to accurately model hydrology and water quality.

While the EIR/EIS discusses the limitations of DSM2, it fails to account for and disclose the uncertainty of model results There are few, if any, error bars attached to predictions and comparisons to indicate to makers and the general public the relative confidence level in the results. The EIR/EIS is deficient without discussion of the degree of uncertainty in results.

Whatever the merits of DSM2 for comparative analysis, it is fundamentally unable to model or identify specific violations of water quality criteria or other impacts to water quality. The EIR/EIS acknowledges that the North Delta diversion facility will increase the percentage of more polluted San Joaquin River water in the Delta. It also acknowledges that BDCP will increase the residence time of water in the East, South, West and North Delta over existing conditions (Table 5C.5.4-14, p. 5C.5.4-84, BDCP). The diversion of two and a half MAF of Sacramento River water will inevitably change the constituent composition and hydrology of the estuary. Changes in hydrology affect the fate and transport of contaminants, which in turn, affect beneficial uses.

As previously discussed, water quality criteria for aquatic life are established on a one-hour or four-day basis not to be exceeded more than once in three years. Exceedances of these criteria cause direct adverse impacts to listed species and other aquatic life. Exceedances of human health criteria can have direct adverse impacts to people. Exceedances of criteria protecting other identified beneficial uses of water will adversely impact those who rely on the beneficial use. For example, multiple exceedances of a pollutant within a waterway would qualify the waterway for listing as an impaired waterbody on the CWA 303(d) list. Such a listing would have enormous financial implications for the municipalities and business discharging wastewater and stormwater into the Delta. NPDES permits and Waste Discharge Permit requirements would become more stringent entailing expensive facility upgrades and enhanced management practices.

The data and models relied upon by BDCP in this EIR/EIS are incapable of evaluating and predicting the potential adverse impacts by the project on water quality. They may confirm common sense: that the removal of 2.5 MAF of freshwater from the Delta will inevitably increase the concentration and residence time of salinity and a number of conservative constituents in the Delta. However, they cannot credibly predict or quantify exceedances of specific water quality criteria for the universe of constituents, especially non-conservative constituents, which exist and interact in the estuary. Consequently, they are unsuitable for analyzing and unable to make the effects determinations described in Chapter 8, Section 8.4.2.3, pp. 8-75 & 8-76. A vast discretionary project with potential to cause great harm that will certainly have major unintended consequences should not proceed until the significant impacts of that project on water quality can be conclusively identified and addressed.

5. BDCP's Inappropriate Use of "Best" Professional Judgment.

Professional judgment is frequently employed but not defined in the EIR/EIS. Chapter 8, Section 8.4.2.1, Screening Analysis and Results, page 8-173, states:

> *This water quality analysis assessed the potential effects of implementing the various alternatives on 182 constituents (or classes of constituents). The initial analysis of water quality effects, referred to as the "screening analysis" in the Methods of Analysis section (above) resulted in the following findings. Of the 182 constituents, 110 were determined to have no potential to be adversely affected by the alternatives to an extent to which adverse environmental effects would be expected. Historical data for these constituents showed no exceedances of water quality objectives/criteria in the major Delta source waters, were not on the State's 303(d) list in the affected environment, were not of concern* ***based on professional judgment*** *or scoping comments, and had no potential for substantial long-term water quality degradation. Consequently, no further analyses were performed for these 110 constituents. Conversely, further analysis was determined to be necessary for 72 constituents. Of these, 15 are addressed further in the Screening Analysis itself in Appendix 8C because they did not warrant alternative-specific analyses, and 1 - temperature - is addressed in Chapter 11, Fish and Aquatic Resources. The remaining 56 constituents are addressed in the Environmental Consequences section, and are contained in the sections noted in Table 8-61.*

Through every step in the screening and evaluative process, professional judgment was used in determining whether a constituent had the potential to exceed thresholds of significance, should be carried forward for further assessment, was a 'constituent of concern,' whether it should be addressed qualitatively or quantitatively and whether the project could result in significant impacts to specific constituents. Of the 182 constituents that were analyzed, detailed assessments were performed on 24 and of those, 8 were assessed quantitatively (modeling, ratios) and 16 were assessed qualitatively (professional judgment).

Unfortunately, the EIR/EIS does not indicate whether professional judgment followed a rigorous step-by-step formal process, if an Ouija board, crystal ball or fortune-teller was involved or if conclusions were simply pulled from someone's arse. It fails to adequately discuss the methodology, science, criteria or analysis used to add, remove or modify constituent inclusion in the screening analysis or to determine the degree of impact significance. There is no discussion of why limited data sets were relied upon or why the more extensive data sets from regulatory programs were ignored. Inadequate data limits professional judgments. There is no discussion justifying the reliance on boundary water quality conditions and the exclusion of the extensive pollutant loading that occurs in the Delta in reaching conclusions. There is no discussion on the use of average or median constituent concentrations or the 95^{th} or average percentile for assessing the potential to violate one-hour or four-day criteria that should not be violated more than once in three years. There is no discussion or attempted quantification regarding the uncertainty of conclusions. Nor is there any discussion of how heavily criticized comparative models, used outside their temporal, spatial and resolution limits, may or may not be sufficient for making explicit determinations regarding the potential effects of BDCP on constituents and impacts to water quality standards caused by a modified hydrology, reduced dilution and increased residence time.

It is the responsibility of those who rely on professional judgment, in the absence of conclusive information, to hold paramount the safety, health and welfare of the public and the environment. Professional judgment must the predicated on ethics and conformance with the respective codes or standards of professional conduct. Professional judgment requires information sufficient to achieve an acceptable degree of accuracy, a working knowledge of the science and criteria, and a degree of synthesis and depth of knowledge necessary to make sound judgment without harm to the environment. An intelligent evaluation of the criteria and a thorough engineering analysis is critical to professional judgment. Professional judgment cannot reside in a black box, but has a responsibility to the public's trust. Professional judgment cannot serve as a substitute for the failure to collect and evaluate adequate data. Professional judgment must disclose a transparent process where explanation of the factors involved, how conclusions were arrived at and the uncertainty of those conclusions is weighed or evaluated. There must be an attempt to quantify uncertainty with error bars or detailed discussion. Whatever professional judgment is, the abject and pervasive failure in the EIR/EIS to acknowledge, quantify and discuss the uncertainty of conclusions is not professional judgment: it is an appalling display of amateurism.

Neither the plan nor EIR/EIS comport with prevailing standards for technical analysis, which is why BDCP's documents are inappropriate, technically invalid and fail to meet the fair disclosure requirements of CEQA and NEPA.

6. Reliance Upon a Truncated and Inadequate Data Set to Screen, Evaluate and Predict Impacts to Water Quality is Technically Indefensible.

Appendix 8C describes the screening analysis. Section 8C.1.1, P. page C-1, Data Sources, states,

> *"This section describes sources for data used in the screening analysis. Water quality data in the Delta has been collected by a myriad of public and private organizations. However, for consistency and due to data availability concerns, the input data for the screening analysis was limited to two data sets that were publically available via the web and managed by a public agency (i.e., data from the DWR Water Data Library and the Bay Delta and Tributaries Project [BDAT])."*

Both data sets are extremely limited. The Bay Delta and Tributaries Project (BDAT) data set is relatively old and is not even presently available on the DWR web site. The DWR data set ignores an enormous quantity of data collected, pursuant to stringent protocols, by other agencies, as evidenced by the extremely few samples of numerous constituents collected. A number of priority pollutants were never sampled or sampled only a few times.

The selection of sites arbitrarily limited the amount and kinds of ambient data that was collected and excluded numerous toxic constituents identified as carcinogens, reproductive toxins, endocrine disruptors and immune suppressors. One, of many, examples is Bis(2-

ethylhexyl)phthalate (DEHP), frequently known as Di(2-ethylhexy)phthalate. Bis(2-ethylhexyl)phthalate is discussed below under its own heading. Regulatory sampling in the Central Valley reveals its presence in both ambient waters and wastewater effluent at concentrations exceeding water quality criteria.

Section 8C.1.1.1, Table SA-1, page 8C-2, identifies the source water locations where data was collected on the upstream Sacramento River, upstream San Joaquin River and Chipps -Mallard – Suisun areas representing the Delta west boundary. It states,

> *"Interior Delta sites were not considered, because modeling performed in support of the Environmental Consequences impact assessments assumed no new sources of water quality constituents and, therefore, water quality concerns are assumed to arise primarily through altered mixing of Delta source waters."*

The assumption that there are "no new sources of water quality constituents" in the Delta illustrates the inadequacies of BDCP modeling or the determination of proponents to only accept facts that support their desired outcome. There are enormous sources of water quality constituents within the Delta. These sources include: municipal wastewater and stormwater discharges from Lodi, Stockton, Manteca, Lathrop, Tracy, Mountain House, Discovery Bay, Brentwood, Iron House Sanitary District, Rio Vista, Isleton and unincorporated areas; industrial and construction stormwater discharges; enormous return flows from irrigated agriculture and dairy operations; discharges from marinas and on-the-water recreational activities; illegal dumping; pesticide drift from aerial spray operations for agriculture and vector control, as well as extensive application of pesticides to control aquatic weeds; and ballast discharges from shipping and spills from bulk loading operations at the ports, among others. Indeed, the permitted waste discharge limits of municipal wastewater treatment plants within the Delta (excluding Sacramento), is over 100 MGD and is almost a third more flow than is flowing in the San Joaquin River at Vernalis, as of this writing.

Failure to consider and analyze the extensive mass loading of an astonishing array of contaminants within the Delta not only renders the screening analysis technically insufficient, it renders all of the subsequent assessments of water quality impacts technically invalid.

Table SA-6, pages 8C-22-27, identifies all constituents (182) measured at the boundary stations, number of times analyzed and detected, and minimum and maximum values reported in the data set.

Because of the extremely limited data set, many of the priority pollutants were not sampled or sampled infrequently. For example, aluminum was not sampled, although the NPDES permit for Sacramento Regional Wastewater Treatment Plant reveals that ambient aluminum in the Sacramento River exceeds the acute water quality criteria for freshwater aquatic life more than tenfold. Cadmium has only one data point on the San Joaquin and 25 (12 dissolved, 13 total) on the Sacramento. The average cadmium concentration on both rivers exceeds the acute and 4-day criteria for aquatic life, adjusted for hardness. The arbitrary selection of screening sampling sites eliminated extensive NPDES and other data sets that would have permitted a more defensible and accurate assessment of potential adverse impacts.

Table SA-11, Step 6 Water quality constituents (totaling 72) for which detailed assessment were performed, page BC-39, identifies which constituents were carried forward for further analysis and which assessments were conducted quantitatively and which were assessed qualitatively. Nine constituents were addressed quantitatively (i.e., modeling) and 63 were assessed qualitatively (i.e., best professional judgment). However, there is virtually no discussion in Appendix 8C or Chapter 8 of what constitutes a quantitative evaluation, the methodology employed, threshold levels and how conclusions were reached. The lack of transparency fails to comply with minimal professional standards for an EIR/EIS for a major water development project.

Chapter 8, Water Quality, Section 8.2.2.1, page 8.27, describes water quality monitoring program and sources of data. Noticeable absent are the vast data sets of the Regional Water Board's NPDES permitting program and Irrigated Lands Program.

Table 8-6, page 8-31, Locations Selected to Represent Existing Water Quality in the Delta, includes only three sites in the interior Delta: San Joaquin River at Buckley Cove, Franks Tract at Russo's Landing and Old River at Rancho del Rio. The data sources were identified as BDAT, again an old data set not currently available on the web. The use of only three sites to represent potential impacts to water quality in an 841 square mile Delta containing 700 miles of meandering waterways is technically indefensible and renders any assessment of impacts to water quality invalid.

Table 8-33, Median Metal Concentrations for Selected Sites, May 1988-September 1993, page 8-105, shows the total and dissolved concentration of the priority pollutants arsenic, cadmium, copper, lead and zinc at San Joaquin River at Buckley Cove, Sacramento River at Green's Landing, Sacramento River above Point Sacramento, San Joaquin River at Antioch Ship Channel, Old River at Rancho Del Rio, Suisun Bay at Bulls Head, Franks Tract and the San Joaquin River at Vernalis. Of these, Buckley Cove, Franks Tract and Old River are within the central Delta. All of the metals are hardness dependent but no hardness data was presented.

Taking the San Joaquin River at Buckley Cove as an example, we found that the lowest ambient hardness in the San Joaquin below the Stockton Wastewater Treatment Plant was 30 mg/l. Buckley Cove is only a few miles downriver from the Stockton Treatment Plant outfall. Table 8-33, shows that the mean ambient concentrations for copper, cadmium and lead (expressed as both dissolved and total recoverable) are 5 ug/l. Adjusting for hardness, per US EPA and SWRCB requirements, the concentrations of all three metals at Buckley Cove are potentially toxic to aquatic life. The hardness adjusted median dissolved or total concentrations of all three metals exceed the acute one-hour and chronic four-day toxicity criteria. As these metal concentrations are median values, the highest recorded concentrations of these metal would potentially be more toxic. The San Joaquin River in the Delta is already listed as impaired for unknown toxicity. Other examples could have been used, as we found relatively low hardness values elsewhere in the Delta; e.g., 36 & 39 mg/l at the Delta pumping plant headworks at Banks.

This issue is discussed more fully in comments on hardness dependent metals below, but it illustrates that the EIR/EIS is deficient in not analyzing the potential adverse impacts caused by the diversion of 2.5 MAF of Sacramento River water and the resulting loss of dilution and increased residence time on water quality and beneficial uses in the eastern Delta. Loss of dilution and increase in residence are recipes for water quality degradation. The EIR/EIS's claims are counterintuitive and without a detailed explanation of how conclusions were arrived at or inclusion of sufficient data to verify conclusions, the EIR/EIS is technically invalid and legally inadequate.

7. The Failure to Evaluate Numerous Toxic Constituents is Unacceptable.

As discussed above, failure to evaluate toxic chemicals because the arbitrarily selected data sets omitted analysis of those chemicals is unacceptable. Bis(2-ethylhexyl)phthalate (DEHP) is an example of a number of chemicals that are known to be highly toxic and for which monitoring data exists. Yet, because these constituents were not included in the very limited data sets used in evaluating impacts for BDCP, there is no analysis of the project's impacts for these constituents.

On 30 December 2009 the US EPA issued a press release announcing an *Action Plan* (a series of actions) on four chemicals raising serious health or environmental concerns, including phthalates. The Action Plan was to address the manufacturing, processing, distribution, and use of these chemicals. One of the phthalates listed is bis(2-ethylhexyl)phthalate, also commonly called di-(2-ethylhexyl)phthalate and abbreviated DEHP. Bis(2-ethylhexyl)phthalate is an organic compound and is produced on a massive scale by many companies. Phthalates were detected in greater than 75% of approximately 2,540 urinary samples collected from participants of the National Health and Nutrition Examination Survey (NHANES). Exposure in the United States to diethyl phthalate, dibutyl phthalate or diisobutylphthalate, benzyl butyl phthalate, and di-(2-ethylhexyl)phthalate is widespread.

Water quality standards for bis(2-ethylhexyl)phthalate were first established in California under the December 1992 National Toxics Rule (NTR), which was amended in 1999. On 18 May 2000, US EPA adopted the California Toxics Rule (CTR). The CTR promulgated new toxics criteria for California and, in addition, incorporated the previously adopted NTR criteria that were applicable in the state. Despite the current regulation under the CTR, US EPA has revised their recommended Ambient Criteria for bis(2-ethylhexyl)phthalate to a significantly lower number. This new lower criteria for bis(2-ethylhexyl)phthalate would result in more wastewater discharges being regulated to keep this plasticizer out of California's waterways.

EPA's existing regulation of bis(2-ethylhexyl)phthalate is based on human consumption of water and fish. EPA has also issued new information regarding the impacts to aquatic life:

> *"Of the 8 phthalates, BBP, DEHP, and DBP elicit the most toxicity to terrestrial organisms, fish, and aquatic invertebrates (EC, 2008a, Staples et al. 1997). Ecotoxicity studies with these phthalates showed adverse effects to aquatic organisms with a broad range of endpoints and at concentrations that coincide with measured environmental concentrations. Toxic effects were observed at*

environmentally relevant exposures in the low ng/L to µg/L range (Oehlmann et al. 2008).”

Sacramento Regional Wastewater Treatment Plant NPDES Permit includes the statement:

> “*The CTR includes a criterion of 1.8 µg/L for bis(2-ethylhexyl)phthalate for the protection of human health for waters from which both water and organisms are consumed… The maximum effluent concentration (MEC) for bis(2-ethylhexyl) phthalate was 8.1 µg/L out of 87 samples while the maximum observed upstream receiving water concentration was 0.58 µg/L out of 55 samples.*”

A CSPA review of phthalates in the Central Valley revealed that 27 wastewater treatment plants had levels of bis(2-ethylhexyl)phthalate in the discharge that presented a reasonable potential to exceed criteria. Receiving water levels in a number of tributaries to the Delta also exceeded criteria, including: Clear Creek (7 ug/l); Yolo Bypass (9 ug/l); Upper Sacramento near Red Bluff (10 ug/l); Deer Creek, tributary to the Yuba River (4 ug/l); Yuba River near Yuba City (10 ug/l); and the San Joaquin River near Turlock (12.3 ug/l) and near Stockton (8.1 ug/l).

Despite the concern by US EPA in issuing an Action Plan for bis(2-ethylhexyl)phthalate, widespread human exposure, the fact that bis(2-ethylhexyl)phthalate has been regulated in California since 1992, sampling is required as a condition of NPDES permits and bis(2-ethylhexyl)phthalate has been detected at levels exceeding criteria in both wastewater discharges and receiving waters that are tributary to the Delta; the EIR/EIS simply concludes that bis(2-ethylhexyl)phthalate is not of concern, is only found in low concentrations and analytical tools have only recently been developed.

The EIR/EIS Chapter 8, page 8-58, states that:

> “*In 2006, CCWD participated in a study to examine the toxicological relevance of EDCs and PPCPs in both raw source and treated water (Contra Costa Water District 2009). Of the 62 compounds analyzed, only five were detected in the treated water: sulfamethoxazole (pharmaceutical), meprobamate (pharmaceutical), atrazine (herbicide—endocrine disruptor), triclosan (pharmaceutical), and dioctyl phthalate (used to make plastics—endocrine disruptor). <u>The study concluded that detection occurred at low concentrations and should not pose any health threats</u>.*” (Emphasis added)

And Appendix 8C, page 15, states that:

> “*Examples of EDCs include natural plant and animal steroid hormones, metals (e.g., arsenic, cadmium, lead, and mercury), dioxins, PAHs, pesticides, pharmaceuticals and personal care products (PPCPs), and PCBs. Sources of anthropogenic EDCs include wastewater treatment plants, private septic systems, urban stormwater runoff, industrial effluents, landfill leachates, discharges from fish hatcheries and dairy facilities, runoff from agricultural fields and livestock enclosures, and land amended with biosolids or manure. Constituents of emerging*

> *concern (CECs) include the following classes of chemicals: perfluoranated compounds (e.g., PFOS, PFOA), polybrominated diphenyl ethers (PBDEs), PPCPs, and phthalates. <u>These chemicals are generally found in such low concentrations in the environment that only recently have analytical tools been developed to detect and quantify these concentrations</u>.*" (Emphasis added)

However, the EIR/EIS, in discussing the 2006 Contra Costa Water District Report, failed to consider other significant factors that may have biased the conclusions. Chapter 8, page 8-57, also observes:

> *"In 2001 and 2002, a survey of raw and treated drinking water from four water filtration plants in San Diego County showed the occurrence of several PPCPs including phthalate esters, sunscreens, clofibrate, clofibric acid, ibuprofen, triclosan, and DEET (Loraine and Pettigrove 2006). This is important because on average, roughly a third of the water in San Diego County originates from the Delta via conveyances of the SWP. According to the study, occurrence and concentrations of these compounds were highly seasonally dependent, and reached maximums when the flow of the San Joaquin River was low and the quantity of imported water was high. The maximum concentrations of the PPCPs measured in the raw water were correlated with low-flow conditions in the Delta that feed the SWP."*

For example, 2006 was an extremely wet year in both the Sacramento and San Joaquin river basins, while the preceding year (2005) was above normal in the Sacramento basin and wet in the San Joaquin basin. Had the CCWD study occurred during a drought, results might have been very different. The San Diego County study demonstrates that dry years and reduced dilution are correlated with constituent concentration. The EIR/EIS is deficient for failing to address phthalates and the array of other constituents that were excluded from analysis because of the data set selected.

8. Failure to Adequately Account for Changes in Dilution Undermines Water Quality Impact Analyses.

The EIR/EIS acknowledges that the SWP/CVP water diversions "…reduce the amount of water available for dilution and assimilation of contaminant inputs…" Chapter 8, page 8-14, lines 14-17) Table 8-38, Summary of Methodologies Used for Water Quality Impact Analyses, page 8-14 of Chapter 8, identifies the methodologies and tools employed for impact analyses. CalSim2 served as input to the DSM2 model. DSM2 addressed EC and DOC concentrations and flow fractions. Mass Balance, using flow fractions and constituents addressed the other constituents quantitatively, other than EC and DOC (apparently 6 constituents). Qualitative analysis addressed the remaining parameters (apparently 16 constituents) through a varied approach based on constituent and location but "attempted to estimate concentration changes attributable to the Alternatives."

CalSim II is a heavily criticized large-scale comparative model that runs in 30-day time steps. DSM2 is a heavily criticized, comparative, never-peer-reviewed model that takes CalSim II output and attempts to track particles, representing conservative constituents, through the myriad twisted channels of the Delta. Neither model is sufficient for addressing constituents that are toxic in low micrograms or nanograms with respect to one-hour and four-day criteria that are predicated upon a standard not to be exceeded more than once in three years. Professional judgment, as used in this document, embraces black-box conclusions based on extremely limited data sets collected from few locations and that ignores constituent loading in a heavily polluted estuary. This is not a recipe for making technically valid conclusions regarding available dilution or changes in dilution.

It is an undeniable fact that concentrations of constituents in the Sacramento River are considerably lower than concentrations of equivalent constituents in the San Joaquin River. It is an undeniable fact that removing 2.5 MAF of Sacramento River water decreases dilution and assimilative capacity and increases the residence time for constituents to interact with the environment in the Delta. It is an undeniable fact that many constituents in the Delta exceed applicable water quality criteria and numerous other constituents are extremely close to exceeding criteria. It is an undeniable fact that the Delta is part of a tidal estuary where constituents slosh back and forth with incoming and ebbing tides. It is an undeniable fact that the loss of dilution and increase in residence time in a tidal environment will increase the concentration of constituents. It is an uncontestable fact that this will increase degradation and violations of water quality standards. Yet, through sheer sophistry, magical modeling and black-box conclusions, the EIR/EIS blatantly proclaims that there will be no adverse impacts from the maelstrom of toxic pollutants that currently plague the Delta.

In the previous section on limited data sets, we discussed the San Diego County water filtration plant study that showed that occurrence of PPCP increased during periods when the plants received increased water supplies from the Delta. Chapter 8, page 8-57. It noted that,

> *According to the study, occurrence and concentrations of these compounds were highly seasonally dependent, and reached maximums when the flow of the San Joaquin River was low and the quantity of imported water was high. The maximum concentrations of the PPCPs measured in the raw water were correlated with low-flow conditions in the Delta that feed the SWP."*

Droughts are a normal condition in California. According to DWR, there have been 10 multi-year droughts of large-scale extent in the last 100 years, spanning 40 years or 40% of the time. The increase of an average of 2.5 MAF of water diverted under the Delta will, in effect, create more drought conditions experienced in the Delta regardless of actual weather occurring. It will exacerbate the impacts of drought on water quality. As global warming reduces Delta inflow, the project impacts will be substantially greater because of the tunnels.

The EIR/EIS, Chapter 8, page 8-449, lines 19-31, states in addressing nitrate that,

> *"When dilution is necessary in order for the discharge to be in compliance with the Basin Plans (which incorporate the 10 mg/L-N MCL by reference), not all of the assimilative capacity of the receiving water is granted to the discharger. Thus, limited decreases in flows are not anticipated to result in systemic exceedances of*

the MCLs by these POTWs. Furthermore, NPDES permits are renewed on a 5-year basis, and thus, if under changes in flows, dilution was no longer sufficient to maintain nitrate below the MCL in the receiving water, the NPDES permit renewal process would address such cases."

This statement confirms a basic lack of understanding of the NPDES permitting process in the Central Valley by the EIR/EIS. The Central Valley Regional Board has granted dischargers the entire assimilative capacity of a stream on a number of occasions. For example, the September 2006 NPDES Permit for Linda County Water District Wastewater Treatment Plant (NPDES No. CA0079651) granted the full assimilative capacity of the Feather River for EC to Linda County. Further, the Regional Board frequently issues NPDES permits without requiring an antidegradation analysis that would identify how much authorized but presently unused assimilative capacity has been granted and how much assimilative capacity remains for future allocation. Additionally, the Regional Board never requires watershed wide or basin wide antidegradation analyses. Consequently, there are a number of watersheds where more assimilative capacity has been authorized than remains and other waterways where assimilative capacity is presently exceeded but have not yet been placed on the 303(d) list. The suggestion that lack of assimilative would be addressed in subsequent NPDES renewal processes relies on a regulatory requirement that is not followed or enforced in practice.

9. The Assessment of Hardness Dependent Metals is Wrong and Leads to Significant Errors of Analysis.

The EIR/EIS's analysis of the family of hardness dependent metals is technically wrong. The discussion below is focused on copper but the comments are equally applicable to cadmium, lead, silver and zinc. In fact, even with the extremely limited data set, use of the proper methodology reveals that the San Joaquin River at Vernalis has the potential to exceed both the acute and chronic criteria for copper, cadmium, lead, zinc. The Sacramento River has the potential to exceed both the acute and chronic criteria for copper, cadmium and the chronic criteria for lead. Even using average concentrations and the 5^{th} percentile of hardness reveals potential to exceed some criteria. Silver was not sampled in the data sets provided.

Table 8N.1, Appendix 8N, Trace Metals, page 8N-1, Table 1, Concentration of dissolved copper in primary source waters to Delta, shows the maximum dissolved copper concentrations in the Sacramento River (9.5 ug/l), San Joaquin River, (8.0 ug/l) and San Francisco Bay (2.6 ug/l).

Chapter 8, Water Quality, page 8-170, Table 8-58, Water Quality Criteria and Objectives for Trace Metals (µg/L), presents the dissolved water quality standards for copper as 13 ug/l (acute, 1-hour average) and 9 ug/l (chronic, 4-day average).

Chapter 8, page 8-169, lines17-18, states, "*Criteria were calculated based on each source waters average and 5th percentile hardness.*" The toxicity of hardness dependent metals was based on average (58 mg/l) and the 5^{th} percentile hardness (39 mg/l, Sacramento River, appendix 8N6, table 11) rather than the lowest observed hardness (16 mg/l). Hardness dependent metals exhibit greater toxicity at lower hardness. Ambient criteria for acute values are applicable to short periods of time, acute 1-hour average concentrations and chronic 4-day average concentrations.

The Water-Quality Assessment of the Sacramento River Basin, California Water-Quality, Sediment and Tissue Chemistry, and Biological Data, 1995-1998 (Open-File Report 2000- 91) by the United States Geological Survey found the hardness of the Sacramento River at Freeport to be 19 mg/l as CaCO3, on 6 January 1997.[9] The USGS is a reliable source of information and there is no reason not to use the lowest reported hardness of 19 mg/l.

Page F-65 of Central Valley Regional Board Order No. R5-2010-0114-01, NPDES NO. CA0077682, for the Sacramento Regional Wastewater Treatment Plant states: "For the receiving water, the applicable copper chronic criterion is 3.0 µg/L and the applicable acute criterion is 4.0 µg/L, as total recoverable, based on a hardness of 26 mg/L (as CaCO3), using USEPA default translators. The maximum observed upstream total copper concentration was 20.4 µg/L, based on data from 1992-2008."

The rationale in the EIR/EIS for using the average and 5th percentile data points rather than the simple worst-case hardness is not presented. There is certainly no indication that a four-day average would be properly represented by an average of data points collected over a 24 year period. The worst-case conditions and the worst-case potential for toxicity have not been evaluated for hardness dependent metals. As can be seen from the Sacramento Regional NPDES permit, the regulatory agency responsible for water quality in most of the Delta, the Central Valley Regional Water Quality Control Board, assessed the applicable receiving water criteria using the lowest observed hardness of 26 mg/l. The permit was appealed because of its use of an elevated hardness value, among other things.

The procedures described in US EPA's *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* indicate that, except possibly where a locally important species is very sensitive, (freshwater or saltwater) aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of (name of material) does not exceed (the Criterion Continuous Concentration) µg/L more than once every three years on the average and if the one-hour average concentration does not exceed (the Criterion Maximum Concentration) µg/L more than once every three years on the average. The use of an average or 95th percentile hardness would potentially allow the criteria for hardness dependent metals to exceed the water quality criteria each time a hardness higher than the lowest recorded hardness is used to calculate the hardness. This in turn allows for exceedance of the criteria more than once in three years, the level EPA suggests would unacceptably affect aquatic life.

US EPA adopted new copper criteria in 2007 based on the biotic ligand model (BLM) which is a metal bioavailability model based on recent information about the chemical behavior and physiological effects of metals in aquatic environments. The EIR/EIS, page 8-171, explains that:

> "*The BLM criteria account for the aggregate effect of several different water quality parameters on copper toxicity in addition to hardness (e.g., dissolved organic carbon, pH, and various salt concentrations), with the protective*

---

9 http://ca.water.usgs.gov/sac_nawqa/Publications/ofr_2000-391/data_sw/Freeport/freefld.html

criterion being sensitive to DOC concentrations in water. When calculated based on the average of all necessary parameters and the 5th percentile DOC, copper BLM-based criteria were higher (i.e., less sensitive) than the corresponding non WER-adjusted copper criteria presented in Table 8-59. Therefore, the calculated hardness-based CTR copper criteria are found to be adequately protective of fish olfaction."

However, the EIR/EIS again uses average and 95th percentile values for the input values into the BLM model resulting in the situation where water quality is not protected during periods when low hardness occurs.

Using a hardness of 25 mg/l results in dissolved copper criteria of 2.7 ug/l (4-day average) and 3.6 ug/l (1-hour average) which is significantly more protective than the 9 ug/l and 13 ug/l, respectively, developed and used in the EIR/EIS. Using the worst-case hardness of 19 mg/l, as measured by the USGS results in even more restrictive criteria than that required by the Central Valley Regional Board. The EIR/EIS's conclusion on page 8-171 that "*the calculated hardness-based CTR copper criteria are found to be adequately protective of fish olfaction"* is simply misleading, wrong, non-protective and technically deficient.

10. The Analysis of Aluminum is Deficient.

Aluminum is identified as a water quality constituent for which a detailed assessment is performed (Table 8-61, p. 8-174), identified as a constituent carried forward in the screening analysis (Table SA-9, p. 8C-37) and subjected to qualitative analysis (Table SA-11, p. 8C-40). However, water quality data for aluminum is not included in the detailed table of constituents measured at boundary stations (Table SA-6, p. 8C-22) and there is no discussion of aluminum in Chapter 8.

The Sacramento River maximum aluminum concentrations are over 8,000 µg/L (Sacramento Regional Wastewater Treatment Plant NPDES Permit, page F-43, Order No. R5-2010-0114-021). The US EPA water quality criteria for the protection of freshwater aquatic life are four-day average (chronic) and one-hour average (acute) for aluminum are 87 ug/*l* and 750 ug/*l*, respectively. The drinking water standard (maximum contaminant level (MCL)), both state and federal, for aluminum is 200 ug/l. The draft EIR/EIS (8-764, Trace Metals) is quite simply wrong in stating that the primary source of aluminum in the Delta is due to wastewater discharges. As is stated above the background concentration of aluminum in the Delta, above the Sacramento Regional WWTP, was almost 92 times higher than EPA's chronic criteria for aluminum and more than ten times above the acute criteria which is necessary to protect aquatic life. This measured concentration of aluminum in the Delta also exceeds the drinking water standard by 40 times.

The failure to address aluminum in the Water Quality section is a serious omission causing the EIR/EIS to be incomplete and not in compliance with CEQA and/or NEPA.

11. Impacts on Existing Mixing Zones are Ignored.

The Central Valley Regional Water Quality Control Board has issued numerous NPDES permits that allow for mixing zones for numerous constituents in ambient waters. Mixing zones are controversial and only allowed following detailed analysis and modeling that defines the specific dimensions of a zone of initial dilution. Mixing zones are especially difficult in tidal areas as incoming and outgoing tides cause constituents to slosh back and forth: this tidal-action essentially re-doses the area. There must always be a zone of passage, because a mixing zone cannot legally prevent passage of aquatic life. The EIR/EIS does not identify, discuss or provide maps of existing mixing zones in the Delta.

Altering the flow regime in a waterbody would impact the hydraulic and perhaps the constituent assimilative capacity available for mixing zones. Failure to reevaluate and modify mixing zones within the Delta could have significant adverse impacts to the beneficial uses of receiving waters. Mixing zones were also issued based in part on the economic impact to wastewater dischargers to fully treat their wastestream to meet end-of-pipe limitations. The impacts of Alternative 4 to mixing zones, beneficial uses, the associated economics and a requirement for reissuing NPDES permits that contain mixing zones should be evaluated and discussed.

12. Additive and Synergistic Impacts are Not Considered.

The EIR/EIS identifies the Delta as being listed as impaired by numerous pollutants including unknown toxicity. It is reasonable to assume that additive or synergistic effects of the many listed constituents could be contributing to toxicity within the Delta. It is more than reasonable to believe that a massive hydrologic project that proposes to deprive an estuary of more than 2.5 MAF of freshwater, thereby altering the existing flow regime, increasing residence time and affecting the fate and transport of pollutants in a highly degraded Delta, will likely have an impact on additive and synergistic toxicological interactions. However, in reviewing the EIR/EIS, we could only find one sentence mentioning additive or synergistic effects in the 791 pages of Chapter 8, Water Quality, no mention in Appendix 8C, Screening Analysis and only one passing sentence in the 3,055 pages of Chapter 11, Fish and Aquatic Resources, Parts 1 & 2.

If two or more constituents are present together in water, they may exert a combined effect to aquatic life, which can be additive, antagonistic or synergistic. For example: zinc and cadmium are additive in toxicity; copper is more than additive with chlorine, zinc, cadmium and mercury, while it decreases the toxicity of cyanide. The toxicity to mayflies of phenol and ammonia at low concentrations is additive, but at higher concentrations is more than additive. Organophosphate pesticide mixtures frequently exhibit additive or synergistic effects, as do pyrethroid and organophosphate mixtures. Temperature, pH, hardness, salinity and dissolved oxygen levels can exacerbate toxic effects. Acute toxicity to aquatic life can occur even when none of the individual constituents in a mixture exceed a water quality standard. Loss of dilution or increases in residence time enhances toxicity. As many as fifteen different pesticides have been identified in a single sample of Delta waters.

US EPA and the Environmental Research Laboratory published a study of acute and chronic toxicity tests that were conducted to determine the effects of metals combined as mixtures at proposed water quality criteria concentrations and at multiples of the LC50 and obtained from tests on six metals with three aquatic species. Arsenic, cadmium, chromium, copper, mercury and lead caused nearly 100% mortality in rainbow trout and daphnids (*C dubia*) during acute exposure. These results point out the need for additional studies to determine the type and degree of interaction of toxicants because single chemical water quality criteria may not sufficiently protect some species when other toxicants are present concurrently. (http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=91005B2N.txt)

The Central Valley Basin Plan,[10] *Implementation, Policy for Application of Water Quality Objectives* requires that:

> *"Where multiple toxic pollutants exist together in water, the potential for toxicologic interactions exists. On a case by case basis, the Regional Water Board will evaluate available receiving water and effluent data to determine whether there is a reasonable potential for interactive toxicity. Pollutants which are carcinogens or which manifest their toxic effects on the same organ systems or through similar mechanisms will generally be considered to have potentially additive toxicity."* Implementation, page IV-17.00-18.00.

The section provides the specific methodology to be followed to determine additive toxicity.

The EIR/EIS is grievously deficient in failing to acknowledge or adequately address how the project's hydrological modifications and resulting changes in flow, residence time, dilution and the fate, transport and mixing of pollutants will affect aquatic species.

13. Analysis of Potential Impacts Related to pH is Deficient.

Appendix 8C, Section 8C.1.5.7, pH, Page 8C-19, states, in part, the following with regard to pH:

> "*Because pH is a fundamental property of water, it affects the chemistry of numerous other constituents within the water, and thus, in addition to having potential direct effects on beneficial uses (such as municipal and domestic water supply and aquatic organisms), can also affect beneficial uses indirectly by altering the chemistry and toxicity of other constituents in the water.*
>
> *Within the affected environment, pH is typically between 6.5 and 8.5. The pH within the affected environment is controlled primarily by natural factors, such as alkalinity from natural weathering of minerals and carbon dioxide concentrations controlled by algae and bacterial respiration. Figure 8C- 1 shows exceedance probabilities of historical pH data from 1975 to 2009 in the Sacramento River at Freeport/Greene's Landing, the San Joaquin River at Vernalis, and San Francisco Bay at Martinez. The data indicate that the Sacramento River and San*

[10] http://www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/index.shtml

> *Francisco Bay are within the Basin Plan objective range of 6.5 to 8.5 >95% of the time, while the San Joaquin River is between the limits >90% of the time. As water moves from these locations to areas within the Delta, pH changes as a result of natural factors, and therefore the pH at any given location within the Delta may have no correlation to the source waters that contribute water to that location. Given this, and given that the alternatives do not include components that would directly depress or elevate pH, it is not expected that pH would change substantially upstream of the Delta, within the Delta, or in the SWP and CVP Service Area under the alternatives, relative to Existing Conditions and (for Alternatives 1A–9) the No Action Alternative. Any negligible changes in pH that may occur in the water bodies of the affected environment would not be of frequency, magnitude and geographic extent that would adversely affect any beneficial uses or substantially degrade the quality of these water bodies, with regards to pH.*"

The quote graphically illustrates the inadequacies of the EIR/EIS's method of assessing pH. It only considers pH loading from tributary rivers to the exclusion of in Delta inputs. Review of the annual monitoring reports from the San Joaquin County and Delta Irrigated Lands Coalition reveals numerous exceedances of pH criteria, as do the annual reports submitted pursuant to the General Industrial and Construction Stormwater Permit program. There are many other sources including illegal dumping (the Delta is a favorite place to dump old batteries) and spills from bulk loading of petroleum coke, sulfur and other fertilizers at the Port of Stockton. The EIR/EIS fails to address how hydrologic modification and increased residence time in Delta channels affects pH impacts on water quality.

For drinking water, pH levels are important due to corrosive effects and adverse impacts to water treatment processes. For aquatic life, the pH range from 6.5 to 9 is considered nontoxic, however the toxicity of many constituents can be affected by changes in pH. Where pH levels are outside the 6.5 to 9.0 range, fish suffer adverse physiological effects increasing in severity until lethal levels are reached. The degree of dissociation of weak acids or bases is affected by changes in pH, which is important since the toxicity of several compounds is affected by the degree of dissociation. US EPA criteria recommend that rapid pH fluctuations should be avoided. The Central Valley Basin Plan water quality objective for pH limits shifts to no more than 0.5 pH units outside the 6.5 to 8.5 range.

The final page of Appendix 8C is Figure 8C-1, Probability of Exceedance for pH for Sacramento River at Freeport/Greene's Landing, San Joaquin River at Vernalis, and San Francisco Bay at Martinez for 1975-2009, shows that the Sacramento River and San Francisco Bay are below the 6.5 objective approximately 5% of the time and the San Joaquin River is below the pH objective almost 10% of the time. The EIR/EIS speaks as if this is a good record of compliance. It is not when one considers the potentially toxic impacts to aquatic life. US EPA Water Quality Criteria procedures are described in *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* and indicate that, except possibly where a locally important species is very sensitive, (freshwater or saltwater) aquatic organisms and their uses should not be affected unacceptably if the four-day average concentration of (name of material) does not exceed (the Criterion Continuous Concentration) µg/L more than once every three years on the average and if the one-hour average concentration does not exceed (the Criterion Maximum Concentration) µg/L more than once every three years on the average. While pH is not measured as a concentration, surely exceeding the objective 5 or 10% of the time is not an acceptable compliance record when other potentially toxic constituents are present.

The EIR/EIS states that "natural factors" will alter pH levels and any changes in pH would not be of frequency, magnitude and geographic extent that would adversely affect any beneficial uses or substantially degrade the quality of these water bodies. However, there is no information in the EIR/EIS supporting this claim. To the contrary, any exceedance of a water quality objective should be considered serious. As water is withdrawn from the Delta, water from the San Joaquin River would have a proportionally greater impact on the Delta waters under all scenarios of Alternative 4. This could lead to an increase in overall pH violations of the water quality objective for pH. The EIR/EIS fails to discuss pH shifts, which have the potential to increase toxicity and violate the Basin Plan objective for pH.

14. The Assessment of Pesticides Fails to Meet Minimal Requirements for a Disclosure Document.

The impacts of CM1 on pesticides is addressed at: Pesticides (Impact WQ-21: Effects on Pesticide Concentrations Resulting from Facilities Operations and Maintenance (CM1), pp. 8-463 – 8-467. The assessment of pesticide impacts is a largely qualitative analysis based upon best professional judgment. We could find no discussion of the analysis that would justify the subjective conclusion that, "These modeled changes in source water fractions are not of sufficient magnitude to substantially alter the long-term risk of pesticide-related toxicity to aquatic life, nor adversely affect other beneficial uses of the Delta." (P. 8-465, lines 30-33)

BDCP Appendix 8D, Source Water Fingerprinting Results, reveals that the distribution and mixing of Delta source water would significantly change. Modeling shows that for Alternative 4 H4, relative to the Existing Conditions Alternative, the source water fraction of San Joaquin River water at Rock Slough would increase 15-22% during September through March (11-15% during drought periods). At Contra Costa PP No. 1, the fraction would increase 15-23% during September through March (11-15% during October and November of droughts). At Franks Tract, the San Joaquin fraction would increase 11-16% during October through April and February through June. At Buckley Cove, the fraction would increase 11% in July and 16% in August during droughts. The other scenarios resulted in different fractions, as did comparisons with the No Action Alternative. For example, relative to the No Acton Alternative, the fraction of San Joaquin water at Buckley Cove would increase 16-17% in July (31-34% in drought conditions) and 24-25% in August (47-49% during droughts). Delta agricultural fractions are also projected to increase up to 8%, depending on location.

Not only will the San Joaquin River comprise a greater percentage of volume in eastern and southern Delta channels but the increase in residence time ensures that the suite of pesticides and other pollutants flowing down the river will have a longer period in which to mix with local municipal, industrial and agricultural inputs of pesticides and other pollutants and to interact with the environment.

We could find no credible discussion of the suite of pesticides present in these waters. It appears that limited data sets were used that ignored much of the pesticide monitoring data that has been acquired in recent years, especially monitoring by municipalities and agricultural coalitions. We could find no credible discussion regarding the potential effects of increased residence time on pesticide concentration and potential for bioaccumulative effects in the Delta. Despite the San Joaquin River and Delta being listed as impaired by various pesticides and unknown toxicity, we could find no discussion of the concentration, frequency and synergistic and additive effects of the universe of pesticides found in local waters.

For example, diazinon and chlorpyrifos are additive in toxicity, as are diazinon and esfenvalerate. Carbamate and organophosphate insecticides interact synergistically. There is an expansive literature on the toxicity and sublethal effects of pesticide mixtures.

Addressing pesticides, the Delta Independent Science Board in their Review of the Draft BDCP EIR/EIS and Draft BDCP (15 May 2014) observed,

> "Despite the acknowledged difficulty in predicting water quality impacts of the project, caused by lack of observational field data, as far as we could see there was no call for enhanced monitoring of pesticides in the Delta. As stated above, reliance on model outputs without their validation by comparison to observational data is a flawed approach, especially for assessing the effects of water quality constituents with high levels of uncertainty surrounding them, such as pesticides. In the section on pesticides, it was also remarkable that there was no mention of recent investigations showing very significant synergism between carbamate and organophosphate insecticides." Page B-24.

Apparently, source waters plus local inputs plus increased residence time plus additive/synergistic effects were not modeled or assessed. CM13 herbicide application was found to have significant and unavoidable impacts but we could not find a discussion where the impacts of CM13 were integrated into consideration of potential impacts of CM1. There is no antidegradation analysis that quantifies the degree of degradation, even if degradation fails to exceed a water quality standard. How much degradation or how many toxic events must occur in order to meet a "sufficient magnitude" threshold?

15. The Evaluation of Salinity and Electrical Conductivity is Deficient.

The SWRCB's 2010 Integrated Report, Clean Water Act Section 303(d) List/305(b) Report identifies vast areas of the Delta as impaired and incapable of supporting identified beneficial uses because of electrical conductivity (EC). The EIR/EIS states:

> "*The Region 5 Basin Plan specifies EC objectives for the Sacramento River, Feather River, and San Joaquin River; it also contains EC objectives for the Delta, which have been superseded by the 2006 Bay-Delta WQCP… impairment by elevated EC levels, as follows: (a) southern, northwestern, and western channels in the Delta; (b) Delta export area; (c) Grasslands drainage area, Mud Slough, and Salt Slough in the San Joaquin River valley; (d) San Joaquin River*

> *from Bear Creek to Delta boundary; and (e) Suisun Marsh (State Water Resources Control Board 2011)*." (P. 8-55)

The EIR/EIS acknowledges that:

> *"In the Plan Area, Alternative 4, Scenarios H1-H4, would result in an increase in the frequency with which Bay-Delta WQCP EC objectives are exceeded for the entire period modeled (1976–1991): in the Sacramento River at Emmaton (agricultural objective; 17–19% increase) in the western Delta, and in the San Joaquin River at San Andreas Landing (agricultural objective; 2–3% increase) and Prisoners Point (fish and wildlife objective; 14–25% increase), both in the interior Delta; and in Old River near Middle River and at Tracy Bridge (agricultural objectives; up to 2% increase), both in the southern Delta. Average EC levels at Emmaton would increase by <1–14% for the entire period modeled and 8–13% during the drought period modeled. Average EC levels at San Andreas Landing would increase by 0–9% during for the entire period modeled and 7–13% during the drought period modeled."* (P. 8-440)

Consequently, operation of CM1 results in a significant adverse impact (P. 8-440). Since, the effectiveness of mitigation measures is uncertain, the impacts are termed significant and unavoidable.

With respect to the potential impacts on EC from implementation of CM2-22, the EIR/EIS acknowledges the CM4 would increase the magnitude of daily tidal water exchange and alter other hydrodynamic conditions in adjacent Delta channels. However, the DSM2 modeling included "assumptions regarding possible locations of tidal habitat restoration areas, and how restoration would affect Delta hydrodynamic conditions and thus the effects of this restoration measure on Delta EC were included in the assessment of CM1 facilities operations and maintenance." (P. 8-442, lines 27-30) Consequently, implementation "would not be expected to adversely affect EC levels in the affected environment" and the effects are determined, "to not be adverse." (P. 8-442, lines 31-34) Please explain how CM4 could be evaluated with CM1, which was found to have significant and unavoidable impacts, but that CM4 will not be expected to have adverse effects, especially, as CM4 is only evaluated at a programmatic level. The CEQA conclusion of no adverse impacts is equally baffling. It assumes that the substitution of agricultural lands with habitat will offset any increased tidal effects and, consequently, there will be no adverse impacts and no mitigation is required. (P. 8-442, lines 35-43; P. 8-443, lines 1-2) Since the specific extent and location of habitat has not been determined, on what basis and methodology does the EIR/EIS conclude that CM2-CM22 would not cause significant impacts and that no mitigation will be required?

The EIR/EIS Section 8.2.3.7 Salinity and Electrical Conductivity, beginning on page 8-52 states:

> "*Concern about salinity involves three main issues: drinking water, crop irrigation, and biota/habitat… In addition, industrial processes that require low-salinity water can be negatively affected. Salt removal during the water purification process (for either drinking or process water) is presently very expensive*."

> "*When salinity concentrations in irrigation water are too high, yields for salt-sensitive crops may be reduced*." (Page 8-53)
>
> "*Incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, Environmental Commitments, a separate, non-environmental commitment to address the potential increased water treatment costs that could result from EC concentration effects on municipal, industrial and agricultural water purveyor operations*."

Agricultural crop yields reductions will occur as salinity in the irrigation water increases, not just for salt sensitive crops but also for more tolerant plant species. (Irrigation with Reclaimed Municipal Wastewater, a Guidance Manual, SWRCB Report No. 84-1 wr, Chapter 3 and Table 3-1) The anticipated reduction in crop yield as EC levels increase is not presented. A methodology for determining crop yield reductions is not presented. The proposed commitment to address "increased water treatment costs" does not address crop yield reductions and the associated lower profits earned since it is unlikely that irrigation water would be treated. In any case, the project does not fully protect the identified beneficial use of irrigated agriculture.

Industrial uses of water can be the most limiting water quality objectives for salinity as shown in Water Quality Criteria (McKee and Wolf, SWRCB 1963) Chapter 5. It is currently not uncommon for industries to use reverse osmosis (RO) system to remove salts prior to use in cooling towers and boiler systems. The EIR/EIS should document how many systems are in place for industrial uses to account for elevated salt levels within the use area. How many additional salt treatment and removal systems will need to be installed to account for the increased EC levels projected by the project? The existing and future costs associated with the EIR/EIS alternatives have not been accounted for. In any case, the project fails to full protect the identified beneficial use of municipal and industrial supply.

The Delta currently exceeds the water quality standard for EC and Alternative 4 will exacerbate this situation. The EIR/EIS essentially states that we will "look at it later" and attempt to mitigate by reimbursing for losses. There is no assessment of the current crop yield losses or those expected to occur due to implementation of the various options. There is no assessment of the current and anticipated impacts to industry or other from increased salinity and modified hydrology. There is no quantification of the actual costs to agriculture, industry, local communities or individuals that may occur due to increasing salinity levels. Mitigation must be feasible: have funds been committed to repay those who experience losses? It's easy to say there will be a commitment to offset the costs when those costs have not been assessed and a mechanism for injured parties to file claims to recover those costs has not been developed. However, this should be analyzed as a part of the EIR/EIS.

The EIR/EIS makes several conclusory, unsupported statements concerning increased EC loading in the future, including:

> *There could be increased discharges of EC-elevating parameters in the future in water bodies upstream of the Delta as a result of urban growth and increased runoff and wastewater discharges. The state has begun to aggressively regulate*

point-source discharge effects on Delta salinity-elevating parameters, capping dischargers at existing levels, and is expected to further regulate EC and related parameters upstream of and within the Delta in the future as salt management plans are developed. Based on these considerations, EC levels (highs, lows, typical conditions) in the Sacramento River and its tributaries, the eastside tributaries, or their associated reservoirs upstream of the Delta would not be expected to be outside the ranges occurring under Existing Conditions or the No Action Alternative. (8-436, lines 9-17)

However, with the implementation of the adopted TMDL for the San Joaquin River at Vernalis and the ongoing development of the TMDL for the San Joaquin River upstream of Vernalis and its implementation, it is expected that long-term EC levels will improve. Based on these considerations, substantial changes in EC levels in the San Joaquin River relative to Existing Conditions or the No Action Alternative would not be expected of sufficient magnitude and geographic extent that would result in adverse effects on any beneficial uses, or substantially degrade the quality of these water bodies, with regard to EC. (8-436, lines 29-35)

CSPA routinely reviews municipal and industrial NPDES permits and has filed numerous appeals with the SWRCB over the Regional Board's failure to comply with CWA regulations regarding EC loading. Several of the Regional Board-issued permits have been or are in litigation. CSPA recently submitted comments on the renewal of Waste Discharge Requirements (WDRs) for the Grasslands Bypass Project. We were involved in the development of TMDLs and have unsuccessfully sought to persuade the Regional Board to comply with SWRCB direction to move the salinity compliance point upstream from Vernalis. We authored the legislation that sunset the original agricultural waiver of Waste Discharge Requirements (WDRs), were deeply involved in the development of the replacement conditional waivers and litigated each one of them. We currently have appeals pending before the SWRCB of the recently adopted agricultural WDRs for the Eastside and Westside San Joaquin Valley, San Joaquin County/Delta and the Sacramento Valley. CSPA maintains a rotating docket of 30-35 enforcement cases against industrial violators of the General Industrial Stormwater Permit. We have no evidence and do not believe there is any documented, quantifiable evidence that the mass loading of EC has stabilized, been reduced or that there is significant likelihood of reductions in the near future. If the authors of EIR/EIS believe otherwise, they should provide the documented quantifiable evidence. If not, they should eliminate or modify the unsupported conclusions referenced above.

The SWRCB has refused to enforce water quality standards it adopted in 1995 and incorporated into water rights permits in 2000. For example, between April of 2007 and December 2013, there were 868 documented days of noncompliance with the D-1641 EC standards at the Old River near Tracy Boulevard Bridge compliance point. In 2013 EC standards at Emmaton were ignored, as the SWRCB informed DWR and USBR that it would not seek enforcement. This year, the SWRCB simply waived existing standards. Based on past enforcement history, there is no reasonable basis to assume that EC standards will be enforced in the future. Consequently, the EIR/EIS conclusions that salinity levels are likely to be consistent with levels projected in the EIR/EIS are in error. If the authors of the EIR/EIS have reason to believe that future enforcement or compliance will be substantially different that it has been in the past, please provide it.

As previously noted, the EIR/EIS completely ignores the federally promulgated salinity standards at 40 CFR 131.37. Those standards include estuarine habitat criteria for salinity at Chipps Island, Roe Island and Suisun Marsh plus a criteria of 0.44 micro-mhos between 1 April and 31 May for striped bass and splittail spawning and migration on the San Joaquin River at Jersey Point, San Andreas Landing, Prisoners Point, Buckley Cove, Rough and Ready Island, Brandt Bridge, Mossdale and Vernalis when the San Joaquin Index is greater than 2.5 MAF and at Jersey Point, San Andreas landing and Prisoners Point when the San Joaquin Index is less than 205 MAF. The EIR/EIS must discuss, analyze and address the project's impacts and compliance with currently applicable USEPA federally promulgated criteria for the Delta.

Chapter 8 (Water Quality) and Chapter 11 (Fish and Aquatic Resources, Parts 1 & 2) largely ignore the water quality and habitat needs of striped bass and splittail in the eastern Delta and lower San Joaquin River. The studies US EPA relied upon in establishing salinity criteria protective of the migration and spawning beneficial uses of striped bass and splittail are still applicable.[11]

Neither, Chapter 8 (Water Quality) and Chapter 11 (Fish and Aquatic Resources, Parts 1 & 2) adequately surveys, analyzes or discusses the impacts of EC and other contaminants, or the impacts of modified hydrology and increased residence time on freshwater invertebrates (especially their egg and sensitive stages) in the eastern and southern Delta and lower San Joaquin River. Zooplankton is a critical source of food to numerous fish species. Different zooplankton species tend to inhabit freshwater, low salinity zones or high salinity zones. Native Copepod and Mysid species have plummeted. The same applies to the phytoplankton community.

With respect to native aquatic and adjacent riparian plant species, the EIR/EIS acknowledges that field surveys were limited by continuing legal challenges to efforts to obtain entry permits. In reviewing Chapter 8, we could find little discussion or analysis on the potential salinity and other water quality impacts to aquatic and riparian plants, with the exception of assessments on the effects of CM2-22 herbicide and pesticide use. The problem here is not an inadequate analysis

---

[11] Turner, J.L., Striped Bass Spawning in the Sacramento and San Joaquin Rivers in Central California from 1963 to 1972. Calif. Fish and Game, 62(2):106-118, 1972: Turner, J.L. and Harold K Chadwick, Distribution and Abundance of Young-of-the-Year Striped Bass, Morone saxatilis, in Relation to River Flow in the Sacramento-San Joaquin Estuary. Anadromous Fisheries Branch, CDFG, 1972: Fraley, T.C., Striped bass, Roccus Saxatilis, Spawning in the Sacramento-San Joaquin Rivers During 1963 and 1964, 1966: Radtke, L.D. and Jerry L. Turner, High Concentrations of Total Dissolved Solids Block Spawning Migration of Striped Bass, Roccus saxatilis, in the San Joaquin River, California. Transactions of the American Fisheries Society. 96:4, 405-407, 1967: Radtke, L.D., Distribution of Adult and Subadult Striped Bass, Roccus Saxatilis, in the Sacramento-San Joaquin Delta, 1966: Turner J.L and Timothy C. Farley, Effects of Temperature, Salinity, and Dissolved Oxygen on the Survival of Striped Bass Eggs and Larvae. Calif. Fish and Game 57(4):268-273. 1971: See also, SWRCB, Draft Water Quality Control Plan for Salinity, San Francisco Bay/Sacramento-San Joaquin Delta Estuary, 1988 and SWRCB, Water Quality Control Plan for Salinity, San Francisco Bay/Sacramento-San Joaquin Delta Estuary, 1991.

of the impacts of salinity and other contaminants to riparian and channel vegetation communities in the South Delta or San Joaquin River, but that there is virtually no analysis.

The Delta was historically dominated by freshwater and the estuary was where the mixing of fresh and salt waters occurred. There are several natural divisions within the Delta and lower San Joaquin River system. Historically, the Southern and Eastern Delta was dominated by freshwater conditions and once supported myriad native freshwater species. A few of these species include common tules (*Scirpus acutus, S. californicus*), cattails (*Typha spp.),* common reed (*Phragmites communis*), swamp knotweed (*Polygonum coccineum*), marsh bindweed (*Calystegia sepium*), bur-reed (*Sparganium eurycarpum*), cinquefoil (*Potentilla anserina*), twinberry (*Lonicera involucrata*), dogwood (*Cornus stolonifera*), buttonwillow (*Cephalanthus occidentale*), and willows (*Salix lasiolepis, S. lucida*). This wetland community was once very common and remnants of these communities still can be found on numerous channel islands and along the waterside of levees. Others grow in the water itself. A number of these species, like twinberry (*Lonicera involucrate*), are extremely sensitive to salt. The EIR/EIS must examine potential impacts of increased salinity levels and residence time to native aquatic and riparian plants.

16. The Discussion of the Narrative Toxicity Objective and the Potential for Emerging or Legacy Pollutants to Violate Criteria and Beneficial Uses is Inadequate.

The EIR/EIS Table 8.5, Receptors Affected by Water Quality-Characterized by the Designated Beneficial Uses of the Study Area (p.8-29) identifies emerging pollutants (ECs/PPCPs) as having the potential to affect water quality. The Central Valley Regional Board Basin Plan contains a narrative toxicity objective that prohibits: ***"****Toxic substances to be present, individually or in combination, in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life."*

Constituents of Emerging Concern (CECs) clearly have potential to violate the Basin Plan's narrative toxicity objective. There is an extensive and rapidly expanding body of scientific literature discussing emerging pollutants.

> The increasing production and use of pharmaceuticals and personal care products (PPCPs) – some of which may be endocrine disrupting compounds (EDCs) – have led to a growing concern about the occurrence of these compounds in the environment. Recent studies have reported the occurrence worldwide of EDCs, PPCPs, and other organic wastewater contaminants (OWCs) – collectively referred to as "constituents of emerging concern" (CECs) or "emerging constituents" (ECs) – in wastewater treatment plant (WWTP) effluents, surface waters used as drinking water supplies, and in some cases, finished drinking waters. Of the 126 samples analyzed for the project, one sample (American River at Fairbairn drinking water treatment plant [DWTP] intake collected in April 2008) had no detectable levels of any EDCs, PPCPs, or OWCs. All other samples had one or more analytes detected at or above the corresponding MRLs. The five most frequently detected PPCPs were caffeine, carbamazepine, primidone, sulfamethoxazole, and tri(2-chloroethyl) phosphate (TCEP). At the sample sites upstream of WWTP discharges in all three watersheds, the concentrations of selected PPCPs, except for

caffeine, were low (i.e., ≤ 13 ng/L), pointing to WWTP discharges as the main source of most PPCPs and OWCs in the environment. (Source, Fate, and Transport of Endocrine disruptors, Pharmaceuticals, and Personal Care Products in Drinking Water Sources in California, National Water Research Institute Fountain Valley, California, May 2010)

Over the last 10 years, reports of feminized wildlife have fueled chilling headlines. Most of these reports have focused on the many ways that estrogen in sewage effluent can distort normal male development. Now a new study reveals one way that the hormone pollutant can affect females: Too much estrogen causes subtle changes in female fish's courting behavior, which could alter a population's genetic makeup (Environ. Sci. Technol., DOI: 10.1021/es101185b).

Increase in intersex fish downstream from WWTP possibly associated with endocrine-active contaminants. (Boulder Colorado, Colorado University, 2008)

Skewed sex ratio downstream from WWTP possibly associated with endocrine-active contaminants. (Boulder Colorado, Colorado University, 2006)

Fluoxetine (FLX), Sertraline (SER) and their degradants NFLX, and NSER were the primary antidepressants in brain tissue samples. Little or no venlafaxine (VEN), the dominant antidepressant in both water and bed sediment, was present. Degradates were measured at higher concentrations in brain samples than parent compounds. (Boulder Creek, Colorado & Fourmile Creek, Iowa, the College of Wooster, 2010)

SAR sites (with WWTP or urban runoff influent) males had significantly lower Testosterone (T) than the reference site males. Males from SAR sites had significantly higher17β-estradiol (E2) than reference site. Females from SAR sites had significantly lower E2 than the reference site females. (USGS, Santa Ana River (SAR) SAR sites, 2009)

"Several recent studies have documented endocrine disruption in Delta fish. One of the biomarkers of EDCs is intersex fish, fish with both male and female reproductive organs. A recent histopathological evaluation of delta smelt for the Pelagic Organism Decline found 9 of 144 maturing delta smelt (6%) collected in the fall were intersex males. This study provides evidence that delta smelt are being exposed to EDCs. Brander and Cherr (2008) observed choriogenin induction in male silversides from Suisun Marsh. Riordan and Adam (2008) reported endocrine disruption in male fathead minnows following in-situ exposures below the Sacramento Regional Treatment Plant. Lavado, et al. (in press) conducted studies in 2006 and 2007 to evaluate the occurrence and potential sources of EDCs in Central Valley waterways. In their study, estrogenic activity was repeatedly observed at 6 of 16 locations in the Bay-Delta watershed, including in water from the Lower Napa River and Lower Sacramento River in the Delta. Further studies are needed to identify the compounds responsible for the observed estrogenic activity and their sources." (Alameda County Water District, Alameda County Flood Control and Water Conservation District, Zone 7, Metropolitan Water District of Southern California, San Luis

& Delta-Mendota Water Authority, Santa Clara Valley Water District, State Water Contractors, June 1, 2010)

A 2008 study of the maternal transfer of xenobiotics and effects on larval fish in the estuary documented that offspring of fish caught in the Delta had undeveloped brains, inadequate energy supplies and dysfunctional livers. An array of compounds known to cause myriad problems in both young and adult fish, including skeletal and organ deformities and dysfunction; changes in hormone function and behavior were identified in fish tissue. A two-year DWR funded study of sublethal factors that might be contributing to the decline of pelagic fish in the Bay-Delta assessed the health status of larval, juvenile and adult female striped bass collected in the Delta using morphometric, histopathological, otolith and biochemical metrics. It concluded that a wide-array of contaminants were significant stressors on the vast majority of juvenile striped bass causing severe physiological stress, morbidity and likely compromised immune systems. Findings of abnormal disease and parasitism were found in juvenile fish in all years studied and were considered to have a significant impact on the health of the fish and the population. In addition, the data suggested that adult striped bass are also likely adverse affected by the bioaccumulation of contaminants, such as PBDE's, and that such contaminant effects need to be considered a significant stressor that is affecting the decline of striped bass and are likely causing population level effects in early life stages. Both studies can be found accessed at https://sites.google.com/site/drdavidostrach/about-david-ostrach.

A recent study by the Toxic Substances Hydrology Program of the U.S. Geological Survey (USGS) shows that a broad range of chemicals found in residential, industrial, and agricultural wastewaters commonly occurs in mixtures at low concentrations downstream from areas of intense urbanization and animal production. The chemicals include human and veterinary drugs (including antibiotics), natural and synthetic hormones, detergent metabolites, plasticizers, insecticides, and fire retardants. One or more of these chemicals were found in 80 percent of the streams sampled. Half of the streams contained 7 or more of these chemicals, and about one-third of the streams contained 10 or more of these chemicals. This study is the first national-scale examination of these organic wastewater contaminants in streams and supports the USGS mission to assess the quantity and quality of the Nation's water resources. A more complete analysis of these and other emerging water-quality issues is ongoing. Knowledge of the potential human and environmental health effects of these 95 chemicals is highly varied; drinking-water standards or other human or ecological health criteria have been established for 14. Measured concentrations rarely exceeded any of the standards or criteria. Thirty-three are known or suspected to be hormonally active; 46 are pharmaceutically active. Little is known about the potential health effects to humans or aquatic organisms exposed to the low levels of most of these chemicals or the mixtures commonly found in this study. ("Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000: A national reconnaissance," an article published in the March 15, 2002 issue of Environmental Science & Technology, v. 36, no. 6, pages 1202-1211. Data are presented in a companion USGS report, "Water-quality data for pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000" (USGS Open-File Report 02-94). These and other reports, data, and maps can be accessed on the Internet at http://toxics.usgs.gov.)

PPCPs are found where people or animals are treated with drugs and people use personal care products. PPCPs are found in any water body influenced by raw or treated sewage, including rivers, streams, ground water, coastal marine environments, and many drinking water sources. PPCPs have been identified in most places sampled. The U.S. Geological Survey (USGS) implemented a national reconnaissance to provide baseline information on the environmental occurrence of PPCPs in water resources. You can find more information about this project from the USGS's What's in Our Wastewaters and Where Does it Go? (http://toxics.usgs.gov/highlights/whatsin.html). PPCPs in the environment are frequently found in aquatic environments because PPCPs dissolve easily and don't evaporate at normal temperature and pressures. Practices such as the use of sewage sludge ("biosolids") and reclaimed water for irrigation brings PPCPs into contact with the soil. (http://www.epa.gov/ppcp/faq.html#iftherearei ndeed)

From the recent scientific investigations and literature, it is reasonable to conclude that CECs are present in the Delta at levels that cause toxicity in violation of the narrative toxicity objective. It is also reasonable to conclude that wastewater discharges into the Delta contain CECs in concentrations that at a minimum threaten to violate the Receiving Water Limitation for toxicity, which prohibits toxic substances to be present in concentrations that produce detrimental physiological responses in human or aquatic life.

US EPA has compiled a database; *Treating Contaminants of Emerging Concern A Literature Review Database* (August 2010). Local wastewater treatment system design engineers have also been testing treatment system capabilities for removing CECs. There appear to be treatment technologies that are capable of removing significant levels of CECs.

With respect to CEC's, the Delta Independent Science Board in their Review of the Draft BDCP EIR/EIS and Draft BDCP (15 May 2014) observed,

> *"Very optimistic descriptions of CECs and their removal from wastewater by WWTPs are given, but no acknowledgment is made of many other CECs that are shown to be highly recalcitrant to such removals. Such demonstrations of unfamiliarity with the subjects covered do not engender confidence in the analysis."* Page B-22.

With respect to pollutants that bioaccumulate, the Delta Independent Science Board observed,

> *"Also, in regard to bioaccumulation, mercury and selenium appear to be the only constituents that were evaluated for their bioaccumulative properties. A range of organic contaminants (e.g., PAHs, dioxins, some endocrine disrupting compounds) also bioaccumulate, but this was not acknowledged or addressed in the DEIR/DEIS document."* Page B-24.

The EIR/EIS does not sufficiently assess the current state of water quality within the Delta or compliance with the narrative toxicity objective. The Delta is 303d listed as impaired for unknown toxicity. CECs, legacy and bioaccumulating pollutants present more than a reasonable potential to be causing and/or contributing to this toxicity.

17. There is no Defensible Antidegradation Analysis.

There is a fundamental flaw in the EIR/EIS in the analysis regarding Water Quality. Individual constituents were analyzed and discussed based on the potential for exceedance of federal water quality criteria or state water quality objectives or if the constituent was on the state's Clean Water Act Section 303(d) list. A cornerstone of the State Water Board and Regional Water Board's regulatory authority is the Antidegradation Policy (Resolution 68-16), which is included in the Basin Plans as an appendix. However, the EIR/EIS fails to discuss or analyze constituents which will "degrade" water quality unless they pose a threat to exceed a water quality standard.

Section 101(a) of the Clean Water Act (CWA), the basis for the antidegradation policy, states that the objective of the Act is to "restore and maintain the chemical, biological and physical integrity of the nation's waters." Section 303(d)(4) of the CWA carries this further, referring explicitly to the need for states to satisfy the antidegradation regulations at 40 CFR § 131.12 before taking action to lower water quality. These regulations (40 CFR § 131.12(a)) describe the federal antidegradation policy and dictate that states must adopt both a policy at least as stringent as the federal policy as well as implementing procedures.

The CWA requires the **full** protection of identified beneficial uses. The Federal Antidegradation Policy, as required in 40 CFR 131.12 states, "The antidegradation policy and implementation methods shall, at a minimum, be consistent with the following: (1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." EPA Region 9's guidance on implementing antidegradation policy states, "All actions that could lower water quality in Tier II waters require a determination that existing uses will be fully maintained and protected." (EPA, Region 9, Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12, page 7) The Delta is classified as a Tier II, "high quality," waterbody by US EPA and the SWRCB.

California's Antidegradation Policy is composed of both the federal antidegradation policy and the State Board's Resolution 68-16 (State Water Resources Control Board, Water Quality Order 86-17, p. 20 (1986) ("Order 86-17); Memorandum from Chief Counsel William Attwater, SWRCB to Regional Board Executive Officers, "Federal Antidegradation Policy," pp. 2, 18 (Oct. 7, 1987) ("State Antidegradation Guidance")). As a state policy, with inclusion in the Water Quality Control Plan (Basin Plan), the antidegradation policy is binding on all of the Regional Boards (Water Quality Order 86-17, pp. 17-18).

The BDCP will require a number of waste discharge permits from the SWRCB or Regional Water Quality Control Board for construction and operation of the project. It will require a CWA Section 401 Water Quality Certification, which is necessary for any "federal license or permit to conduct and activity…[that] may result in any discharge into navigable waters." (33 U.S.C. § 1341(a)(1).) In order to obtain a 401 certification, a project must meet CWA requirements to meet water quality requirements CWA Section 303 (33 U.S.C. § 1341(d)) BDCP will require a CWA Section 404 permit from the U.S Army Corps of Engineers, which will trigger the 401 certification process. The state cannot issue a Section 401 certification if there is no reasonable assurance that the project will meet water quality standards. As confirmed by the U.S. Supreme Court, CWA Section 401 certification considers the impacts of the entire activity and not simply the impacts of a particular discharge that triggers Section 401. (*PUD No. 1 of Jefferson County v. Washington Department of Ecology*, 511 U.S. 700 (1994)) Since water quality standards consist of both the water quality criteria and the designated uses of the navigable waters involved, an antidegradation analysis is required to ensure that the "existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." (40 CFR 131.12)

California's Antidegradation Policy (Resolution 68-16) requires that:

- Existing high quality water will be maintained until it has been demonstrated that any change will be with the maximum benefit to the people of the State.
- The change will not unreasonably affect present and anticipated beneficial uses.
- The change will not result in water quality less than prescribed in the policies.
- Any activity which produces a waste or increased volume or concentration will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that a pollution or nuisance will not occur and the highest water quality with maximum benefit to the people of the state will be maintained.

Implementation of the state's antidegradation policy is guided by the State Antidegradation Guidance, SWRCB Administrative Procedures Update 90-004, 2 July 1990 ("APU 90-004") and USEPA Region IX, "Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12" (3 June 1987) (" Region IX Guidance"), as well as Water Quality Order 86-17.
The Regional Board must apply the antidegradation policy whenever it takes an action that will lower water quality (State Antidegradation Guidance, pp. 3, 5, 18, and Region IX Guidance, p. 1). Application of the policy does not depend on whether the action will actually impair beneficial uses (State Antidegradation Guidance, p. 6). The proposed project, as defined by the alternatives described in the EIR/EIS, will result in reduced flows and lower water quality in the Delta for some constituents.

The State Board's APU 90-004 specifies guidance to the Regional Boards for implementing the state and federal antidegradation policies and guidance. The guidance establishes a two-tiered process for addressing these policies and sets forth two levels of analysis: a simple analysis and a complete analysis. A simple analysis may be employed where a Regional Board determines that: 1) a reduction in water quality will be spatially localized or limited with respect to the waterbody, e.g. confined to the mixing zone; 2) a reduction in water quality is temporally limited; 3) a proposed action will produce minor effects which will not result in a significant reduction of water quality; and 4) a proposed activity has been approved in a General Plan and has been adequately subjected to the environmental and economic analysis required in an EIR. A complete antidegradation analysis is required if discharges would result in: 1) a substantial increase in mass emissions of a constituent; or 2) significant mortality, growth impairment, or reproductive impairment of resident species. Regional Boards are advised to apply stricter scrutiny to non-threshold constituents, i.e., carcinogens and other constituents that are deemed to present a risk of source magnitude at all non-zero concentrations. If a Regional Board cannot find that the above determinations can be reached, a complete analysis is required.

Even a minimal antidegradation analysis would require an examination of: 1) existing applicable water quality standards; 2) ambient conditions in receiving waters compared to standards; 3) incremental changes in constituent loading, both concentration and mass; 4) treatability; 5) best practicable treatment and control (BPTC); 6) comparison of the proposed increased loadings relative to other sources; 7) an assessment of the significance of changes in ambient water quality and 8) whether the waterbody was a ONRW. A minimal antidegradation analysis must also analyze whether: 1) such degradation is consistent with the maximum benefit to the people of the state; 2) the activity is necessary to accommodate important economic or social development in the area; 3) the highest statutory and regulatory requirements and best management practices for pollution control are achieved; and 4) resulting water quality is adequate to protect and maintain existing beneficial uses.

The EIR/EIS, page 8-408 states in part that:

> "*Effects of the Alternative on Delta Hydrodynamics Under the No Action Alternative and Alternatives 1–9, the following two primary factors can substantially affect water quality within the Delta:*
> - *Within the south, west, and interior Delta, a decrease in the percentage of Sacramento River sourced water and a concurrent increase in San Joaquin River-sourced water can increase the concentrations of numerous constituents (e.g., boron, bromide, chloride, electrical conductivity, nitrate, organic carbon, some pesticides, selenium). This source water replacement is caused by decreased exports of San Joaquin River water (due to increased Sacramento River water exports), or effects of climate change on timing of flows in the rivers. Changes in channel flows also can affect water residence time and many related physical, chemical, and biological variables.*
> - *Particularly in the west Delta, sea water intrusion as a result of sea level rise or decreased Delta outflow can increase the concentration of salts (bromide, chloride) and levels of electrical conductivity. Conversely, increased Delta outflow (e.g., as a result of Fall X2 operations in wet and above normal water years) will decrease levels of these constituents, particularly in the west Delta*."

BDCP will reduce flows and result in lower water quality for a number of constituents, including boron, bromide, chloride, electrical conductivity, nitrate, organic carbon, some pesticides and selenium. The Delta is currently impaired for many of the constituents that will increase under the proposed alternative. While California's Antidegradation Policy requires that, "[t]he change will not unreasonably affect present and anticipated beneficial uses and the change will not result in water quality less than prescribed in the policies," the Federal Antidegradation Policy requires a "determination that existing uses will be fully maintained and protected." EPA, Region 9, Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12, page 7.

The proposed project will result in a substantial increase in mass emissions of constituents that already exceed water quality standards. This does not comply with the Policies set forth in the Basin Plan. Massively exceeding a water quality standard – any water quality standard - does not fully protect present and anticipated beneficial uses. Impacts to the existing impaired water for unknown toxicity and specifically mortality, growth and reproduction of resident species have not been thoroughly discussed or analyzed for toxic constituents. Nor have impacts to native zooplankton and phytoplankton communities that comprise the base of the food chain web been analyzed.

A complete Antidegradation analysis must be conducted to determine: incremental changes in constituent loading, both concentration and mass; the significance of changes in ambient water quality; whether such degradation is consistent with the maximum benefit to the people of the state; whether the activity is necessary to accommodate important economic or social development in the area; and whether the resulting water quality is adequate to fully protect and maintain existing beneficial uses.

18. The Analysis and Discussion of Pathogens is Fundamentally Flawed.

The EIR/EIS (8.2.3.12) identifies the beneficial uses impacted by pathogens as municipal and domestic supply, water contact recreation, shellfish harvesting, and commercial and sport fishing. Missing from this list is irrigated agriculture. Pathogens have not been evaluated for Agricultural Supply water. California Code of Regulations, Title 22, is mentioned in the EIR/EIS specifically with regard to pathogens and protecting Contact Recreational beneficial uses. However, Title 22 equally addresses agricultural irrigation and the acceptable levels of pathogens. From a regulatory point of view, Title 22 requirements are only directly applicable to reclaimed water; however, the science used to determine a protective level for pathogens is directly applicable for protecting irrigated agriculture and recreational activities. The potential impacts to irrigated agriculture and the ingestion of food crops irrigated with water exceeding the recommended levels for pathogens presents at least the same level of concern as does recreational activity in that same water. The impacts to Irrigated Agriculture from pathogens, nitrates, constituents of emerging concern (CECs) and phthalates have not been assessed. The EIR/EIS is therefore incomplete.

This Section of the EIR/EIS, page 8-80 states that: "*Viruses also can be removed effectively through chlorine or ozone oxidation.*" This statement is incorrect; while chlorination may be effective at rendering some limited number of viruses inactive, it removes none. For the most part, viruses and protozoa have a moderate to high tolerance to chlorine. (CDC, Effect of Chlorination on Inactivating Selected Pathogens, 21 March 2012) It is also fairly well documented in Civil Engineering texts that viruses and parasites are best removed by filtration and chlorination is generally accepted as ineffective. Going back to the requirements contained in CCR Title 22, filtration is required to remove pathogens, and one will note that disinfection with chlorine is not a requirement. Tertiary treatment, consisting of chemical coagulation, sedimentation, and filtration, has been found to remove approximately 99.5% of viruses. Filtration is an effective means of reducing viruses and parasites from the waste stream, not disinfection with chlorine.

The EIR/EIS is also incorrect in stating that pathogens experience rapid die off in the natural environment. The latest science shows that pathogens can survive for lengthy time periods and the indicator tests used to identify pathogens may not be reliable:

A. "*Previous research had raised questions about whether E. coli O157:H7 outlasts indicator bacteria in the environment. So Michael Jenkins and his colleagues at the U.S. Department of Agriculture's Agricultural Research Service decided to test the reliability of the EPA's method by measuring the survival rates of E. coli O157:H7 and four species of indicator bacteria. In one experiment, they injected the E. coli strain and the indicator bacteria into small, porous chambers and then suspended the chambers in test ponds in northeast Georgia. By varying the chambers' depth in the water, the scientists could monitor the microbe's survival rate under different levels of solar radiation. In another experiment, they placed inoculated pond water in bottles in an outdoor laboratory. The researchers then measured bacteria levels at regular intervals. Both experiments exposed the bacteria to predation by other microorganisms—a common fate of microbes in the environment.*

*They found that in both experiments, the indicator bacteria died off significantly more quickly than E. coli O157:H7 did. For example, in the outdoor lab experiments, most cells of fecal Enterococcus—an indicator species—died in less than five days. But it took between seven and 18 days for most of the E. coli O157:H7 to die. The virulent strain appeared to be more resistant than indicator bacteria to solar radiation and to predation by other microorganisms. The findings suggest that the dangerous E. coli could be present in water even when tests for fecal indicator bacteria are negative, Jenkins says. "We need to develop methods that are going to be able to quantify the pathogens themselves," he says." (*Chemical & Engineering News, ISSN 0009-2347)

B. *"In general, many different kinds of viruses can persist in and on environmental media, including liquid and solid media and in the airborne state, with half-lives of hours, days, weeks or even months. The extent of persistence depends on the type of virus, it physical state (dispersed, aggregated, cell-associated, membrane-bound, adsorb to other solids, etc.), the medium in which it is present (faeces, respiratory secretions, tissues, other liquids or solids, air, etc. and prevailing environmental conditions that influence virus survival. The environmental conditions influencing virus survival generally include: temperature; pH and other physical and chemical properties of the medium in which the viruses are present, such as moisture content, organic matter, particulates, salt concentration, protective ions, and antiviral chemicals such as proteolytic enzymes; antiviral microbial activity, and light. On environmental surfaces and in aerosols additional environmental factors also influence virus survival, such as relative humidity and physico-chemical forces at air-water and air-water-solid interfaces."* (WHO Virus Survival Report, Virus Survival in the Environment with Special Attention to Survival in Sewage Droplets and Other Environmental Media of Fecal or Respiratory Origin, August 21, 2003)

C. *"Three enteroviruses — polioviruses, echoviruses and coxsackieviruses — were used to contaminate soil and vegetables; their survival times, under various storage* *conditions, were then recorded (2). The concentration of the viruses employed varied from 1 x 104-5 to 1 x 105-5 CCID50/ml. Depending on soil type, moisture content, pH and temperature, the viruses survived for 150 to 170 days in soil. When added to uncooked vegetables and stored under household conditions, the viruses survived for as long as 15 days."* (Rev. sci. tech. Off. int. Epiz., 1991, 10 (3), 733-748, Virus survival in the environment)

Pathogens and their longevity are important in the context of multiple beneficial uses. Below, we describe how many of these uses affect and are affected by pathogens, and how these effects, of and on, these uses should have been analyzed

<u>Recreational Waters Criteria and Beach Closures</u>

In most areas of California, the current water quality criterion for bacteria in recreational waters is based on fecal coliform organisms:

- 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.

US EPA's evaluation of the bacteriological data indicated that using the fecal coliform indicator group at the maximum geometric mean of 200/100 ml would cause an estimated 8 illnesses per 1,000 swimmers at marine beaches (*Ambient Water Quality Criteria for Bacteria – 1986)*. US EPA now recommends the addition of criteria for E. coli (126/100 ml) and enterococci (33/100 ml) based on the same "acceptable" illness rate of 8 illnesses per 1,000 swimmers at marine beaches.

Even at the "acceptable" illness rate of 8 out of every 1,000 swimmers; the National Resources Defense Council (NRDC) in 2008 issued a press release interpreting EPA's data that beach closures were at their highest level in 18 years. In 2002, the Centers for Disease Control and Prevention (CDC) concluded that the incidence of waterborne infections from recreational water use has steadily increased over the last several decades. Despite the beach closures and the increase in reported sewage-related illnesses, in a healthy population, most of the illnesses resulting from exposure to inadequately treated sewage are relatively minor (respiratory illness; ear, nose, or throat irritation; and especially gastroenteritis) and go unreported. Even if such illnesses are reported to doctors, there is seldom an attempt to find or track an environmental source.

Another complicating issue is inadequate data on the occurrence of sewer spills or overflows. The State Water Board has only begun requiring reporting of sewer spills into its new sanitary sewer overflow (SSO) database and reporting compliance rates are mixed. The lack of data regarding sewer spills and the under-reporting of illnesses makes it difficult to definitively estimate the incidence of diseases caused by exposure to sewage-contaminated waters. The number of reported cases is a small subset of the actual number of illnesses caused by sewage exposure or waterborne pathogens.

The Delta is a recreational magnet, attracting many thousands of water enthusiasts, including boaters, swimmers, water-skiers, windsurfers, fishermen and others who routinely come into contact with the water. The Delta is also home to thousands of people who permanently live on boats, many of which do not always follow proper sanitation protocols. During warmer weather, many people anchor boats for extended periods of time in attractive anchorages, without always returning to pump-out facilities empty marine sanitation devices. A large homeless population lives in the Delta and along urban tributary streams and lack even rudimentary sanitation facilities.

CSPA staff and members have spent thousands and thousands of days on Delta waters and are acutely aware of the numerous cases of gastrointestinal illnesses and seriously infected cuts experienced by individuals following exposure to the water. Few of these illnesses are formally report to health authorities. We are aware that urban stormwater monitoring reveals that, following rainfall, stormwater discharges and local receiving waters far exceed water quality standards for pathogens.

The EIR/EIS fails to identify how many exceedances of bacteria standards were recorded during the period analyzed, discuss or estimate the number of illnesses typically occurring or that are projected to occur or identify recreational closures.

Beneficial Uses of the Receiving Water

By memorandum, dated September 28th 2000, Jeff Stone, California Department of Health Services (DHS), Office of Drinking Water, Recycled Water Unit, to Regional and District Engineers wrote that: "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)." The memorandum goes on to state that the Department does not believe that the federal criteria are protective if the source of water is domestic wastewater and cites the "Uniform Guidelines" prepared by the Department.

Irrigated Agriculture

Although the discussion of pathogens has largely been limited to recreational uses, Irrigated Agriculture is a designated beneficial use of most inland waters. Outbreaks of bacteria-contaminated food have made headlines over the past few years. California Department of Public Health, Regulations, CCR Title 22, Section 60303, require that for the irrigation of Food Crops, including edible root crops, reclaimed water be tertiary treated water disinfected to 2.2 MPN/100 ml (total coliform organisms). Obviously, 2.2 MPN total coliform is significantly less than the 200 MPN fecal coliform bacteria criteria established for recreational waters.

Undiluted surface water can be and is used to irrigate food crops. The science used to develop the bacteria limitation in the Title 22 Reclamation Criteria for the irrigation of food crops is applicable to surface waters even though the Title 22 regulatory requirements do not apply. By Memorandum to Regional Water Boards, dated August 18, 1992, the then Department of Health Services, Office of Drinking Water, issued the *Uniform Guidelines for the Disinfection of*

Wastewater (Uniform Guidelines). The Uniform Guidelines recommend that for agricultural uses where there is less than a twenty-to-one dilution of wastewater within the receiving stream, that a tertiary level of treatment be required with a 2.2 MPN/100 ml limitation for total coliform organisms. A footnote for this situation states that where there is no dilution, the water reclamation criteria shall apply. The Uniform Guidelines further recommend that: when there is dilution available in the receiving stream of at least 20-to-1 the wastewater be treated to a secondary level and disinfected to a 23 MPN/100 ml; and when there is dilution available of at least 100-to-1 the wastewater be treated to a secondary level and disinfected to a 240 MPN/100 ml.

Municipal (Drinking) and Domestic

The Uniform Guidelines recommend that for drinking water uses where there is less than a twenty to one dilution of wastewater within the receiving stream, no domestic wastewater discharges be allowed. Tertiary treated, 2.2 MPN/100 ml, wastewater could only be allowed to a receiving stream with a drinking water beneficial use if greater than a twenty-to-one dilution reliably exists.

Contact Recreation

The Uniform Guidelines and the Reclamation Criteria of CCR Title 22 require that for unrestricted recreational uses that wastewater be tertiary treated and disinfected to 2.2 MPN/100 ml (total coliform organisms), unless a 20 to 1 in stream dilution exists then the wastewater may be secondary treated and disinfected to 23 MPN/100 ml. This recommendation for contact recreational uses is directly comparable to the US EPA recommended bacteria criteria.

Domestic Wastewater Treatment

As stated above, the California Department of Public Health, formerly the Department of Health Services, does not support the Federal Criteria as being protective if the source of water in the receiving stream is domestic wastewater (treated or untreated).

Domestic wastewater discharges are regulated under Federal NPDES permits issued by the State and Regional Boards. The federal Clean Water Act, Section 101(a)(2), states: "it is the national goal that wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife, and for recreation in and on the water be achieved by July 1, 1983." Federal Regulations, developed to implement the requirements of the Clean Water Act, create a rebuttable presumption that all waters be designated as fishable and swimmable. Federal Regulations, 40 CFR Sections 131.2 and 131.10, require that all waters of the State regulated to protect the beneficial uses of public water supply, protection and propagation of fish, shell fish and wildlife, recreation in and on the water, agricultural, industrial and other purposes including navigation.

The diversion of approximately 2.5 MAF of relatively good dilution flow from the estuary will increase the relative percentage of water from the San Joaquin River in the eastern and southern Delta. This will inevitably increase the relative concentration of human and agricultural wastes in these waters, including dairy and livestock wastes that have been identified as sources of pathogens. It will also increase the residence time of pathogens and increase the potential to impact those who come in contact with the water. It will increase the opportunity for pathogens to affect irrigated food crops and domestic water supplies. The EIR/EIS is deficient because it fails to adequately and accurately consider the potential adverse effects of pathogens on human health

19. The Analysis of Water Temperature is Deficient.

The Water Quality section of the EIR/EIS states that: "*Because the primary concern of water temperature is effects on fish and aquatic organisms, temperature is addressed in Chapter 11, Fish and Aquatic Resources.*" Any discussion of Water Quality is incomplete without including temperature. There are water quality objectives for temperature in the Basin Plan; Water Quality Objectives (Page III-8.00, Sacramento and San Joaquin Basins), and the Water Quality Control Plan for Temperature (Thermal Plan, an appendix to the Basin Plan). Elevated temperature is a pollutant and compliance with objectives is a relevant discussion with regard to water quality. Also, temperature directly affects the toxicity of other constituents such as ammonia. Temperature also impacts dissolved oxygen concentrations and may impact compliance with the DO objective. Strictly in terms of compliance with objectives and the impacts to other constituents, a thorough discussion of temperature must be included in the Water Quality section of the EIR/EIS. The Water Quality section must be amended to discuss temperature, compliance with limitations, protection of beneficial uses and the impacts from the various alternatives described in the EIR/EIS.

The temperature objectives in the Basin Plan and the Thermal Plan are principally based on antidegradation (changes in temperature) and not necessarily on the direct protection of beneficial uses of receiving water or the Delta. The Delta is home to numerous species of Coldwater fish and all life stages. Maximum temperatures for the protection of Coldwater fish species are well documented; and the Central Valley Regional Board has included specific temperature regimes in NPDES permits, such as for the Cities of Lincoln and Placerville. Any discussion of temperatures must not be limited to regulatory compliance with objectives but must also discuss the temperatures necessary to assure a productive population of Coldwater aquatic life.

20. Color is Inadequately Addressed.

CCR Title 22, Chapter 15, Article 16, Secondary Water Standards, Section 64449, states, in part, that: "The secondary MCLs shown in Tables 64449-A and 64449-B shall not exceed in the water supplied to the public by community water systems." Table 64449-A contains a MCL for color of 15 units.

Drinking water MCLs are included in the Central Valley Basin Plan by direct reference under the Chemical Constituents Objective; therefore the MCLs are applicable water quality standards.

The EIR/EIS (Section 8C.1.5.2) incorrectly states that: "*Color in water has a secondary MCL of 15 color units. Secondary MCLs are established only as guidelines to assist public water systems* *in managing their drinking water for aesthetic considerations*." In California the secondary MCL for color is a regulatory requirement and an applicable water quality standard.

The EIR/EIS (Section 8C.1.5.2) continues:

> "*To the degree that color itself is a concern from an aesthetic standpoint, conventional drinking water treatment removes many of the constituents that cause high color levels in water. <u>Coagulation/flocculation and filtration remove metals like iron, manganese and zinc</u>. <u>Aeration removes iron and manganese</u>. <u>Granular activated carbon removes most of the contaminants which cause color</u> (U.S. EPA 2012b). Color in the three major source waters to the Delta does not vary considerably (see Step 1, Table SA-6). The average in the Sacramento River at Freeport/Greene's Landing is approximately <u>22 units</u>, while San Francisco Bay at Martinez and San Joaquin River at Vernalis average approximately <u>30 units</u>. The standard deviations at these locations are 22–37 units, indicating that substantial variability exists at all three locations, and no specific source waters is consistently highest in color. <u>The Delta is not 303(d) listed for color and thus no beneficial use impairment due to its current levels is occurring</u>.*"

The total portions of iron, manganese and zinc may be removed by coagulation, flocculation and filtration; however, the dissolved segment will likely pass through such treatment systems. The EIR/EIS does not present any information regarding the total and/or dissolved speciation of these metals.

It makes no engineering sense that aeration would remove iron and manganese from a water column. Aeration is a process where air is added to a treatment process; this may remove volatile constituents to the atmosphere, but not metals.

The EIR/EIS clearly shows that color exceeds the water quality standard throughout the Delta where the average levels of 22 units and 30 units clearly exceed the 15 unit standard. The fact that the 303(d) list has not been modified to include color does not indicate that the water quality standard is not being exceeded.

The State Water Resources Control Board's Policy, Resolution No. 88-63, "Sources of Drinking Water" states that All surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards…" Drinking water quality must be maintained within the waters of the State not just following extraction and treatment.

The drinking water beneficial use is impaired by color within the Delta; the EIR/EIS clearly documents this case by showing average color levels, which exceed the drinking water MCL. The EIR/EIS is not only deficient with regard to the discussion of color, but it is misleading and simply incorrect.

In closing, the EIR/EIS is seriously misleading, grossly inadequate, technically deficient and fails, in multiple ways, to meet the minimal CEQA and NEPA requirements for an environmental review document.

Thank you for considering these comments. If you have questions or require clarification, please don't hesitate to contact us.

Sincerely,

Bill Jennings, Executive Director
California Sportfishing Protection Alliance

Attachment: Comments on Bay Delta Conservation Plan (BDCP) Draft EIR/EIS Chapter 8 – Water Quality, Chapter 25 – Public Health, G. Fred Lee, PhD, PE, BCEE, F.ASCE and Anne Jones-Lee, PhD

Comments on Bay Delta Conservation Plan (BDCP) Draft EIR/EIS
Chapter 8 – Water Quality
Chapter 25 – Public Health

G. Fred Lee, PhD, PE, BCEE, F.ASCE and Anne Jones-Lee, PhD
G. Fred Lee & Associates
El Macero, California
July 25, 2014

The following comments are offered in response to the request for public comment on the Bay Delta Conservation Plan (BDCP) Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) (http://baydeltaconservationplan.com/PublicReview.aspx). According to published information (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Highlights_of_the_Draft_EIR-EIS_12-9-13.sflb.ashx),

> *"The proposed Bay Delta Conservation Plan (BDCP) is a comprehensive conservation strategy that intends to address the critical issues in the Delta using an ecosystem-based approach. The Plan would help to restore fish and wildlife species in the Delta and to improve reliability of water supplies, while minimizing impacts on Delta communities and farms."*
>
> *"The Draft EIR/EIS is intended to analyze and disclose the potential impacts on the human environment from the proposed action and alternatives."*

These comments address Chapter 8 of the draft EIR/EIS, which is devoted to Delta Water Quality as impacted by the preferred alternative plan described thus: (http://baydeltaconservationplan.com/Libraries/Dynamic_Document_Library/Draft_BDCP_Highlights_12-9-13.sflb.ashx):

> *"The proposed BDCP project includes three new intakes along the Sacramento River in the north Delta and twin underground main tunnels through the Delta, approximately 30 miles long, to carry water under the Delta to the CVP* [Central Valley Project] *and SWP* [State Water Project] *pumping plants. A forebay would be needed near the intakes to collect water diverted from the river, then gravity flow would move water supplies through the tunnels."*
>
> *"The twin tunnels would be lined with concrete segments and capable of moving a maximum of 9,000 cubic feet per second (cfs). The gravity-flow system requires two 40-foot-diameter tunnels to convey the needed flows and overcome friction losses to keep water moving through the system."*

These comments also address additional aspects of public health impacts of the proposed project as included in Chapter 25 of the draft EIR/EIS, which is described thus (Chapter 25 page 1):

> *"This chapter focuses on issues related to human health and safety that could potentially be affected by implementation of the BDCP alternatives, particularly with respect to water quality, the potential to cause or worsen water borne illness, the potential to create habitat for vectors that may carry diseases; and to address potential health related concerns from additional electric transmission lines needed under most of the alternatives."*

Overall Assessment

Overall, the draft BDCP EIR/EIS and approaches used in its development are inadequate in scope and reliability for evaluating the potential impacts of diverting substantial amounts of Sacramento River water around or through the Delta on chemical constituents and water quality in Delta channels. The draft EIR/EIS basically used model output of expected changes in the concentrations of a few water quality parameters that have not been found to exceed a water quality objective at a few selected locations in the Delta as was done for this draft EIR/EIS. The approach used does not adequately or reliably consider the range of water quality impacts caused by the wide variety of potential pollutants present in the various Delta channels, that can be expected to result from the removal of large amounts of high-quality Sacramento River water from the Delta by this project.

As discussed herein the existing database on chemical contaminants contributed to the Delta, the impacts of sources of flow and changes in those sources on contaminant concentration, distribution, and impact within the Delta, and Delta channel water quality overall is too limited to make a sufficiently reliable assessment of the impacts of a project as extensive, expensive, and far-reaching as that proposed. Further, the level of uncertainty inherent in the existing modeling of Delta channel flows, and the Sacramento River component of those flows, renders it insufficiently reliable to adequately estimate the change in channel flow and character that will be expected to result from the massive diversion of Sacramento River flow around or through the Delta as proposed, much less the influence on those flow alterations on the concentrations, distribution, and impacts of chemical contaminants in the Delta.

As discussed in these comments there are a number of issues that should have been, but were not adequately, considered in assessing the water quality impacts of the existing Sacramento River flow into the Delta as well as the impacts of significantly reducing that flow. An area of the Delta of importance and with which Dr. Lee is particularly familiar is the Central Delta where the Sacramento River mixes with the San Joaquin River below Columbia Cut. As found in his studies of that area, and discussed in his reports that are on Drs. Lee and Jones-Lee's website, [www.gfredlee.com in the San Joaquin River Delta section at http://www.gfredlee.com/psjriv2.html] the amount of Sacramento River in the San Joaquin River channel is dependent on the amount of south Delta water that is pumped from the Delta by the CVP and SWP; the Sacramento River is drawn through the Delta by and toward the export pumps While the export pumps for those two projects will continue to draw south Delta water from the Southern Delta with half of total exports will coming from the north Delta facilities and, in the long-term alternative 4 will lead to increased exports and reduced outflow. These issues as well as others discussed herein need to be defined and evaluated before further consideration is given to the proposed BDCP diversion project.

A properly developed EIR/EIS would have included a detained analysis of potential errors in predicting constituent concentrations in the various Delta channels and in predicting the changes in flow and associated impacts on constituent concentrations, distribution, and effects. As it stands now Chapter 8 of this EIR/EIS does not reliably inform the public or decision-makers about the magnitude of the errors in estimates and conclusions inherent in the BDCP analysis of the impact of the diversions on Delta water quality/beneficial uses.

Background to Comments

Dr. G. Fred Lee has been involved and pioneered in graduate-level teaching, research, laboratory direction, consulting, and professional service in a myriad aspects of sources, fate, transport, and public health and environmental quality impacts of chemicals in natural waters (including lakes, reservoirs, rivers, estuaries, and nearshore marine waters) since the early 1960s; he has published nearly 1000 professional papers and reports on his work. Information on Drs. Lee and Jones-Lee's experience in these areas and publications are available on their website, www.gfredlee.com; their involvement in, and publications concerning, the Sacramento San Joaquin River Delta specifically are addressed at http://www.gfredlee.com/psjriv2.html.

Drs. Lee and Jones-Lee began working on Delta water quality issues in the summer of 1989 when he was a Distinguished Professor and she was Associate Professor of Engineering at the New Jersey Institute of Technology. At that time they were contracted by Delta Wetlands, a proposed private project to develop water supply reservoirs in the Delta, to evaluate the expected water quality in the proposed reservoirs based on their more than 25 years of work on reservoir water quality in the USA and many other areas of the world. Their project involved collecting and reviewing existing Delta water quality and related data and assessing the anticipated water quality in the proposed Delta reservoirs for water supply and other beneficial uses, since it was to be Delta water that would be used to fill the proposed reservoirs.

Beginning in 2002 Drs. Lee and Jones-Lee became technical advisors to the San Joaquin River Deep Water Ship Channel (DWSC) Low-DO (dissolved oxygen) TMDL Steering Committee. That involvement led to their being appointed principal investigators (PIs) for a $2-million CalFed project to investigate the causes of the low-DO problems in the DWSC. As project PIs they coordinated the studies of 12 investigators and developed synthesis reports for the project. In addition, they published additional papers and reports discussing the study findings and their significance and implications for water quality in Delta. Appendix A to these comments provides a brief description and citations with URLs for many of those writings; additional papers and reports on Delta water quality issues are available in the San Joaquin River & Delta section of their website (http://www.gfredlee.com/psjriv2.html). The SJR DWSC low DO TMDL project led to the development of,

> Lee. G. F., and Jones-Lee, A., "Synthesis and Discussion of Findings on the Causes and Factors Influencing Low DO in the San Joaquin River Deep Water Ship Channel near Stockton, CA: Including 2002 Data," Report Submitted to SJR DO TMDL Steering Committee/Technical Advisory Committee and CALFED Bay-Delta Program, G. Fred Lee & Associates, El Macero, CA, March (2003). http://www.gfredlee.com/SJR-Delta/SynthesisRpt3-21-03.pdf
>
> Lee, G. F. and Jones-Lee, A., "Supplement to Synthesis Report on the Low-DO Problem in the SJR DWSC," Report of G. Fred Lee & Associates, El Macero, CA, June (2004). http://www.gfredlee.com/SJR-Delta/SynthRptSupp.pdf

and a number of other papers and reports on these studies. Further information on these studies is presented below.

Following the completion of the SJR DWSC DO TMDL synthesis report developed, Lee, G. F. and Jones-Lee, A., "Overview of Sacramento-San Joaquin River Delta Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA (2004). http://www.gfredlee.com/SJR-Delta/Delta-WQ-IssuesRpt.pdf

Lee, G. F., and Jones-Lee, A., "Overview—Sacramento/San Joaquin Delta Water Quality," Presented at CA/NV AWWA Fall Conference, Sacramento, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, October (2007). http://www.gfredlee.com/SJR-Delta/DeltaWQCANVAWWAOct07.pdf

The Lee and Jones-Lee (2004) Delta water quality report was the first comprehensive report on Delta water quality issues that examined the water quality implications of violations of water quality objectives in the Delta channels.

A major finding discussed therein was that the flow through the Delta channels impacted the location and magnitude of violations of water quality objectives in a Delta channel. While the importance of channel flow was impacting water quality/beneficial uses of the channel, it was pointed out that there was very little concrete understanding of how altering the channel flow impacted the water quality.

Of particular note with respect to addressing issues of the draft EIR/EIS Chapter 25 is Dr. Lee's BA and MSPH degrees in public health and his PhD in environmental engineering with a minor with public health. Much of his work during his five-decades-long profession career has been in water quality research and consulting activities that address public health and water quality aspects of chemical and biological contaminants in the environment and drinking water.

In summary these comments on the adequacy of the BDCP draft EIR EIS to adequately and reliably present information on the impact of proposed diversion of 9,000 cfs of Sacramento River around the Delta began in 1989. Since then we have been active in review of Delta water quality issues including developing over 90 reports/papers on these issues. Further information on this experience is in

Lee, G. F., and Jones-Lee, A., "Experience in Reviewing Delta Water Quality Issues," G. Fred Lee & Associates, El Macero, CA, April 3 (2011). http://www.gfredlee.com/SJR-Delta/GFLAJL-Delta-EXP-REV.pdf

Specific Comments on Draft EIR/EIS BDCP "Chapter 8 Water Quality"

"8.1 Readers' Guide

Chapter 8, Water Quality, describes the environmental setting and potential impacts of the BDCP on water quality in and upstream of the Sacramento-San Joaquin Delta. The chapter provides the results of the evaluation of the effects of implementing the BDCP conservation measures on water quality constituents under a no action alternative and 15 different project alternatives."

Pages 8-15&16 Table 8-1 lists the beneficial uses of the Delta. An issue that needs to be acknowledged and understood is that Sacramento River flow into and through the Delta plays an important part in reducing the water quality impacts of regulated and unrecognized/unregulated pollutants added to Delta water, both by its dilution of pollutant concentration and by decreasing the pollutant residence times in the Delta. The reduction in Sacramento River flow into and through the Delta that will result from the proposed plan will be expected to increase the water quality and public health significance of unrecognized/unregulated pollutants in the Delta waters. These issues were discussed in the following presentations and writings:

Lee, G. F., and Jones-Lee, A., "Enhanced Delta Flows Needed to Help Control Water Quality Impacts of Delta Pollutants," Testimony for CA State Water Resources Control Board Public Workshop: Comprehensive (Phase 2) Review & Update to Bay-Delta Plan Workshop 1: Ecosystem Changes and the Low Salinity Zone, Sacramento, CA, September 5, 2012, Report of G. Fred Lee & Associates, El Macero, CA, August 17 (2012).
http://www.gfredlee.com/SJR-Delta/Lee_Testimony_BayDelta_Workshop_1.pdf

Lee, G. F., and Jones-Lee, A., "Discussion of Water Quality Issues That Should Be Considered in Evaluating the Potential Impact of Delta Water Diversions/Manipulations on Chemical Pollutants on Aquatic Life Resources of the Delta," Report of G. Fred Lee & Associates, El Macero, CA, February 11 (2010).
http://www.gfredlee.com/SJR-Delta/Impact_Diversions.pdf

Lee, G. F., and Jones-Lee, A., "Comments on Water Quality Issues Associated with SWRCB's Developing Flow Criteria for Protection of the Public Trust Aquatic Life Resources of the Delta," Submitted to CA State Water Resources Control Board as part of Public Trust Delta Flow Criteria Development, by G. Fred Lee & Associates, El Macero, CA, February 11 (2010).
http://www.gfredlee.com/SJR-Delta/Public_Trust_WQ.pdf

The proposed BDCP diversion of Sacramento River water around the Delta rather than continuing to allow river water to flow through the Delta to the CVP and SWP diversions will be detrimental to Delta water quality.

Section 8.2.1.8 beginning on Page 8-25 presents a review of "water quality constituents of concern," and makes mention of some of the unrecognized pollutants. That section, however, does not adequately address this issue. There are many more unregulated and unrecognized potential pollutants that could be impacting Delta water quality beneficial uses; these issues are reviewed in:

Lee, G. F., and Jones-Lee, A., "Unrecognized Environmental Pollutants," Water Encyclopedia: Surface and Agricultural Water, Wiley, Hoboken, NJ pp 371-373 (2005).
http://www.gfredlee.com/SurfaceWQ/WileyUnrecognizedPollutants.pdf

Volume 13 Number 1, January 12, 2010 - Topics: Impacts of unmonitored, unregulated, and unrecognized chemicals in the aquatic systems.
www.gfredlee.com/Newsletter/swnewsV13N1.pdf

As noted, above the proposed BDCP diversion of Sacramento River water around the Delta will be adverse to beneficial uses of the Delta due by enhancing the water quality impacts of unregulated and unregulated potential pollutants.

Page 8-26 lines 16-17 states, *"Excess nutrients can cause blooms of nuisance algae and aquatic* *vegetation, and their decay can result in depleted DO."* The draft does not adequately address the at least equally, and in some areas, more significant impacts of aquatic macrophytes on aquatic life (fish) habitat and recreational use (boating) in the Delta.

Page 8-36 lines 20-22 state, *"Nutrient concentrations currently in the Delta are high enough that they are probably not a true limiting factor for overall algal growth, and therefore increases in ammonia generally will not lead to an increase in algal growth (Jassby et al. 2002:1)."* It should be noted that the Central Valley Regional Water Quality Control Board (CVRWQCB) recently established a limit on the release of ammonia in city of Stockton wastewater discharges to the SJR on the belief that that ammonia is significant in stimulating the growth of algae in Southern California water supply reservoirs, causing tastes and odors in the water supply.

Page 8-47 presents a discussion of PCB-pollution of the Delta. That discussion is highly deficient in that it fails to mention the large amount of work that has been done on PCB accumulation in fish in the Delta and Delta tributaries. In 2002 Dr. Lee reviewed the extensive data on PCBs in fish of the Central Valley on behalf of the State Water Resources Control Board (SWRCB)/CVRWQCB. From that work, Lee and Jones-Lee developed the following reports:

Lee, G. F. and Jones-Lee, A., "Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance," California Water Institute Report TP 02-06 to the California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 170 pp, California State University Fresno, Fresno, CA, December (2002). http://www.gfredlee.com/SurfaceWQ/OClTMDLRpt12-11-02.pdf

Lee, G. F., and Jones-Lee, A., "Update of Organochlorine (OCl) 'Legacy' Pesticide and PCB Concentrations in Delta and Central Valley Fish," Report of G. Fred Lee & Associates, El Macero, CA, September 10 (2007). http://gfredlee.com/SurfaceWQ/UpdateLegacyPestCVFish.pdf

As discussed in those reports, the PCB-pollution of Delta and Delta tributary fish is a major water quality issue in the Central Valley waterways, sufficient to render the consumption of some large game fish such as largemouth bass hazardous to human health. While the California Office of Environmental Health Hazard Assessment (OHHEA) has reported that the levels of legacy chlorinated hydrocarbon pesticides such as DDT/DDE in fish tissue has been decreasing, the PCB content of Central Valley fish has not decreased.

Pages 8-51&52 present some information on the low-DO situation in the SJR DWSC. That discussion is deficient, however, in that it fails to discuss how manipulation of SJR DWSC flow has been, and still can be, a major factor in causing low-DO conditions in the DWSC. As discussed in reports cited in the Background section of these comments and Appendix A, the export of Delta waters by the CVP and SWP is a major contributor to low DO in the DWSC. The draft EIR/EIS fails to adequately discuss the current situation concerning the low DO in DWSC. As written, it misleads a reader to believe that the installation and operation an aeration system will control the low-DO situation in the DWSC. It also fails to discuss that there are no funds available to operate an aeration system in a manner to control the low DO that can result from the residual oxygen demand contributed from agricultural sources. Agricultural sources contribute algal nutrients to the upstream SJR waters; those nutrients support the growth of algae that cause significant oxygen demand in the DWSC especially under low-flow conditions in the SJR DWSC. The loss of Sacramento River water in the ship channel will potentially expand the downstream range of dissolved oxygen problems. Information on the current low-DO situation in the SJR DWSC is available in the following reports:

Lee, G. F., Comments on SJR DWSC Low-DO issues discussed at March 28, 2012 BDCP meeting. Comments submitted to J. Grindstaff, Executive Officer, Delta Stewardship Council, by G. Fred Lee & Associates, El Macero, CA, April 28 (2012). http://www.gfredlee.com/SJR-Delta/Comments_SJR_DO_Issues_DSC.pdf

Lee, G. F., and Jones-Lee, A., "Background Information on SJR Upstream Oxygen Demand Control Issues," Prepared for San Joaquin River Technical Work Group, Report of G. Fred Lee & Associates, El Macero, CA, July 11 (2010). http://www.gfredlee.com/SJR-Delta/Bkgrnd-SJR-DO.pdf

Lee, G. F., and Jones-Lee, A., "Issues in Controlling the Residual Oxygen Demand in the SJR DWSC That Leads to DO WQO Violations," Report of G. Fred Lee & Associates, El Macero, CA, November 3, 2010; updated February 6 (2011). http://www.gfredlee.com/SJR-Delta/Residual-Ox-Demand-DWSC.pdf

As discussed in those reports, algal nutrients discharged by irrigated agriculture in the Grasslands Project area needs to be controlled in order to control algal growth in the SJR that contributes to the residual oxygen demand in the DWSC that can lead to low-DO conditions. The control of that source is especially important under the proposed plan that would divert Sacramento River water around the Delta, in order to mitigate the impact of the loss of Sacramento River on the low-DO situation in the SJR DWSC. The control of algal nutrients upstream in the SJR could greatly reduce, if not eliminate, the need for an aeration system.

Page 8-52 lines 36-37 states, *"EC and TDS values tend to be highly correlated because the majority of chemicals that contribute to TDS are charged particles that impart conductance of water."* It is incorrect to describe ions that contribute to electrical conductivity as "charge particles." The ions are not particles.

Pages 8-69 through 8-74 are devoted to "Nitrate/Nitrite and Phosphorus" in the Delta. That discussion is significantly deficient as it does not adequately discuss problems with the Gilbert discussion of N/P ratios as factor in influencing fish populations in the Delta. While those issues were discussed in an earlier section of the draft EIR/EIS, they are not discussed in the section that focuses on these issues on pages 8-70 and 8-71. When Gilbert first proposed to rely on N/P ratios, we developed the paper cited below to address the unreliability of that approach.

Lee, G. F., and Jones-Lee, A., "Comments on the Adequacy of C. Dahm's Discussion of Delta Eutrophication Issues & Delta N/P Rations as a Cause of Adverse Impact on Delta Fish," Comments to Delta Stewardship Council, Report of G. Fred Lee &Associates, El Macero, CA, November 17 (2011). http://www.gfredlee.com/SJR-Delta/DSC-Comments-Dahm-Eutroph.pdf

Lee, G. F., and Jones-Lee, A., "Comments on P. Glibert Defense of N/P Ratios as Major Influence on Aquatic Ecosystems Composition in Delta," Report of G. Fred Lee & Associates, El Macro, CA, September 17 (2012). http://www.gfredlee.com/SJR-Delta/Comments_Glibert_NPRatio.pdf

The BDCP draft EIR/EIs Water Quality Chapter 8 should have discussed the findings presented in Dr. Erwin van Nieuwenhuyse's professional workshop presentation and publication concerning the response in average summer chlorophyll concentration in the Delta to an abrupt and sustained reduction in phosphorus discharge from the Sacramento Regional Wastewater Treatment Plant. His presentation slides are available at http://www.cwemf.org/workshops/DeltaNutrientsWrkshp/VanNieuwenhuyse.pdf and his published paper is:

vanNieuwenhuyse, E., "Response of Summer Chlorophyll Concentration to Reduced Total Phosphorus Concentration in the Rhine River (Netherlands) and the Sacramento– San Joaquin Delta (California, USA)," Can. J. Fish. Aquatic, Sci. 64(11):1529-1542 (2007). [http://www.ingentaconnect.com/content/nrc/cjfas/2007/00000064/00000011/art00006]

His presentation and paper provided important information on the impact of phosphorus discharges from that facility on planktonic algae in the Delta. He found that the changes in the fish production and ecosystem in Delta that occurred was more likely a result of the decrease in phosphorus discharged rather than of a change in N/P ratios.

Another issue that was not properly addressed in the draft EIR/EIS is that particulate inorganic phosphorus is largely not available to support algal growth. This issue has been reviewed in a number of publications including:

Lee, G. F., "A Proposal for Assessing Algal-Available Phosphorus Loads in Runoff from Irrigated Agriculture in the Central Valley of California," Report of G. Fred Lee & Associates, El Macero, CA, November (2006). http://www.gfredlee.com/Nutrients/AlgalAssayAvailP.pdf

Lee, G. F., "Assessing Algal Available Phosphorus," Submitted for Inclusion in the Proceedings of US EPA Science Symposium: "Sources, Transport, and Fate of Nutrients in the Mississippi River and Atchafalaya River Basins," Minneapolis, MN, November 7-9 (2006). http://www.gfredlee.com/Nutrients/AvailPEPASymp06.pdf

Lee, G. F., and Jones-Lee, A., "Assessing the Water Quality Significance of N & P Compound Concentrations in Agricultural Runoff," Invited Paper Presented at Agrochemical Division, American Chemical Society National Meeting, San Francisco, CA, September (2006). http://www.gfredlee.com/Nutrients/N-PRunoffACS.pdf

It is the algal-available P load to the Delta –soluble ortho P as well as algal-cell phosphorus – that needs to be the focus of phosphorus control programs to control excessive algal growth in Delta waters.

Pages 8-162 & 8-163 present a discussion of organic carbon. That discussion should include the findings reported in:

Lee, G. F., "Synopsis of G. Fred Lee and Anne Jones-Lee's Work on Domestic Water Supply Water Quality, and TOC Issues in the Sacramento/San Joaquin River Delta," Report of G. Fred Lee & Associates, El Macero, CA (2004). http://www.gfredlee.com/SJR-Delta/GFL-DeltaTOCWork.pdf

Lee, G. F. and Jones-Lee, A., "Issues that Need to Be Considered in Evaluating the Sources and Potential Control of TOC that Leads to THMs for Water Utilities that Use Delta Water as a Water Supply Source," Report of G. Fred Lee & Associates, El Macero, CA, May (2003). http://www.gfredlee.com/SJR-Delta/TOC_update.pdf

Pages 8-164 devoted to pesticides fails to mention the comprehensive review of the organochlorine legacy pesticides such as DDT that are still present in Delta tributary soils and sediments and contribute to the presence of some of these pesticides in some fish in the Delta and Delta tributaries in concentrations that represent a threat to human health. These issues are reviewed in:

Lee, G. F. and Jones-Lee, A., "Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance," California Water Institute Report TP 02-06 to the California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 170 pp, California State University Fresno, Fresno, CA, December (2002). http://www.gfredlee.com/SurfaceWQ/OClTMDLRpt12-11-02.pdf

Lee, G. F., and Jones-Lee, A., "Update of Organochlorine (OCl) 'Legacy' Pesticide and PCB Concentrations in Delta and Central Valley Fish," Report of G. Fred Lee & Associates, El Macero, CA, September 10 (2007). http://gfredlee.com/SurfaceWQ/UpdateLegacyPestCVFish.pdf

While OEHHA has been finding that DDT concentrations in Central Valley fish are decreasing they remain sufficiently high in some fish to be of human health concern.

Lee, G. F. and Jones-Lee, A., "Organochlorine Pesticide, PCB and Dioxin/Furan Excessive Bioaccumulation Management Guidance," California Water Institute Report TP 02-06 to the California Water Resources Control Board/Central Valley Regional Water Quality Control Board, 170 pp, California State University Fresno, Fresno, CA, December (2002). http://www.gfredlee.com/SurfaceWQ/OClTMDLRpt12-11-02.pdf

Lee, G. F., and Jones-Lee, A., "Update of Organochlorine (OCl) 'Legacy' Pesticide and PCB Concentrations in Delta and Central Valley Fish," Report of G. Fred Lee & Associates, El Macero, CA, September 10 (2007). http://gfredlee.com/SurfaceWQ/UpdateLegacyPestCVFish.pdf

Page 8-166 devoted to phosphorus fails to discuss key issues concerning the importance of phosphorus in impacting Delta water quality discussed above. Of particular importance is the work of vanNieuwenhuyse (2007) that found that when the phosphorus load to the Delta was decreased, the phytoplankton concentrations also decreased.

Page 8-173 begins Section 8.4.2 Determination of Effects. The comments presented below concerning this section focus on the BDCP's assessment of the impacts of the proposed BDCP diversion of Sacramento River water around the Delta on Delta water quality as presented in 8.4.3.9 Alternative 4 – Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H) that begins on page 8-407. These comments are also applicable to the other identified alternatives identified in the document.

Page 8-173Section 8.4.2.1 Screening Analysis and Results beginning on line 16 states:
"This water quality analysis assessed the potential effects of implementing the various alternatives on 182 constituents (or classes of constituents). The initial analysis of water quality effects, referred to as the "screening analysis" in the Methods of Analysis section (above) resulted in the following findings. Of the 182 constituents, 110 were determined to have no potential to be adversely affected by the alternatives to an extent to which adverse environmental effects would be expected. Historical data for these constituents showed no exceedances of water quality objectives/criteria in the major Delta source waters, were not on the State's 303(d) list in the affected environment, were not of concern based on professional judgment or scoping comments, and had no potential for substantial long-term water quality degradation. Consequently, no further analyses were performed for these 110 constituents."

The approach described for excusing particular constituents from further consideration of impact was imprudent. Such disregard may well result in not considering water quality parameters that are present in one or more of the Delta channels at concentrations just under current water quality criteria/standards/objectives and may well be of concern once the Sacramento River flow is reduced as proposed, and under future revisions of the US EPA water quality criteria, state of California water quality objectives, and regional boards' basin plan objectives. Further it is well-recognized that some of the current water quality criteria, state standards, and Basin Plan objectives are not protective of the beneficial uses of water. Also the BDCP approach for selecting the chemical constituents for analysis of impacts of diverting Sacramento River flow ignores the well established facts of additive and syngistic impacts of chemical where two or more chemicals that exist at less than toxic concentrations can be combined to cause toxicity.

As summarized in writings referenced in Appendix A, Dr. Lee has extensive experience in developing water quality criteria and state standards, and in their implementation in discharge limits for the protection of beneficial uses of waterbodies. On numerous occasions he has been asked to serve as an independent technical peer-reviewer of federal and state water quality criteria and standards. He and Dr. Jones-Lee have published several papers and reports on their work and findings in these areas including:

Lee, G. F., and Jones-Lee, A., "Clean Water Act, Water Quality Criteria/Standards, TMDLs, and Weight-of-Evidence Approach for Regulating Water Quality," Water Encyclopedia: Water Law and Economics, Wiley, Hoboken, NJ, pp 598-604 (2005). http://www.gfredlee.com/SurfaceWQ/WileyCleanWaterAct.pdf

Lee, G. F. and Jones-Lee, A., "Appropriate Use of Numeric Chemical Water Quality Criteria," Health and Ecological Risk Assessment, 1:5-11 (1995). http://www.gfredlee.com/SurfaceWQ/chemcri.pdf

Lee, G. F., Jones, A., and Newbry, B., "Water Quality Standards and Water Quality," Journ. Water Pollut. Control Fed. 54(7):1131-1138 (1982). http://www.gfredlee.com/SurfaceWQ/WQStds-WaterQuality.pdf

The draft BDCP EIR/EIS discussion of anticipated water quality impacts of the proposed plan did not appropriately or adequately address the fact that the concentrations and distribution/locations of regulated and unregulated/inadequately regulated chemicals, whether or not they have or are presently known to exceed regulatory limits, will be expected to be altered by the diversion of large amounts of Sacramento River water around the Delta. This will be expected to affect the water quality impacts of regulated and unregulated/inadequately regulated chemicals in Delta waters. The BDCP's dismissing from further analysis of potential water quality effects, constituents that it concluded based on inadequate evaluation and without appropriate attention to the impact of the loss of Sacramento River water to the system, had not exceeded water quality objectives/criteria in the major Delta source waters, were not on the State's 303(d) list in the affected environment, or were not of concern, renders the draft EIR/EIS fundamentally flawed. That flaw alone is sufficiently significant to merit the denial of certification of this draft EIR/EIS.

As discussed in our review of the Delta Water Quality report cited below, as part of SWRCB water rights decision D-1641, several agencies, through the Interagency Ecological Program (IEP), conduct an Environmental Monitoring Program (EMP) that is supposed to provide information on the impacts of Delta water exports to central and Southern California on Delta resources and water quality.

Lee, G. F. and Jones-Lee, A., "Overview of Sacramento-San Joaquin River Delta Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA (2004). http://www.gfredlee.com/SJR-Delta/Delta-WQ-IssuesRpt.pdf

A critical review of the IEP EMP, however, shows that it falls short of adequately defining the full range of water quality impacts of the export of Delta water by the federal project (Central Valley Project – CVP) and state project (State Water Project – SWP). In 2004 Dr. Lee was a member of the peer-review panel that reviewed the adequacy of the IEP water quality monitoring program. In that forum he pointed out that that program was highly deficient in providing the information needed to evaluate the impacts of the SWP diversions on Delta water quality. His comments were ignored, and even today large amounts of money continue to be spent on Delta monitoring but are not directed to the stated purpose of the D-1641 water rights decision that allowed the SWP to divert large amounts of water from the Delta.

The CVRWQCB and SWRCB have been trying for several years, without success, to develop a comprehensive Delta water quality monitoring program. The basic problem is a lack of funding for such a program. If the BDCP-proposed Delta diversion project is allowed to be implemented, those benefiting from the project should be required to fund a comprehensive water quality monitoring program to adequately define the impacts of that diversion on Delta water quality.

Page 8-407 begins the discussion of Section 8.4.3.9, Alternative 4 – Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H). This section states, “Alternative 4 would comprise physical/structural components similar to those under Alternative 1A, however, there are notable differences. Alternative 4 would convey up to 9,000 cfs of water from the north Delta to the south Delta and that Alternative 4 would include an operable barrier at the head of Old River. Diverted water would be conveyed through pipelines/tunnels from three screened intakes (i.e., Intakes 2, 3 and 5) located on the east bank of the Sacramento River between Clarksburg and Courtland. Alternative 4 would include a 245 acre intermediate forebay at Glannvale Tract. Clifton Court Forebay would be dredged and expanded by approximately 690 acres to the southeast of the existing forebay. Water supply and conveyance operations would follow the guidelines described as Scenario H1, H2, H3, or H4, which variously include or exclude implementation of fall X2 and/or enhanced spring outflow. Conservation Measures 2–22 would be implemented under this alternative, and would be the same as those under Alternative 1A.”

The subsection, “Effects of the Alternative on Delta Hydrodynamics,” begins on page 408 with: *“Under the No Action Alternative and Alternatives 1–9, the following two primary factors can substantially affect water quality within the Delta:*

- *Within the south, west, and interior Delta, a decrease in the percentage of Sacramento River-sourced water and a concurrent increase in San Joaquin River-sourced water can increase the concentrations of numerous constituents (e.g., boron, bromide, chloride, electrical conductivity, nitrate, organic carbon, some pesticides, selenium). This source water replacement is caused by decreased exports of San Joaquin River water (due to increased Sacramento River water exports), or effects of climate change on timing of flows in the rivers. Changes in channel flows also can affect water residence time and many related physical, chemical, and biological variables.*

- *Particularly in the west Delta, sea water intrusion as a result of sea level rise or decreased Delta outflow can increase the concentration of salts (bromide, chloride) and levels of electrical conductivity. Conversely, increased Delta outflow (e.g., as a result of Fall X2 operations in wet and above normal water years) will decrease levels of these constituents, particularly in the west Delta.”*

As discussed in these comments, not only would the concentrations of the mentioned constituents increase with increases in the proportion of San Joaquin River water but also the concentrations of many other known pollutants as well as unregulated, unrecognized and inadequately regulated pollutants be increased. For some constituents the concentrations would be expected to increase in some Delta channels to levels in excess of water quality objectives and in some cases significantly impact Delta water quality. The draft EIR/EIS is deficient in that it fails to address this issue. Also, decreases in the amount of Sacramento River water in the Delta will result in changes in the areas in which adverse impacts on Delta channel water quality occur.

The draft EIR EIS fails to mention that increasing the concentrations of pollutants that are already causing water quality objectives is a violation of SWRCB/CVRWQCB antigradation issues that preclude degrading existing water quality of causing a degradation of water quality that causes and water quality objective violation.

Page 8-432 lines 39-43 and page 8-433 lines 1-2 state, *"Amounts of oxygen demanding substances present (e.g., ammonia, organics) in the reservoirs and rivers upstream of the Delta, rates of photosynthesis (which is influenced by nutrient levels/loading), and respiration and decomposition of aquatic life is not expected to change sufficiently under Alternative 4 to substantially alter DO levels relative to Existing Conditions or the No Action Alternative. Any minor reductions in DO levels that may occur under this alternative would not be expected to be of sufficient frequency, magnitude and geographic extent to adversely affect beneficial uses, or substantially degrade the quality of these water bodies, with regard to DO."*

That assessment ignores the importance of Sacramento River water currently drawn into the Delta by the current export projects, CVP and SWP, in the existing DO levels in the Delta, and the effect on DO that the reduction of that flow as proposed would have. As discussed in the synthesis report cited below, the flow of the Sacramento River water through the Delta limits the downstream extent of the low-DO conditions in the SJR DWSC to Turner Cut. With the reduced Sacramento River flow into the Central Delta as proposed, the lower SJR DWSC could experience low-DO conditions.

Lee. G. F., and Jones-Lee, A., "Synthesis and Discussion of Findings on the Causes and Factors Influencing Low DO in the San Joaquin River Deep Water Ship Channel near Stockton, CA: Including 2002 Data," Report Submitted to SJR DO TMDL Steering Committee/Technical Advisory Committee and CALFED Bay-Delta Program, G. Fred Lee & Associates, El Macero, CA, March (2003). http://www.gfredlee.com/SJR-Delta/SynthesisRpt3-21-03.pdf

As discussed in our reports the current operation of the CVP and SWP draws SJR water that enters the DWSC to the export pumps at Turner Cut. This has important implications for the homing of Chinook Salmon to SJR watershed spawning waters since there is no homing signal as the fish enter San Francisco Bay/Delta to guide them to their home stream waters. We have discussed this issue in,

Lee, G. F., and Jones-Lee, A., "Need for SJR Watershed Water to Reach San Francisco Bay," Comments submitted to Delta Stewardship Council, Sacramento, CA by G. Fred Lee & Associates, El Macero, CA, May 22 (2011). http://www.gfredlee.com/SJR-Delta/NeedSJRtoSFBay.pdf

Page 8-433 lines 13 through 21 state,
Under all operational scenarios of Alternative 4, minor DO level changes could occur due to nutrient loading to the Delta relative to Existing Conditions and the No Action Alternative (see WQ-1, WQ-15, WQ-23). The state has begun to aggressively regulate point-source discharge effects on Delta nutrients, and is expected to further regulate nutrients upstream of and in the Delta in the future. Although population increased in the affected environment between 1983 and 2001, average monthly DO levels during this period of record show no trend in decline in the presence of presumed increases in anthropogenic sources of nutrients (see Table 4.4-15 in the ES/AE section). Based on these considerations, excessive nutrients that would cause low DO levels would not be expected to occur under any operational scenario of Alternative 4.

Based on Dr. Lee's more than five decades of experience assessing the impacts of nutrients on DO in waterbodies throughout the world and his 25 years of experience in investigating nutrient

sources and impacts in the Delta watershed and within the Delta, it is misleading to characterize the current SWRCB efforts in developing nutrient objectives as having *"begun to aggressively regulate"* nutrient discharges. It will be many years before reliable and workable nutrient objectives will be available that can be used to regulate nutrient discharges from agricultural sources in the Delta watershed. As discussed above the major cause of the residual oxygen demand and low-DO in the SJR DWSC is nutrient input from upstream agricultural sources that stimulates the growth of algae in the DWSC which because of the flow-related residence time, are able to decompose in the DWSC where their bacterial decomposition exerts greater oxygen demand than can be assimilated.
We have developed several paper/reports on the impact of and controlling nutrients in SJR watershed including.

Lee, G. F., and Jones-Lee, A., "Potential Water Quality Impacts of Agriculture Runoff/Discharges in the Central Valley of California," Presented at Central Coast Agricultural Water Quality Coalition's 2007 National Conference on Agriculture & the Environment, Monterey, CA, PowerPoint Slides, G. Fred Lee & Associates, El Macero, CA, November (2007).
http://www.gfredlee.com/SJR-Delta/SJRAgImpactsMontereyNov2007.pdf

Lee, G. F., and Jones-Lee, A., "Synopsis of CWEMF Delta Nutrient Water Quality Modeling Workshop – March 25, 2008, Sacramento, CA," Report of G. Fred Lee & Associates, El Macero, CA, May 15 (2008). http://www.gfredlee.com/SJR-Delta/CWEMF_WS_synopsis.pdf

"Overview of Delta Nutrient Water Quality Problems: Nutrient Load – Water Quality Impact Modeling," Agenda for Technical Workshop sponsored by California Water and Environmental Modeling Forum (CWEMF), Scheduled for March 25, 2008 in Sacramento, CA (2008).
http://www.gfredlee.com/SJR-Delta/CWEMF_Workshop_Agenda.pdf

An issue that needs to be addressed by the SWP is the low-DO situation that occurs in the southern-most part of Old River channel in the South Delta in the vicinity of the Tracy Boulevard Bridge. The SWP export pumping of South Delta water resulted in major flow problems in the South Delta. The temporary barriers constructed to try maintain the water levels in the South Delta channels to enable agriculture to continue to pump irrigation water from the channel have restriced the flow in the southern-most part of Old River channel sufficiently to allow large-scale algal growth and die-off leading to low DO in the channel. As part of an extension of the SJR DWSC Low-DO TMDL project, we organized a boat tour of the South Delta channels on August 5, 2004. The DeltaKeeper (Bill Jennings) made available a DK boat and crew that enabled several members of the CVWQCB and CalFed staff to accompany Lee on this tour. During the tour the evidence of a large fish kill that had occurred the evening before was observed near the Tracy Blvd Bridge; hundreds of dead fish were observed floating on the surface of the water. The DWR maintains a DO monitoring station in the region of the fish kill, which showed that the previous night the DO in the channel dropped to near-zero. A report on that tour and the fish kill is presented in,

Lee, G. F.; Jones-Lee, A. and Burr, K., "Results of the August 5, 2003,Tour of the South Delta Channels," Report of G. Fred Lee & Associates, El Macero, CA, February (2004).

http://www.gfredlee.com/SJR-Delta/South-Delta-Tour.pdf

Lee, G. F., "Comments on SWRCB Review of South Delta Channel Water Quality," Report of G. Fred Lee & Associates, El Macero, CA, January 15 (2011). http://www.gfredlee.com/SJR-Delta/SoDeltaWQ1-11.pdf

Review of the data from the DWR monitoring station at that location shows frequent DO water quality objective violations occurred in this channel. That situation has been occurring for many years. It is clear that DWR as part of the SWP should be required to eliminate the low-DO problems that occur in the South Delta as a result of the operation of the SWP.

The low DO in the Old River channel is the result of high nutrient and algal lows in SJR that enters Old River at the Head of Old River and the lack of adequate flow of the channel due to the barrier constructed to maintain water levels in the Old River Channel.

Page 8-435 lines 17-20 states with regard to NEPA Effects:
"CM2–CM22 would not be expected to contribute to adverse DO levels in the Delta. The increased habitat provided by CM2–CM11 could contribute to an increased biochemical or sediment demand, through contribution of organic carbon and the action of plants decaying. However, similar habitat exists currently in the Delta and is not identified as contributing to adverse DO conditions."

Dr. Lee has considerable experience in examining the character of water discharged from wetlands; he conducted some of the first work done on the impacts of wetlands on water quality, which was discussed in the following paper:

Lee, G. F., Bentley, E., and Amundson, R., "Effects of Marshes on Water Quality," IN: Ecological Studies 10, Coupling of Land and Water Systems, Springer-Verlag, New York, pp. 105-127 (1975). http://www.gfredlee.com/SurfaceWQ/MarshesBentleyAmundson.pdf

Based on the monitoring programs and studies that have been conducted in the Delta, it is inappropriate to use the range of DO found in low-flow channels that receive predominately tidal flow from wetlands. The development of wetlands as part of establishing addition shallow habitat as part of the proposed BDCP Delta improvement.

Page 8-435 lines 25-27 states:
"CM14, an oxygen aeration facility in the Stockton Deep Water Ship Channel to meet TMDL objectives established by the Central Valley Water Board, would maintain DO levels above those that impair fish species when covered species are present."

As discussed elsewhere in these comments, the implementation of an aeration facility in the SJR DWSC to eliminate DO water quality objectives since the funding for construction and operation is not available. Further there is significant questions about whether the proposed aeration facility can prevent DO depletions below the water quality objective especially in the near bottom waters of the DWSC so that there are no more than one violation of the DO objective in any amount more than once every three years.

Page 8-440 lines 44-45 and page 8-441 lines 1-3 states:
"In addition to and to supplement Mitigation Measure WQ-11, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, Environmental Commitments, a separate, non-environmental commitment to address the potential increased water treatment costs that could result from EC concentration effects on municipal, industrial and agricultural water purveyor operations."

While it may be possible to pay water utilities and agricultural interests as compensation for impact of increased salinity due to the diversion of Sacramento River around the Delta, an issue that needs to be considered is the impact of increased salinity in domestic waters on the recharge of domestic wastewaters. An increase in the salinity in a municipality's water supply can lead to restrictions on the recharge of its domestic wastewaters as part of groundwater replenishment projects. This is already an issue in the use of Delta waters as a water supply for some Southern California municipalities. It can be very expensive to treat a domestic wastewater to achieve groundwater recharge limits.

Page 8-447-261. The section on the Effects of Nitrate Concentrations Resulting from Facilities Operations and Maintenance (CM1) that begins on line 13 needs to be expanded to include the impact of the CVRWQCB's recent adoption of reduced nitrate loads to the SJR and Delta from the Stockton waste water treatment plant.

Page 8-407 line 32 begins the presentation of Section 8.4.3.9 Alternative 4 – Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H). Many of the issues discussed above in reference to Alternative 4 are applicable to all of the alternatives involved in diversion of Sacramento River water around the Delta. While the relative reduction in the amount of diversion could be expected to lessen or increase the magnitude of some of the impacts, those impacts would still need to be better defined.

Page 8-700 line 28 begins the discussion of 8.4.3.16 Alternative 9—Through Delta/Separate Corridors (15,000 cfs; Operational Scenario G). The diversion of Sacramento River water through the Delta via isolated facilities would lead to many of the same adverse impacts noted above for diversion of Sacramento River water around the Delta via tunnels and or canals.

Page 8-771 line 15 begins a list of references for this draft EIR/EIS. While the list of references is voluminous, as noted in these comments there are a number of key, pertinent papers and reports not included in this list that should have been reviewed, discussed, and referenced in a certifiable EIR/EIS for the proposed BDCP project. The exclusion of those sources contributed to the deficiencies discussed in these comments.

Additional Comments
The limitations of the ability of DWR to provide reliable information on flow of water in Delta channels occurred when we were trying to understand the flow of Sacramento River and the San Joaquin River through the Central Delta as part of our work on SJR DWSC Low-DO TMDL project. We were unable to obtain from DWR modeling staff the respect flows in the Central Delta channels as a function of SJR, Sacramento River, Old River flows and export pumping by the CVP SWP. This situation still exists today. This is the type of information that is needed to

begin to reliably evaluate the impact of diversion of Sacramento River flow around or through the Delta.

MBK Engineers conducted a detailed review of BDCP modeling; Walter Bourez of MBK Engineers presented to the DISB his findings on one of the models used in the BDCP draft EIR/EIS which differed from those presented by BDCP. (He used a 2013 version of the model, rather than the 2009 model BDCP used.)

MBK Engineers concluded in its presentation to the Delta Independent Science Board (2014), *"An initial review led the Reviewers to conclude that the BDCP Model, which serves as the basis for the environmental analysis contained in the BDCP Environmental Impact Report/Statement (EIR/S), provides very limited useful information to understand the effects of the BDCP. The BDCP Model contains erroneous assumptions, errors, and outdated tools, which result in impractical or unrealistic Central Valley Project (CVP) and State Water Project (SWP) operations. The unrealistic operations, in turn, do not accurately depict the effects of the BDCP."*
MBK Engineers presentation to Delta Independent Science Board (2014)

The Delta Independent Science Board (DISB) is required by the Delta Reform Act of 2009 to review the BDCP draft EIR/EIS and to submit its comments to the Delta Stewardship Council and the Department of Fish and Game. In its May 15, 2014 cover letter transmitting its comments pursuant to that requirement [http://deltacouncil.ca.gov/sites/default/files/documents/files/Attachment-1-Final-BDCP-comments.pdf], the DISB acknowledged the monumental task faced by the preparers of the draft EIR/EIS but expressed the following conclusion:
"We find, however, that the science in this BDCP effort falls short of what the project requires. We highlight our concerns in the attached report. The report, in turn, draws on our detailed responses to charge questions from the Delta Stewardship Council (Appendix A) and on our reviews of individual chapters in the DEIR/DEIS (Appendix B). Our concerns raise issues that, if not addressed, may undermine the contributions of BDCP to meeting the co-equal goals for the Delta."

The DISB report transmitted by that letter, cited below, begins with the following summary:

"Summary of Major Concerns
Does the Bay Delta Conservation Plan (BDCP) Draft EIR/EIS (DEIR/DEIS) use the best available science in analyzing project alternatives and their effects? That is, do the analyses use science that is good enough, and use it well enough, for a project that is so large, complex, expensive, long-lasting, and important?

We find that the DEIR/DEIS currently falls short of meeting this "good enough" scientific standard. In particular:
1. Many of the impact assessments hinge on overly optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration.
2. The project is encumbered by uncertainties that are considered inconsistently and incompletely; modeling has not been used effectively to bracket a range of uncertainties or to

explore how uncertainties may propagate.
3. The potential effects of climate change and sea-level rise on the implementation and outcomes of BDCP actions are not adequately evaluated.
4. Insufficient attention is given to linkages and interactions among species, landscapes, and the proposed actions themselves.
5. The analyses largely neglect the influences of downstream effects on San Francisco Bay, levee failures, and environmental effects of increased water availability for agriculture and its environmental impacts in the San Joaquin Valley and downstream.
6. Details of how adaptive management will be implemented are left to a future management team without explicit prior consideration of (a) situations where adaptive management may be inappropriate or impossible to use, (b) contingency plans in case things do not work as planned, or (c) specific thresholds for action.
7. Available tools of risk assessment and decision support have not been used to assess the individual and combined risks associated with BDCP actions.
8. The presentation, despite clear writing and an abundance of information and analyses, makes it difficult to compare alternatives and evaluate the critical underlying assumptions."

Delta Independent Science Board, "Review of the Draft EIR/EIS and Draft BDCP," Report to the Delta Stewardship Council and California Department of Fish and Wildlife, May 15 (2014).

Comments made to the Delta Stewardship Council by Dr. Alex Parker of the California Maritime Academy and a member of the independent science review panel of the BDCP's Effects Analysis established at the request of the Department of Water Resources and the Bureau of Reclamation concerning the technical aspects of the plan were quoted in a June 3, 2014 posting on: http://mavensnotebook.com/2014/06/03/reviewing-the-science-of-the-bay-delta-conservation-plan/. That posting stated:
"Dr. Parker said he would just provide the highlights of their analysis and the major themes that emerged as a result of their review. 'We are heartened to see that the Delta Independent Science Board review of the draft BDCP and the EIR/EIS echoed a lot of our concerns, and I think that probably highlights for folks the areas where attention needs to be paid.'

He said there were four themes that emerged for the panel: [two of which are quoted here:]

- *The first is a real disconnect between the assessments of scientific certainty or uncertainty that is reflected in the Effects Analysis chapter versus what is in technical appendices, he said. 'This was a concern to us because we know that with a set of documents this vast, most people are going to read the Effects Analysis and not the technical appendices. There's a real concern that the effects analysis doesn't adequately address that level of uncertainty around virtually all of the conclusions that are made.'*
- *The implementation of the BDCP and its effects are highly uncertain, so the way to address this is through adaptive management, he said. 'It is part of the plan; however the Effects Analysis needs to really clearly articulate the uncertainty in order to have an effective adaptive management process and at present, that simply doesn't exist within the main document.'"*

"Another place where this [a lack of a whole ecosystem approach in the BDCP effects analysis] is clear to us is with respect to hydrodynamics modeling, Dr. Parker said. 'Hydrodynamics is

basically the movement of water, and this is a master variable in the system,' he said. 'If we want to have any conversation about circulation patterns, temperatures, submerged aquatic vegetation, contaminants, nutrients – we need to have reasonable modeling of the hydrodynamic system, and because we don't know where the restoration opportunity areas are necessarily defined in all cases – these are places where major conservation and restoration activities will take place – they were limited in what they could model in terms of hydrodynamics. That wasn't adequately acknowledged throughout, and again, raises high level of uncertainty in the ultimate analysis.' He also noted there were some counterintuitive results from some of the hydrodynamic modeling that was done there, but there wasn't sufficient information to really understand where those results came from."

Those conclusions concerning the lack of a reliable database and Delta flow information to develop a credible EIR/EIS for the BDCP for assessing the impacts of the diversion of Sacramento River water around or through the Delta, are in keeping with a number of the specific comments made by us independently above.

Comments on Chapter 25 – Public Health
Page 25-1 line 3 states, *"This chapter focuses on issues related to human health and safety that could potentially be affected by implementation of the BDCP alternatives, particularly with respect to water quality, the potential to cause or worsen water borne illness, the potential to create habitat for vectors that may carry diseases; and to address potential health related concerns from additional electric transmission lines needed under most of the alternatives."*

Page 25-1 lines 20-22 states, *"This chapter does not duplicate the information provided in other sections of the EIR/EIS, but rather focuses the discussion on potential impacts on human health of implementing the BDCP action alternatives."* Our comments on those bioaccumulating constituents in Chapter 8 are also applicable to the same constituents covered in Chapter 25.

Page 25-4 lines 9-11 states, *"Please see Chapter 8, Water Quality, Section 8.1.3.13, Pesticides and Herbicides, for a detailed discussion on the prior use of legacy pesticides in the Plan Area."* As discussed in our comments on those sections of Chapter 8, the BDCP draft EIS EIR is deficient as it fails to adequately discuss the readily available compilation data of organochlorine pesticides and PCBs in Delta and Central Valley water and fish developed and discussed by Lee and Jones-Lee.

Page 25-6 presents information on some of the sources of mercury in the Delta watershed. In addition to those mentioned, another tributary source of mercury is the Putah Creek. The findings of Lee and Jones-Lee's study of the current situation regarding mercury in Putah Creek have been published as,

Lee, G. F., and Jones-Lee, A, "LEHR Superfund Stormwater Runoff and Putah Creek Mercury Issues," *Journal Remediation*, **19(2)**:123-134, Spring (2009). http://www.gfredlee.com/SJR-Delta/LEHRrunoffHgRemediation.pdf

Lee, G. F., and Jones-Lee, A., "Summary of Slides – Putah Creek Mercury Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA, Presented to Delta Tributaries Mercury Council, December 2 (2008).

http://www.gfredlee.com/SJR-Delta/PutahHgMineSummary.pdf

Lee, G. F., and Jones-Lee, A., "Runoff of Mercury from UCD/DOE LEHR Superfund Site – Putah Creek Mercury Issues," PowerPoint Slides for Presentation to Delta Mercury Tributaries Council, Sacramento River Watershed Program [http://www.sacriver.org/issues/mercury/dtmc/], December 2 (2008). http://www.gfredlee.com/SJR-Delta/PutahHgMinesli.pdf

As discussed in those papers and reports, soils along Putah Creek are polluted with mercury that accumulates in fish tissue. The source of that mercury is mercury mines in the creek's watershed. Before the Lake Berryessa dam was constructed, stormwater runoff from the Putah Creek watershed transported mercury from former mercury mines to the Putah Creek flood plain. It will be very difficult to remediate the mercury-polluted soils along Putah Creek, and thus difficult to reduce the Putah Creek as source of mercury for the Delta.

Page 25-7 section on PCBs makes reference to deVlaming (2008). More reliable sources of information on PCBs in Delta tributaries and Delta water and fish are those included in the reports:

Lee, G. F., and Jones-Lee, A., "Update of Organochlorine (OCl) 'Legacy' Pesticide and PCB Concentrations in Delta and Central Valley Fish," Report of G. Fred Lee & Associates, El Macero, CA, September 10 (2007). http://gfredlee.com/SurfaceWQ/UpdateLegacyPestCVFish.pdf

Lee, G. F., "Need for Funding to Support Studies to Control Excessive Bioaccumulation of Organochlorine 'Legacy' Pesticides, PCBs and Dioxins in Edible Fish in the Central Valley of California," Report of G. Fred Lee & Associates, El Macero, CA, July (2003). http://www.gfredlee.com/Runoff/OCl_Support.pdf

Lee, G.F, and Jones-Lee, A., "Developing TMDLs for Organochlorine Pesticides and PCBs," Presented at the American Chemical Society Environmental Chemistry Division national meeting in San Diego, California, April (2001). http://www.gfredlee.com/Runoff/sandiego_030801.pdf

Lee, G. F. and Jones-Lee, A., "Excessive Bioaccumulation of Organochlorine Legacy Pesticides & PCBs in CA Central Valley Fish," PowerPoint Slides made available at US EPA National Fish Contaminant Forum, San Diego, CA, January (2004). http://www.gfredlee.com/Runoff/OCl-slides-SanDiego.pdf

Page 25-7 devoted to Legacy Pesticides failed to reference the reports of Lee's comprehensive review of legacy pesticides in Delta and Central Valley fish on behalf of the SWRCB and CVRWQCB; those reports were referenced in the comments above on draft EIR/EIS Chapter 8.

Page 25-8 lines 17-21 states, *"In March 2004, the U.S. Food and Drug Administration (FDA) issued recommendations for the consumption of fish or shellfish for women who might become pregnant, women who are pregnant or nursing, and young children (no other sensitive receptors were identified). While FDA states fish and shellfish are an important part of a healthy diet,* *nearly all fish and shellfish contain trace amounts of mercury (U.S. Food and Drug Administration 2011). However, some species contain higher amounts of the toxicant, and thus it is not recommended that women who might become pregnant, women who are pregnant or nursing, or young children eat shark, swordfish, king mackerel, or tilefish. None of these species are commonly found in the Delta. Further, local advisories should be checked for the safety of locally caught fish and if these advisories are unavailable, the weekly consumption of fish or shellfish species should be limited."* As discussed in US EPA guidance referenced below, it is highly inappropriate to compare Delta or other waterbody fish tissue concentration to FDA tissue limits for the purpose of assessing the health hazard associated with consuming those fish.

US EPA, "Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 1 Fish Sampling and Analysis, Third Edition," EPA 823-B-00-007, US EPA Office of Water, Washington, DC, November (2000).
USEPA_2000_Guidance_Document_volume2.pdf

As stated in the above-referenced US EPA guidance,
"EPA and FDA have agreed that the use of FDA Action Levels for the purpose of making local advisory determinations is inappropriate. in letters to all states, guidance documents, and annual conferences, this practice has been discouraged by EPA and FDA in favor of EPA's risk-based approach to derive local fish consumption advisories."

"FDA action levels and tolerances are indicators of chemical residue levels in fish and shellfish that should not be exceeded for the general population who consume fish and shellfish typically purchased in supermarkets or fish markets that sell products that are harvested from a wide geographic area, including imported fish and shellfish products. However, the underlying assumptions used in the FDA methodology were never intended to be protective of recreational, tribal, ethnic, and subsistence fishers who typically consume larger quantities of fish than the general population and often harvest the fish and shellfish they consume from the same local waterbodies repeatedly over many years."

The US EPA guidelines or the California Office of Environmental Health Hazard Assessment (OEHHA) fish consumption advisory values should be used to determine the potential public health hazards associated with consumption of contaminated fish.

Page 25-24 lines 33-34 states, *"The CWA sets water quality standards for all contaminants in surface waters. In California, such responsibility has been delegated to the State, which administers the CWA through the Porter-Cologne [Water Quality Control] Act (Water Code, Section 13000 et seq.)."* As discussed in reviews cited below, the Clean Water Act establishes the approach for establishing water quality criteria that can be developed into state water quality standards. Contrary to the BDCP's statement quoted above, the CWA does not "set water quality standards for all contaminants."

G. Fred Lee and Anne Jones-Lee Expertise and Experience in Water Quality Standards and NPDES Permits Development and Implementation into NPDES Permitted Discharges http://www.gfredlee.com/exp/wqexp.htm

Lee, G. F., and Jones-Lee, A., "Clean Water Act, Water Quality Criteria/Standards, TMDLs, and Weight-of-Evidence Approach for Regulating Water Quality," Water Encyclopedia:

Water Law and Economics, Wiley, Hoboken, NJ, pp 598-604 (2005). http://www.gfredlee.com/SurfaceWQ/WileyCleanWaterAct.pdf

Page 25-36 lines 6-8 states, discussed in Chapter 8, Water Quality (Section 8.1.1.6), numerical water quality objectives and standards have been established to protect beneficial uses, and therefore represent concentrations or values that should not be exceeded. “That statement is not accurate in that water quality objectives and standards can be exceeded once every three years.

Page 25-36 Section 25.3.1.3 Constituents of Concern and Water Quality again describes the approach used for the draft BDCP EIR/EIS to identify the constituents of concern, that is limiting the constituents considered to those that have been found to be present in concentrations above a water quality object or other standard. As discussed in our comments on Chapter 8 above, this approach is not technically valid for identifying all the constituents that need to be considered in evaluating potential water quality and public health impacts of the proposed BDCP.

As discussed above in the overall assessment, there is insufficient valid information to reliably evaluate the impact of diverting Sacramento River around or through the Delta on water quality/beneficial uses of the Delta.

Appendix A

The following professional papers, reports, and presentations provide examples of Drs. Lee and Jones-Lee's experience in reviewing Delta water quality issues.

Lee, G. F., "New & Updated Presentations/Publications on Delta and SJR Water Quality Issues," Comments to J. Grindstaff, Director CALFED, Sacramento, CA, G. Fred Lee & Associates, El Macero, CA, October 2 (2007).
http://www.gfredlee.com/SJR-Delta/PubsPresentsDeltaSJR.pdf

Lee, G. F., and Jones-Lee, A., "Delta Nutrient-Related Water Quality Problems," PowerPoint Slides Presented at CALFED Science Conference, Sacramento, CA, October 24 (2008).
http://www.gfredlee.com/SJR-Delta/CALFED_SciConf10-08.pdf

Lee, G. F., and Jones-Lee, A., "San Joaquin River Water Quality Issues,"(PowerPoint Slides) Invited Paper Presented at Great Valley Conference, "At the Tipping Point," Sacramento, CA, Sponsored by Great Valley Center, Modesto, CA, May 11 (2006).
http://www.gfredlee.com/SJR-Delta/SJR-April2006.pdf

Lee, G. F., Jones-Lee, A., "San Joaquin River Water Quality Issues," Report of G. Fred Lee & Associates, El Macero, CA, June (2006).
http://www.gfredlee.com/SJR-Delta/sjr-WQIssues.pdf

In recent years the State Water Resources Control Board (SWRCB) and CA Department of Fish and Game have conducted reviews of the impact of altering Delta flows into and through Delta channels on impacting Delta aquatic life resources. Drs. Lee and Jones-Lee have been asked to prepare comments on these issues. This has led to development of several reports and professional presentations on these issues including:

Lee, G. F., and Jones-Lee, A., "Comments on Delta Stewardship Council Staff May 14, 2012 Draft of the Delta Plan," Comments to Delta Stewardship Council by G. Fred Lee & Associates, El Macero, CA, June 13 (2012).
http://www.gfredlee.com/SJR-Delta/DSC-Comments-May2012-StaffDraft.pdf

Lee, G. F., and Jones-Lee, A., "Comments on the DSC Staff Fifth Draft of Chapter 6 Devoted to Delta Water Quality Issues in the Delta Plan," Comments Submitted to Delta Stewardship Council, Sacramento, CA, by G. Fred Lee & Associates, El Macero, CA, August 21 (2011).
http://www.gfredlee.com/SJR-Delta/DeltaPlan5DraftCh6Comm.pdf

Lee, G. F., and Jones-Lee, A., "Comments on Revised Delta Plan Staff Draft Chapter 6 'Improve Water Quality to Protect Human Health and the Environment' as Presented in the Fourth Staff Draft of the Delta Plan," Comments Submitted to Delta Stewardship Council, Sacramento, CA, by G. Fred Lee & Associates, El Macero, CA, June 14 (2011).
http://www.gfredlee.com/SJR-Delta/DeltaPlan4DraftCh6Comm.pdf

Lee, G. F., and Jones-Lee, A., "Discussion of Water Quality Issues That Should Be Considered in Evaluating the Potential Impact of Delta Water Diversions/Manipulations on Chemical Pollutants on Aquatic Life Resources of the Delta," Report of G. Fred Lee & Associates, El

Macero, CA, February 11 (2010).
http://www.gfredlee.com/SJR-Delta/Impact_Diversions.pdf

Lee, G. F., and Jones-Lee, A., "Comments on Water Quality Issues Associated with SWRCB's Developing Flow Criteria for Protection of the Public Trust Aquatic Life Resources of the Delta," Submitted to CA State Water Resources Control Board as part of Public Trust Delta Flow Criteria Development, by G. Fred Lee & Associates, El Macero, CA, February 11 (2010).
http://www.gfredlee.com/SJR-Delta/Public_Trust_WQ.pdf

Lee, G. F., and Jones-Lee, A., "Review of Need for Modeling of the Impact of Altered Flow through and around the Sacramento San Joaquin Delta on Delta Water Quality Issues," and "Summary: Water Quality Modeling Associated with Altered Sacramento River Flows in & around the Delta," Report to CWEMF Stormwater Committee, by G. Fred Lee & Associates, El Macero, CA, March (2009). http://www.gfredlee.com/SJR-Delta/Model-Impact-Flow-Delta.

Lee, G. F., and Jones-Lee, A., "Synopsis of CWEMF Delta Nutrient Water Quality Modeling Workshop – March 25, 2008, Sacramento, CA," Report of G. Fred Lee & Associates, El Macero, CA, May 15 (2008). http://www.gfredlee.com/SJR-Delta/CWEMF_WS_synopsis.pdf

"Overview of Delta Nutrient Water Quality Problems: Nutrient Load – Water Quality Impact Modeling," Agenda for Technical Workshop sponsored by California Water and Environmental Modeling Forum (CWEMF), Scheduled for March 25, 2008 in Sacramento, CA (2008).
http://www.gfredlee.com/SJR-Delta/CWEMF_Workshop_Agenda.pdf

Drs. Lee and Jones-Lee have also submitted comments on Delta water quality issues to BDCP, Delta Stewardship Council, including:

Lee. G. F., "Comments on the CVRWQCB Review of Delta Water Quality Issues," Comments submitted to K. Longley, Chair Central Valley Regional Water Quality Control Board, by G. Fred Lee & Associates, El Macero, CA, March (2008).
http://www.gfredlee.com/SJR-Delta/DeltaIssuesLongleyMarch08.pdf

Lee, G. F., and Jones-Lee, A., "Comments on Strategy 3.5 of the 'Volume 2: Delta Vision Strategic Plan - Fifth Staff Draft Version 5.5,'" Comments submitted to P. Isenberg, Chair, Delta Vision Blue Ribbon Task Force, Sacramento, CA. Report of G. Fred Lee & Associates, El Macero, CA, October 17 (2008).
http://www.gfredlee.com/SJR-Delta/DeltaVisionStaffDraft5.pdf

Lee, G. F., and Jones-Lee, A., "Comments on September 19, 2008 Delta Vision Task Force Meeting Discussion of Nutrient-Related Water Quality Problems in the Delta," Comments submitted to P. Isenberg, Chair, Delta Vision Blue Ribbon Task Force, Sacramento, CA. Report of G. Fred Lee & Associates, El Macero, CA, October 14 (2008).
http://www.gfredlee.com/SJR-Delta/DeltaVisionCom9-19-08.pdf

Lee, G. F., and Jones-Lee, A., "Comments on the DSC Staff Fifth Draft of Chapter 6 Devoted to Delta Water Quality Issues in the Delta Plan," Comments Submitted to Delta Stewardship Council, Sacramento, CA, by G. Fred Lee & Associates, El Macero, CA, August 21 (2011).

http://www.gfredlee.com/SJR-Delta/DeltaPlan5DraftCh6Comm.pdf

Lee, G. F., and Jones-Lee, A., "Comments on Revised Delta Plan Staff Draft Chapter 6 'Improve Water Quality to Protect Human Health and the Environment' as Presented in the Fourth Staff Draft of the Delta Plan," Comments Submitted to Delta Stewardship Council, Sacramento, CA, by G. Fred Lee & Associates, El Macero, CA, June 14 (2011). http://www.gfredlee.com/SJR-Delta/DeltaPlan4DraftCh6Comm.pdf

As well as a number of other comments on Delta management issues that are on Drs. Lee and Jones-Lee's website.