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Sent: Tuesday, July 29, 2014 11:55 AM
To: BDCP.comments@noaa.gov
Cc: Mitchell. Terrie (SDA)
Subject: FW: Regional San's comments on Draft BDCP and Associated Draft EIR/EIS
Attachments: LTR_SRCSD Comment Ltr on BDCP and EIR_2014-07-29 Final Package.pdf

Attached is a comment letter with attachments from the Sacramento Regional County Sanitation District on Draft BDCP and Associated Draft EIR/EIS. If you would like to discuss this further please contact Terrie Mitchell, Manager Legislative and Regulatory Affairs at 916-876-6092, or mitchellt@sacsewer.com

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July 29, 2014

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Submitted via email: BDCP.comments@noaa.gov

Subject: Regional San Comments on Draft BDCP and Associated Draft EIR/EIS

The Sacramento Regional County Sanitation District (Regional San) appreciates the opportunity to comment on the Draft Bay Delta Conservation Plan (BDCP, or Plan) and associated Draft Environmental Impact Report/ Environmental Impact Statement (EIR/EIS). Regional San owns and operates the Sacramento Regional Wastewater Treatment Plant (SRWTP) in Elk Grove in accordance with its National Pollutant Discharge Elimination System (NPDES) permit. Many of the NPDES permit requirements are tied to Sacramento River conditions and the Delta ecosystem. Changes in those conditions can affect Regional San adversely by leading to modifications of the permit that impose costs on the region that would not otherwise occur. In addition, significant environmental effects can result from construction and operation of new or modified facilities to meet permit requirements. Because of these connections to our NPDES permit and the interests of our region, we are concerned with the large-scale changes that BDCP is proposing for the Sacramento River and the Delta.

Regional San's previous comments on early versions of BDCP focused on: the need for BDCP to use the best-available sound science; all BDCP-related impacts on Regional San need full mitigation; and, that a robust and inclusive governance structure be created for all phases of BDCP. Unfortunately, the Plan is compromised by inaccuracies in the modeling of the BDCP's impacts in key areas, such that Regional San is unable to assess the Plan's impacts to its operations or the Delta ecosystem. Significant problems with the technical analyses in the BDCP and EIR/EIS render these documents inadequate under CEQA and NEPA. Errors and other deficiencies, including flaws in modeling of temperature impacts to the Sacramento River, not only undermine the EIR/EIS's adequacy, but also render the BDCP inadequate as a Habitat Conservation Plan under the federal Endangered Species Act.

Regional San's concerns are highlighted below and our comments are expanded upon in more detail in this letter and the accompanying attachments. In summary, Regional San's major concerns include that the BDCP and EIR/EIS:

- Are not clearly written informational documents so project impacts can be understood;
- Incorrectly use flow and temperature data, creating modeling and analytical errors;
- Do not adequately identify mitigation of the Plan's impacts;
- Do not comply with the Delta Reform Act;
- Inadequately consider the State Water Board's Bay Delta Plan and related Delta Flow Criteria;
- Do not properly consider federal antidegradation analysis requirements;
- Do not provide an appropriate governance structure; and
- Mis-characterize Delta science, including the role of ammonia in the Delta.

<u>BDCP and the Associated EIR/EIS Documents are Confusing, Preventing a Clear Understanding of the Project Impacts</u>

BDCP is an ambitious project with a 50-year timescale for project implementation. The scale of the project is huge, as are the potential changes to the Delta and its ecosystem. The BDCP and EIR/EIS documents amount to nearly 40,000 pages. Both the scope of the documents and poor organization make it impossible for the public to understand the project and its impacts. In this regard, the Delta Science Program (DSP) was tasked with conducting an independent review of Chapter 5 (the Effects Analysis) of the BDCP, and their first comment on this section was that it was long and difficult to comprehend. We submit that the public cannot be expected to provide meaningful review of BDCP if a group of *expert scientists* has a difficult time understanding the section of the Plan that lays out the scientific basis for the project.

The use of two different baselines for the CEQA and NEPA elements results in increased confusion. With multiple baselines, it is virtually impossible for the public to discern the incremental impacts of the proposed project. Additionally, the decision to incorporate hypothetical future conditions (projected to the year 2060) into one of the baselines introduces such variability and uncertainty as to effectively render the impact analysis impossible to interpret or understand.

CEQA dictates that the "existing conditions" should normally be the baseline for the impact analysis. In fact, under CEQA, the use of a future baseline is only permissible under specific conditions, i.e. where use of an existing conditions analysis would be misleading or without informational value (as stated on Page 3D-2 in Section 3 of the subject document). As a result, the BDCP impact analysis under CEQA is purportedly based on existing conditions. However, since numerous assumptions about the impacts of a multitude of other ongoing programs were made, the "existing conditions" baseline is not distinct and is not a helpful basis for the assessment of incremental changes.

Under NEPA guidelines, there is no requirement to use a baseline other than the existing conditions. However, a decision was made to select a baseline for impact analysis based on the "No Action" alternative, which includes projected future conditions in the year 2060. No information is presented to defend or rationalize this decision. Instead, text is provided to state that "nothing in

NEPA or NEPA case law precludes NEPA lead agencies…from including anticipated future conditions in the impact assessment."

Given an opportunity to provide clarity and simplicity (in terms of providing an impact analysis that can be understood), a choice was made to go in the opposite direction – i.e. to choose to use different baselines for CEQA and NEPA, which reflect different time frames with different sets of assumptions used to define baseline conditions. This choice greatly impedes the public's ability to understand the impact of the proposed project. The use of a future baseline for assessing operational impacts to the Sacramento River is especially problematic given that BDCP impacts will occur immediately upon initiation of diversions at the north Delta intakes, against conditions likely to be much more similar to those existing today than those that may or may not occur decades in the future. While the use of a future baseline might be illustrative of the BDCP's effects 50 years from now, it does not accurately represent impacts that are likely to occur in the near term. Rather than improving the quality of information provided in the EIR/EIS, the BDCP's choice of a far future baseline has resulted in confusion and a failure to satisfy CEQA and NEPA's informational purposes.

Regional San attempted to quantify the BDCP-related impacts to its operations and facilities but could not complete the analysis because there is too much ambiguity in the EIR/EIS and Plan itself, or the available information provided by BDCP was incorrect (see the "Impacts to Regional San Must be Fully Mitigated" section of this comment letter). The BDCP needs to be clarified, but we do not believe clarification would result from including additional sections or appendices to the nearly 40,000 page Plan. BDCP proponents should consider simplifying the project by reducing the 50-year permit timeframe or possibly separating the Plan into discrete projects that are phased, (i.e., complete the restoration elements before requesting permission for new water conveyance facilities).

<u>Fundamental Errors in the Modeling that Form the Basis for the Impact Analyses Require that the EIR/EIS Be Revised and Re-circulated for Public Review</u>

Two BDCP-related changes to the Sacramento River and Delta that could adversely impact Regional San and its operations are Sacramento River flows and temperature. As to these parameters, there are critical errors in the modeling that formed the basis for the EIR/EIS's impact analyses (see the "Impacts to Regional San Must be Fully Mitigated" section of this comment letter). Regional San has also identified flaws in the failure to account for the BDCP-related depletion of upstream sediment supply, which undermines the accuracy and reliability of the EIR/EIS's analysis of BDCP impacts to delta and longfin smelt. The effect of these errors and omissions is that the EIR/EIS does not rely on substantial evidence to support its impact determinations in numerous areas, including the BDCP's impacts on listed fish species. The modeling and analytical errors and omissions must be corrected, and the EIR/EIS impact analyses that depend on these models must be revised and re-circulated for public review and comment.

<u>Impacts to Regional San Must be Fully Mitigated</u>

<u>Flow-Related Impacts:</u>

Regional San currently discharges secondary treated effluent into the Sacramento River at Freeport, which is approximately 2 to 12 miles upstream of the proposed new water intakes. Because there is a lack of clarity and information regarding BDCP related river flow changes, it is difficult to assess the potential impacts BDCP will have on Regional San's operations, future water quality standards and/or NPDES permit obligations. For instance, Regional San's wastewater treatment plant is required to maintain a minimum of 14:1 ratio between the Sacramento River flow at Freeport and Regional San's treated effluent discharge rate. When river flow rates drop such that the 14:1 ratio cannot be maintained, Regional San must divert the treated effluent to on-site emergency storage basins (ESBs), with a capacity of 302 million gallons, until river flow rates return to levels that allow the treated effluent to be discharged. We are concerned that BDCP-related changes to flows in the Sacramento River could cause Regional San to divert effluent to the ESBs more often, or even necessitate expansion/upgrades of the ESBs to handle higher volumes of diverted effluent. Either of these consequences could adversely affect Regional San and its operations.

Flow Science, Inc., recognized experts in hydrodynamic modeling, evaluated BDCP's flow-related impacts on Regional San. Flow Science used BDCP model data to determine how the proposed BDCP alternatives would impact Regional San's ability to discharge effluent, and if the discharge disruptions would require upgrades to the ESBs. (Flow Science's technical memorandum can be found in Appendix B.) For this analysis, Flow Science used simulated Sacramento River flow rates (at Freeport) from BDCP DSM2 modeling obtained from the California Department of Water Resources (DWR). For each of the seven scenarios evaluated—EBC1, EBC2, NAA-LLT, Alt4H1, Alt4H2, Alt4H3, and Alt4H4—a Matlab code was used to calculate an hourly time series of required ESB volume corresponding to the 16-year BDCP modeling period (Water Years 1976-1991).

Flow Science concluded that the assumptions included in the BDCP model regarding future effects of sea level rise and BDCP habitat restoration seemed to mask the effects that the new BDCP export facilities would have on Sacramento River flows and our ESBs. However, BDCP lacks detail on exactly where and when habitat restoration would occur, thus the evidence supporting the model output is lacking, or not evident. Moreover, any assumptions about effects of sea level rise are merely hypothetical and cannot be considered facts. Due to these substantial uncertainties, it is equally plausible that operation of the north Delta water intake facilities will not only effect water quality, but will also increase diversion events at Regional San and effect discharge and NPDES permit requirements. CEQA requires that an EIR be based on substantial evidence. Substantial evidence is defined as facts, expert opinion supported by facts, and reasonable assumptions supported by facts. To the extent the model, and thus the EIR/EIS, relies on unsubstantiated assumptions to support a determination regarding the BDCP's effects on river flows, those determinations are not based on substantial evidence, and the model, and EIR itself, are inadequate.

Because the EIR/EIS has not adequately demonstrated that the BDCP will not have significant adverse flow-related impacts to Regional San, the EIR/EIS must be revised and re-circulated for public review. Prior to revising the EIR/EIS, BDCP must clarify the modeling to include reasonable and identifiable assumptions for a realistic habitat restoration schedule, and any assumptions about the effect of sea level rise must be supported by substantial evidence and analysis. If habitat restoration timing and acreage are critical for avoiding impacts to Regional San, then the operational plan for the north Delta intakes must be modified to reduce these impacts by guaranteeing that any necessary habitat restoration has been completed and that the postulated effects on flows demonstrated, prior to the commencement of diversions from the new north Delta intakes. If this cannot be done, BDCP must mitigate the significant impacts to Regional San's operations or NPDES permit obligations that would not otherwise occur. This would include funding an ESB capacity analysis and funding any required changes to the ESBs (including any required supplemental environmental review) due to BDCP impacts.

Sacramento River Temperature Impacts:

Another potentially adverse effect of the BDCP on Regional San is a change in ambient river water temperature. Regional San currently operates under NPDES permit requirements that allow it to discharge treated effluent based on a temperature schedule approved by the Central Valley Regional Water Quality Control Board (Regional Board). The temperature schedule is based on river and effluent temperatures, and any changes to either could affect Regional San's ability to comply with the thermal discharge requirements in its NPDES permit. If the changes in river temperature cause Regional San to be noncompliant with thermal requirements applicable to the discharge, or lead to modification of permit requirements, there is a possibility that Regional San would be required to build cooling towers to cool its effluent before it is discharged to the Sacramento River. The capital cost of cooling towers is expected to be tens of millions of dollars. The construction and operation of the cooling towers would also have associated environmental impacts that are not considered in the BDCP EIR/EIS. Given that the EIR/EIS did not specifically evaluate BDCP's potential temperature impacts to Regional San's operations, we requested that Flow Science conduct this analysis. (Flow Science's technical memorandum on temperature impacts can be found in Appendix C.)

Flow Science reviewed the California Department of Water Resources (DWR) DSM2 model input and output files (for 24 scenarios) used in the EIR/EIS analysis of the BDCP. For all scenarios, DWR provided Flow Science with 15-minute interval output data for water years 1976-1991. Following the release of these modeling data, DWR informed Flow Science of inaccuracies in the temperature modeling runs that were the basis for the EIR/EIS's assessment of BDCP effects on Sacramento River temperatures, and thus temperature-related effects on sensitive fish species. Specifically, the temperature boundary conditions used in the EIR/EIS modeling (Reclamation et al., 2013) for the early late-term (ELT) and late late-term (LLT) runs were incorrect. DWR stated that the problem with these temperature boundary conditions was related to an error in applying climate-change corrections in modeling. The error affected almost all of the 24 scenarios. This error in temperature boundary conditions made the modeling data useless for determining temperature impacts in the Delta and Sacramento River.

As a result, Flow Science asked DWR for corrected boundary conditions. DWR gave Flow Science the updated input data, but the DWR modelers themselves did not rerun the model with the corrected data inputs. Flow Science compared the old and corrected input boundary temperatures and re-ran the DSM2 model for two scenarios. They found high variability and large differences in output temperatures between the results that were based on the incorrect data relied on in the EIR/EIS and the corrected results produced by Flow Science.

The BDCP's use of inaccurate data is a fatal flaw in the modeling of temperature impacts that invalidates both the model results and the temperature impact analysis in the BDCP and the EIR/EIS. Due to these flaws in the model, there is no substantial evidence to support the EIR/EIS's analysis of temperature effects to fish and there is no way for Regional San to evaluate impacts to its operations. Even the Delta Independent Science Board noted that the Water Quality analysis in

Chapter 8 of the EIR/EIS is "not very informative" and is overly-reliant on unvalidated models.[1] Regional San shares this concern.

Water temperatures in the Sacramento River and Delta are too critical for the BDCP to proceed with this much uncertainty and error in the models. BDCP must investigate this error and make the appropriate corrections to its model and rerun the analysis. All elements of the BDCP and EIR/EIS that rely on the river temperature modeling can then be revised in light of the corrected data, and the analysis must be re-circulated for public review and comment. The revised analysis must evaluate not only temperature impacts to fish, but also potential impacts to Regional San's operations and discharge requirements. Any impacts identified to Regional San's facilities or operations as a result of BDCP must be fully mitigated.

BDCP Does Not Meet the Requirements of the Delta Reform Act

The Delta Reform Act states that the BDCP will not be incorporated into the Delta Plan unless it meets specific requirements. The Act also establishes other conditions that relate to BDCP. The BDCP and EIR/EIS fail to adequately address the Act's requirements in the following major areas:

- The Act requires a comprehensive analysis of a reasonable range of flow criteria, rates of diversion, and other operational criteria to identify the remaining water available for export and other beneficial uses. The BDCP and EIR/EIS fail to include this analysis or an evaluation of the range of the flows necessary to recover the Delta and restore fisheries under a reasonable range of hydrologic conditions.

- The Act requires that construction of a new Delta conveyance facility shall not be initiated until arrangements have been made to pay for the cost of mitigation required for construction, operation and maintenance of any new Delta conveyance facility. However, the BDCP and EIR/EIS do not clearly specify the mitigation measures needed; nor do they plainly identify the linkages to impacts of the proposed project so that the financial obligations are apparent.

- The Delta Reform Act also requires that the EIR/EIS provide special attention to water quality impacts. A number of water quality impacts identified in the EIR/EIS are deemed to be significant and unavoidable. Such impacts include increased levels of Electrical Conductivity (EC), chloride, and methylmercury and increased violations of water quality objectives. Moreover, as noted above, the project may have a significant impact to Regional San's operations and NPDES permit compliance requiring construction of cooling towers, new or expanded emergency storage basins, and/or other facility enhancements as a result of project-related river temperature and flow changes. The EIR/EIS does not provide or describe specific and effective mitigation to avoid or substantially lessen such impacts. More troubling, as the Delta Independent Science Board (ISB) found, "There is a general lack of knowledge displayed by the authors of this chapter about certain water quality constituents."[2]

[1] "*Review of the Draft BDCP EIR/EIS and Draft BDCP*," Delta Independent Science Board, App. B at page B-22. (Hereafter, "ISB Review.") ("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. It is also unclear whether the models were run under likely scenarios of future conditions in the Delta (e.g., changing precipitation patterns, decreased snow pack, changes in timing and amount of freshwater delivery, higher temperatures, etc.).")
[2] ISB Review, App. B at page B-22.

> In addition, many of the proposed water quality mitigation measures are non-specific, are not clearly enforceable and are deferred to the future. For instance, the EIR/EIS does not identify the number of acres of farmland in the Delta that would be impacted by water quality (e.g. EC) degradation associated with the project. The absence of such information prevents a meaningful assessment of the scope of the potential impact or the development of definitive mitigation. Instead, the EIR/EIS relies on vague statements and does not include actual commitments. For example, the proposed mitigation measure for salinity (WQ-11) states "proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions, followed by development and implementation of the actions, if determined to be necessary." This is not a clear commitment to mitigate the significant impacts that the proposed project will create on Central and West Delta salinity.

Overall, the EIR/EIS, by omission and by lack of specificity, does not address these major requirements of the Delta Reform Act. In addition, the failure to propose and commit to implement definitive mitigation measures that would clearly offset the BDCP's numerous adverse impacts is a significant flaw in the EIR/EIS and contradicts the Legislature's mandate under the Delta Reform Act. The BDCP as circulated cannot be incorporated into the Delta Plan.

BDCP and Associated EIR/EIS Ignore the State Water Resources Control Board's Delta Flow Objectives

In all the assumptions listed to "describe" the baseline conditions (e.g. in Table 3D-2 and 3D-4), at least one major ongoing effort was noticeably absent—the State Water Resources Control Board (SWRCB) efforts to adopt Delta flow objectives, which in turn may affect Delta exports through the proposed BDCP project. These tables in the EIR/EIS do not mention the August 2010 Delta flows report that was issued by the SWRCB in specific response to a mandate under the Delta Reform Act of 2009. The EIR/EIS also does not mention the multiple workshops that have been held by the SWRCB to develop scientific information that will be used in the final adoption of Delta flow requirements or the schedule for adoption of Delta flow standards by the SWRCB.

In a July 2013 letter by Delta Stewardship Council (DSC) staff and consultants, the requirements in the Delta Reform Act of 2009 to address Delta flow requirements in the EIR/EIS were re-emphasized, having been previously raised in letters submitted in April 2012 and June 2010. The DSC's letter states that the Delta Reform Act requires that the EIR/EIS include a comprehensive analysis of a reasonable range of flow criteria, rates of diversion, and other operational criteria to meet the requirements for approval of a Natural Communities Conservation Plan (NCCP). The 2013 letter also reiterated that the EIR/EIS must take into account the SWRCB's August 2010 "Development of Flow Criteria for the Sacramento/San Joaquin Delta Ecosystem." The Delta Reform Act intended that the results of that 2010 SWRCB study would be used to inform planning decisions for the BDCP. The DSC's 2013 letter asked that the SWRCB's 2010 flow criteria be addressed directly in the EIR/EIS.

Review of the EIR/EIS indicates that the SWRCB 2010 Delta flow criteria were mentioned in Section 3 and that one alternative (Alternative 8) considered a "version" of the recommendations that the SWRCB made in its report. However, it is not clear that the evaluation of Alternative 8 was adequate to meet the requirements of the Delta Reform Act. The EIR/EIS must be revised to describe how it provides the comprehensive analysis required under the Act.

In February 2014 the Delta Science Program held a workshop to identify the best available science to inform the State Water Resources Control Board's (State Water Board) decisions regarding Delta outflow requirements included in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan). In May 2014 the Delta Science Program released a Delta Outflow and Other Stressor report to the SWRCB that was written by an expert panel with the charge of:

> "…reviewing and assessing the provided written materials and oral presentations in order to identify the best available science to inform the State Water Board's decisions on Bay-Delta Plan requirements related to Delta outflow and related factors (Delta outflow requirements)."

A similar report will be released before the end of 2014 on Delta Inflow and Other Related Stressors. The BDCP proponents should also review both of these reports and incorporate, as appropriate, the most current best available science into the Plan and EIR/EIS related to the SWRCB flow objectives.

BDCP and the EIR/EIS Fail to Properly Consider the Federal Antidegradation Policy

The use of two different baselines (the CEQA and NEPA baselines) and, the evaluation of water quality impacts in 2060 yield information that is extremely difficult to understand or verify. An analysis of near-term water quality changes from existing ambient water quality is needed to provide the public with understandable information and to provide context/grounding for the long-term impacts that are presented. These analyses will also allow a proper assessment of compliance with state and federal antidegradation policies.

The EIR/EIS states, in various places (e.g. in Section 8 and in Table 31-1), that significant unavoidable increases in salt as measured by EC (and/or TDS) and methylmercury will occur in the Delta as a result of the BDCP (Alternative 4) as embodied in CM 1, the Water Facilities and Operations control measure evaluated in the BDCP Effects Analysis. The EIR/EIS predicts significant increases in current ambient concentrations of EC and methymercury at various Delta locations. The Delta is currently 303(d)-listed for EC and methylmercury, a federal Clean Water Act listing which is made when water quality objectives are not attained. The projected increased concentrations associated with CM 1 represent significant degradation in water quality and further impairment of already impaired beneficial uses in the Delta.

Under the federal antidegradation policy, "major federal actions" that affect water quality (pursuant to NEPA and the Endangered Species Act) trigger the application of the federal antidegradation policy and requirements. Those requirements prohibit actions that would lower water quality in areas where existing water quality objectives are not attained (e.g. Tier I waters) [USEPA, Region 9, 1987, Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12, June 3).

The EIR/EIS does not adequately articulate or address the federal antidegradation requirements, which place significant constraints on the proposed project and associated mitigation. The "key questions" to be addressed by the surface water quality impact assessment (Section 8.4.1, page 8-127, lines 37-40 and page 8-128 lines 1-4) do not adequately address the requirements of the federal antidegradation policy. The "key questions" add a threshold consideration ("to cause or substantially contribute to significant adverse effects on the beneficial uses of water in these areas of the affected environment") which does not exist in the federal antidegradation policy. As such, the evaluation in the EIR/EIS does not properly address the fact that significant degradation of water quality in 303(d)-listed waters is prohibited under the federal policy. The acknowledged degradation of EC which will occur in 303(d)-listed areas such as Suisun Bay and portions of the Delta is not allowed under the federal policy. The proposed EC mitigation measures (WQ-11, WQ-11a and WQ-11b) described in the EIR/EIS are inadequate in that they will not ensure that the EC levels will be maintained in 303(d)-listed waters.

The same considerations apply to the "significant and unavoidable" degradation of methylmercury levels that will occur in the 303(d)-listed Delta as a result of implementing "habitat restoration projects" associated with the BDCP. The Delta is 303(d) listed for mercury – actions which cause significant degradation of mercury levels in the Delta are prohibited. CM12, the proposed control measure for mercury, does not adequately assure the prevention of unallowable degradation of mercury levels in the Delta.

BDCP Proposes Large-scale Changes to Existing Governance Structures with Inadequate Local Representation

The governance of BDCP is an important element of the plan because all of the important decisions (i.e., adaptive management, facility design and construction, habitat restoration, conservation measures, research, public outreach, land acquisition, etc.) will be made under the governance framework proposed by BDCP. On a plan so far-reaching and consequential as BDCP, it is important that governance be as representative as possible. Unfortunately, the BDCP proposed governance structure gives great authority to water exporter interests, but does not provide local entities (such as local government and special districts such as Regional San) any official voice in future BDCP actions or adaptive management decisions. As described in Chapter 7 of BDCP, key decisions associated with implementation of the BDCP are deferred to the Implementation Office, which will be lead by a Program Manager to be selected by, and report to, the Authorized Entity Group. The Authorized Entity Group will be established to provide program oversight and general guidance to the Program Manager regarding implementation of the Plan. The Authorized Entity Group will consist of the Director of DWR, Regional Director for Reclamation, and a representative from both the State Water Contractors and Federal Water Contractors. Clearly, this is not configured as a robust public stakeholder process, as virtually ***all*** of the governance and implementation authority remains in the control of water supply interests.

It is also unclear why there is no role proposed for either the SWRCB or the Delta Watermaster in any substantive oversight entity. The SWRCB will be setting new Delta flow standards in the coming few years, and will be responsible for ongoing water quality and water rights permitting and regulatory actions, which are likely to affect BDCP actions over the course of the 50-year permit. Similarly, the Delta Watermaster – created by the Delta Reform Act – has important authority to enforce the SWRCB's regulatory decisions affecting the Delta, and should also be part of any BDCP oversight entity.

The proposed governance structure lacks any meaningful role for local stakeholders. Although there is a Stakeholder Council, which allows many stakeholders, including local counties and agencies, to convene and hold meetings on BDCP-related issues, this group has no authority in decision-making matters for BDCP—even for issues that directly affect local counties and agencies. As currently structured, disputed matters will be raised to the Authorized Entity Group and the Permit Oversight group. However, there is a lack of balance between the two groups that could lead to an inherent bias towards water exporter interests. This imbalance must be corrected and could possibly be solved by adding local county representation on the Authorized Entity Group, thus making both groups have four members each.

In summary, the governance structure of BDCP gives decision-making authority to water exporter interests and grants dispute resolution authority to water exporter interests. There must be a more balanced approach to governance that does not exclude local government or stakeholders (including Regional San). There needs to be a mechanism to allow these stakeholders an effective role in representing their interests in the decision-making process. [3]

Much of the BDCP and the EIR/EIS are Scientifically Suspect and Cannot be Legally Supported

In its review dated May 15, 2014, the ISB, while commending the document preparers for their efforts to assemble and analyze volumes of information, stated that "the science in this BDCP effort falls short of what the project requires."[4] In its "Summary of Major Concerns" section, the ISB Review expressed very troubling conclusions regarding the BDCP and the supporting EIR/EIS:

- "Many of the impact assessments hinge on overly optimistic expectations about the feasibility, effectiveness, or timing of the proposed conservation actions, especially habitat restoration."
- "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."
- "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."
- "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."
- "The presentation, despite clear writing and an abundance of information and analyses, makes it difficult to compare alternatives and evaluate the critical underlying assumptions."

[3] Indeed, a review of the various NCCPs adopted and in the planning stages throughout California reveal that the vast majority of these plans are either lead by or include affected county and local governments or special districts within their governance structure. (*See*, https://www.dfg.ca.gov/habcon/nccp/status/index.html.) If adopted, the BDCP would be unusual in California, in that it would enable parties not located within the affected geographical area of the NCCP to literally control most (if not all) of the day-to-day operations and decision-making relative to the NCCP.

[4] ISB Review, Cover Letter.

These criticisms of the BDCP and supporting EIR/EIS, provided by an Independent Science Board established by the California Legislature, are cause for serious pause and concern. We urge the BDCP proponents to address the ISB's concerns.

The Important Regional Actions Section is Inappropriate and Incorrectly Characterizes the Role of Ammonia in the Estuary

Regional San has previously commented on the "Important Regional Actions" section of BDCP, including a comment letter to Secretary Laird and Ms. Olson on September 6, 2013. (This letter is attached as Appendix D.) We take exception to the fact that our suggested changes to the Important Regional Action section were not incorporated in this version of the BDCP.

Section 3.5.1 of the BDCP lists ammonia load reduction as an Important Regional Action that must occur if BDCP intends to achieve its fish recovery targets. As described in our detailed comments in Appendix A, there are a number of serious problems with this section: ammonia load reductions at Regional San are not among the activities that BDCP applicants plan to undertake in order to obtain their incidental take permits; an incomplete scientific literature set is used; disputed scientific claims are used without regard to their merit; and increase in productivity claims are unsubstantiated.

BDCP is being proposed by parties who wish to acquire long-term incidental take permits under the Endangered Species Act (ESA) as a means to protect diversions of water from the Delta. Under section 10 of the ESA, a habitat conservation plan must specify actions that the *permit applicants* will take to avoid, minimize, or mitigate impacts of their take. Regional San is not an applicant for the BDCP; thus the BDCP must, and should, focus on the *applicants'* activities that will support their request for a permit that authorizes their take.

The Federal Habitat Conservation Plan Handbook (HCP Handbook), "Habitat Conservation Planning and Incidental Take Processing Handbook," (U.S. Department of Interior, Fish and Wildlife Service, U.S. Department of Commerce, NOAA, National Marine Fisheries Service, November 4, 1996) offers guidelines for HCPs; notably it does not authorize the reliance on unenforceable third party actions as a mitigation strategy. Inclusion of Section 3.5.1 in BDCP is neither required nor appropriate. Its inclusion is not insignificant to Regional San. There is no precedent for an "Important Regional Actions" section in an HCP and it prompts more questions than it provides answers. For example: Will it be contended that Regional San is now subject to the BDCP because it was specifically mentioned as an entity that is completing an action the BDCP believes is important? Just as concerning, however, is the mis-characterization of scientific "facts" in Section 3.5.1—which is not a fair representation of the current understanding of ammonia's role in the Delta and Suisun Bay. As described in detail in Appendix A, this section of the BDCP overstates the magnitude and certainty of the effects of reduced ammonia loadings by including only a portion of the scientific literature on this topic. One of the most comprehensive scientific reviews of ammonia's role in the estuary, completed by the San Francisco Estuary Institute, was not even included as a reference in this section. (See http://www.sfei.org/sites/default/files/SuisunSynthesisI_Final_March2014_0.pdf.)

The section also relies on, and presents as fact, information that has not been peer reviewed and contains grossly deficient methods descriptions, and makes bold, unsubstantiated claims about increases in productivity due to ammonia load reductions. Accordingly, the Ammonia Load Reduction portion of the Important Regional Action section should be deleted because: it provides no useful benefit to BDCP; it perpetuates disputes that are now moot (since Regional San is approximately 1.7 billion dollars to upgrade its treatment plant (of which nearly a billion dollars of that is to significantly reduce ammonia and nitrate in its treated effluent); and as an action outside the authority of the permit applicants, it is not appropriately included in an HCP designed to authorize take occurring as a result of BDCP actions.

BDCP further confuses the role of nutrients in the estuary by describing BDCP-related nutrients as beneficial while also claiming that nutrients from Regional San (and other sources) are harmful. It is disingenuous for BDCP proponents to argue that Regional San must remove nutrients from its discharge while simultaneously claiming that BDCP conservation measures will improve the Delta ecosystem by adding nutrients.

Conclusion

In summary, while appreciating the complexity and challenges associated with conducting proper analysis, Regional San believes that the BDCP and EIR/EIS have very fundamental deficiencies that must be addressed.

Our additional detailed comments on the BDCP and EIR/EIS are presented in Appendix A, two expert technical memoranda on flow and temperature impacts are included as Appendix B and C, and a previous letter to Secretary Laird regarding Important Regional Actions is included as Appendix D. Because the BDCP states that the Plan and supporting documents are incorporated in the EIR/EIS, our comments on the BDCP should also be considered as comments on the EIR/EIS.

If you have any questions about our comments, please contact me at (916) 876-6092 or mitchellT@sacsewer.com .

Sincerely,

Terrie Mitchell

Terrie Mitchell
Manager Legislative and Regulatory Affairs

cc: Prabhakar Somavarapu, District Engineer, Regional San
Christoph Dobson, Director of Policy & Planning, Regional San
Delta Stewardship Council Members
SWRCB Members and Executive Officer

Attachments:
Appendix A: Regional San Detailed Comments on BDCP and Associated Draft EIR/EIS
Appendix B: Flow Science Technical Memorandum on BDCP Flow Related Impacts to SRWTP
Appendix C: Flow Science Technical Memorandum on BDCP Temperature Related Impacts to SRWTP
Appendix D: September 16, 2013 Letter to Resource Secretary Laird on Important Regional Action

Appendix A

Regional San Detailed Comments on BDCP and Associated Draft EIR/EIS

Regional San Detailed Comments on BDCP and Associated Draft EIR/EIS

(Where appropriate, comments listed by chapter, page numbers, and line numbers)

Chapter 2: Existing Ecological Conditions

- Page 2-15, lines 28-45:

  "In the absence of other factors such as Potamocorbula, nutrients do not limit the development of primary producers in the Delta; instead, light levels within the water column appear to control primary productivity (Cole and Cloern 1984; Kimmerer 2004). Light penetration through the water column has an inverse exponential relationship with suspended particulate matter at a given depth. Therefore, the large majority of phytoplankton production occurs near the surface. If the current pattern holds and water clarity continues to increase in the Delta as it has done over the past few decades (Lehman 2000), higher phytoplankton production is expected. However, the growth rate, depth distribution, and extent of Egeria and other nonnative invasive aquatic plants may respond positively to increasing water clarity due to reduced particulate matter concentrations and their dense and extensive canopies may drive down light levels (Kimmerer 2004). High concentrations of ammonia and ammonium, which are derived primarily from wastewater treatment plants, may also contribute to reduced productivity in the Delta and bays of the Plan Area by suppressing the uptake of nitrate by diatoms and phytoplankton (Dugdale et al. 2007; Dugdale 2008). Elevated ammonium concentrations may also directly impair primary productivity (Parker et al. 2010). Glibert (2010) has found evidence that spatio-temporal patterns in ratios of ammonia, nitrate, and phosphate concentrations can explain spatial and temporal patterns in algal functional groups (i.e., diatoms, and flagellates), and cyanobacteria in the Delta, and may also explain zooplankton and pelagic fish abundance."

  The first and last sentence in this passage contradicts each other. Also, Parker et al. (2010) found that ammonia and effluent additions resulted in greater phytoplankton growth and added effluent resulted in increased primary productivity (14C-uptake rates) in many of the samples.

- Page 2-15, line 15:

  "Return flows from wastewater treatment plants, island drainage, and groundwater seepage have introduced toxic substances into the Delta. Barriers and new channels that were constructed and are operated to maintain water quality (e.g., Head of Old River barrier, and Delta Cross Channel) have significantly altered flow, transport, and mixing of suspended particles, dissolved gases, and dissolved salts in the Delta."

  A discussion about "toxic substances" without regard to relevant concentrations gives the reader the impression that wastewater treatment effluent is toxic. This is not the case. A wastewater treatment plant's effluent must comply with its NPDES permit, which does not allow for toxicity.

- Page 2A.1-21, line 31

> *"A dynamic suspended sediment model of the Plan Area would be required to take into account the many interacting factors that may influence water clarity and to reduce uncertainty regarding the potential effects of the BDCP on water clarity."*

Turbidity is clearly important to Delta Smelt and is decreasing within the Delta for a number of reasons. The expected effects of BDCP on turbidity levels and indirect impact on delta smelt populations should be discussed in more detail, rather than just claiming a new model will be developed.

- Page 2A.1-13 , line 40

> *"The overbite clam, Potamocorbula amurensis, found in brackish areas, has had a dramatic effect on food resources in the western Delta, Suisun Bay, and Suisun Marsh (Kimmerer and Orsi 1996), while the effect of the freshwater Asian clam, Corbicula fluminea, are mainly limited to freshwater flooded island areas (Lucas et al. 2002; Lopez et al. 2006)."*

This statement is incorrect; Corbicula can be abundant at any freshwater location throughout the watershed (central Delta, north Delta, south Delta or river systems).[1]

- Page 2.A.1-14, line 22-34

The results from the cited papers indicate that ammonia can reduce phytoplankton nitrate uptake, but the resulting effects on diatom growth are not well understood, especially since phytoplankton (including diatoms) will also grow using ammonia as their nitrogen source.

Also, please see our comments on Teh et al. (2011) in other sections of this comment letter.

- Page 2A.1-14, line 40

Warner et al. (2008) did not find evidence that ammonia from municipal wastewater treatment plants could cause delta smelt toxicity. The paper concluded that ""Based on test results obtained in this and related studies, we conclude that average ammonia/ium concentrations reported for the Sacramento River immediately below SRWTP are about 3.6 times lower than the highest no observed effect concentration (NOEC) tested in this study, and are not likely to affect 7-d survival of 55-d old delta smelt larvae (Werner 2008)."

[1] Lisa V. Lucas and Janet K. Thompson. 2012. Changing restoration rules: Exotic bivalves interact with residence time and depth to control phytoplankton productivity. Ecosphere 3: 1-26

This section suggests that ammonia is reducing food resources, but all the referenced papers investigate the effects of pesticides on zooplankton. This statement should begin "**Pesticides** may affect delta smelt indirectly by…"

- Page 2A.1-15, line 42

  "In an experiment where delta smelt were released into Clifton Court Forebay, recapture rates were very low due to prescreen losses attributed to increased residence time, which increased exposure to predators and other sources of potential mortality (Castillo et al. 2012)."

  This section dismisses the more detailed findings of the paper: the range of pre-screen losses was 94.3 to 99.9% (Castillo et al. 2012), indicating that most delta smelt drawn into Clifton Court Forebay, by water export procedures, die before reaching the Fish Protection Facilities, and over half of the delta smelt reaching the facility pass through undetected with the exported water.

- Page 2A.2-3, line 2

  Delta outflows are the primary factor regulating ammonia concentrations in the Sacramento River, and high Delta outflows (that reduce ammonia concentration) are well known to improve fish population abundance, including delta smelt. The exact reason for this benefit is not completely understood.

Chapter 3: Conservation Measures

- Chapter 3. General Comment

Monitoring and research should be defined as conservation measures, so that they are mandatory and permittees are accountable for their implementation. This is especially true because the probability of success of the BDCP is poorly gauged using current knowledge. In fact, one third of the species-specific biological objectives for covered fish have not been evaluated in the effects analysis, and the public is being asked to trust that the Adaptive Management Program (which will depend on monitoring and research) will be able to "figure out later" how BDCP will attain the objectives. If monitoring and research are inadequate or funding lapses, adaptive management will fail.

Section 3.3. Biological Goals and Objectives

- Section 3.3. General Comment

  Triggers for adaptive management are not articulated. No numeric or qualitative triggers or thresholds, or schedules, are defined for adaptive management for any of the goals and objectives. How long will poor performance or failure to achieve biological objectives be tolerated?

- Section 3.3. General Comment

Methods for assessing compliance with numeric objectives for smelt entrainment are not explained. The plan does not sufficiently explain how the permittees will demonstrate compliance with the numeric objectives for entrainment of delta and longfin smelt. The numeric objectives for entrainment of delta and longfin smelt are contained in the following two species-specific biological objectives:

> *"Objective DTSM1.2: Limit entrainment mortality associated with operations of water facilities in the south Delta to ≤5% of the delta smelt population, calculated as a 5-year running average of entrainment for subadults and adults in the fall and winter and their progeny in the spring and summer. Assure that the proportional entrainment risk is evenly distributed over the adult migration and larval-juvenile rearing time-periods."*

> *"Objective LFSM1.2: Limit entrainment mortality associated with operation of water facilities to ≤5% of the longfin smelt population, calculated as a 5-year running average of entrainment for subadults and adults in the fall and winter and their progeny in the winter and spring. Assure that the proportional entrainment risk is evenly distributed over the adult migration and larval-juvenile rearing periods."*

No details are provided in Chapter 3 or Appendix 3.D. (Monitoring and Research) for how salvage data for delta smelt and data from the fish abundance trawls (fall midwater trawl and spring Kodiak trawl) will be combined to express delta smelt entrainment as a percentage of the delta smelt population. Section 3.3.7.1.3. Species-Specific Goals and Objectives reveals that there is great uncertainty surrounding the derivation of entrainment estimates from salvage data, and does not provide assurance that entrainment estimates reflect real take at the south Delta facility:

> "*Different methods for estimation of past and future entrainment can produce significantly different entrainment level estimates (Miller 2011) as can different assumptions about cumulative predation loss prior to salvage (Kimmerer 2008; Castillo et al. 2012). However, as long as the entrainment target is projected and measured using the same method, the target can be compared relative to historical levels calculated with the same method.*" (p. 3.3-110, line 7)

Section 3.4.1.6.3 (in which CM1 Water Facilities and Operation is related to associated Goals and Objectives) consists of four paragraphs. As acknowledged in this passage, Clifton Court Forebay is included as one of the potential hot-spots for predator reduction techniques in CM15 (Table 3.4.15-1). However, compliance and effectiveness monitoring specified for CM15 in Section 3.4.15.3 does not include measurement of pre-screen mortality for smelt, its contribution to total entrainment losses of smelt in the south Delta, nor any proposal for estimating pre-screen loss in Clifton Court Forebay as a percentage of delta smelt population. Finally, no information is provided on how entrainment of delta smelt at the north Delta intakes (less likely for longfin smelt) will be monitored, although delta smelt have been documented in the diversion reach of the Sacramento River (Vincik and Julienne 2012).[2] Methods for studying fish entrainment and impingement at the north Delta fish screens are detailed in Section 3.4.1.5.1 (Compliance and Effectiveness Monitoring Actions for CM1) and may apply to delta smelt and/or longfin smelt through use of "smelt proxy fishes" and (perhaps) through fyke net deployments behind the screens. In this section, trawl surveys are identified as a method to "calibrate density of entrained organisms", but a procedure for converting impingement and fyke net data into values that can be compared to the numeric objectives for smelt entrainment are not provided. Although direct entrainment of longfin smelt is less likely at either intake location, no details are provided in the plan for how entrainment of longfin smelt will be expressed as a percentage of the longfin smelt population.

Finally, no explanation is provided regarding why larval, juvenile, and/or adult delta smelt are not (or cannot) be monitored in the canals between the Tracy and Skinner fish facilities and the export pumps, and behind the north Delta intake fish screens.

- Section 3.3. General Comment

  <u>Section 3.3 displays an inconsistent and self-serving view of nutrient loading</u>. Nutrient loading is described as beneficial when it is the presumed outcome of a conservation measure, but detrimental if produced by actions unrelated to BDCP. In multiple places in the Plan, BDCP states that provision of <u>*nutrients*</u> to subtidal (i.e. pelagic) habitat is an expected benefit of proposed habitat restoration and other conservation measures, as follows:

  - As a rationale for Objective L1.3: "*Restoration of tidal wetlands is expected to improve habitat conditions for some native species, improve connectivity among habitat areas within Suisun Marsh and Suisun Bay, <u>provide nutrients</u> and food to adjacent subtidal aquatic habitat, and contribute to the long-term conservation of marsh- associated covered species*." (p. 3.3-37, line 4-6)

  - As a rationale for Objectives L1.4 and L1.7: "*Restoring tidal freshwater marsh habitats along an environmental gradient extending from the subtidal perennial aquatic natural community to upland natural communities is expected to increase the abundance and distribution of associated native wildlife and plant species, <u>provide nutrients</u> and food to adjacent subtidal perennial aquatic habitat, and contribute to the long-term conservation of tidal freshwater marsh-associated covered species*." (p. 3.3-69, line 18)

  - As a rationale for Objective L.2.7: "*Tidal channels also convey marine nutrients into the marsh, and facilitate organic material produced in the marsh to be transported to the tidal perennial aquatic natural community and support the aquatic foodweb*." (p.3.3-59, line17)

[2] Vincik, R.F., and J.M. Julienne. 2012. Occurrence of delta smelt (*Hypomesus transpacificus*) in the lower Sacramento River near Knights Landing, California. Cal. Fish Game 98: 171-174.

- As a rationale for Objective TFEWMNC1.1 and TFEWNC1.2: "*Restoring tidal freshwater marsh habitats along an environmental gradient extending from the subtidal perennial aquatic natural community to upland natural communities is expected to increase the abundance and distribution of associated native wildlife and plant species, improve connectivity among habitat areas within the Plan Area, <u>provide nutrients</u> and food to adjacent subtidal perennial aquatic habitat, and contribute to the long-term conservation of tidal freshwater marsh-associated covered species*." (p. 3.3-64, line 27)

- As a benefit of Objective L2.3 (Connect rivers and their floodplains to allow input of large woody debris, leaves, and other organic material to rivers): "*Achieving this objective may also contribute to an increase in allochthonous inputs, such as terrestrial insects and plant matter, and <u>provide additional nutrients</u> and increase the productivity of aquatic systems, which may contribute to a more diverse and robust forage base*." (p. 3.3-102, line 16)

- As a benefit of Objective TBEWNC1.3: "*Achieving this objective is intended to increase the transport of food and <u>nutrients</u> from tidal marshes (main channel and off-channel) to areas occupied by green sturgeon. This is expected to increase available food to contribute to an increase in the survival of green sturgeon*." (p. 3.3-189, line 3)

- As a benefit of Objective TBEWNC1.4: "*Achieving this objective is intended to promote effective exchange throughout the marsh plain to increase the transport of <u>nutrients</u> and food from restored wetlands to habitats in the low-salinity zone typically occupied by older (older than 1 year of age) juvenile green sturgeon*." (p. 3.3-189, line 7)

- As a benefit of Objective TFEWNC1.2: "*Achieving this objective is intended to increase the transport of <u>nutrients</u> and food from restored wetlands to habitats in the low-salinity zone occupied by subadult and adult green sturgeon*." (p. 3.3-189, line 15)

- Regarding CM2 (Yolo bypass Flows): "*It will also provide additional nutrients and water surface area to increase biological productivity, which is expected to contribute to an increase in food for fish and other aquatic species. This increased productivity and <u>nutrient loading</u> will also potentially benefit other areas as it is transported off the floodplain and downstream within the Sacramento River*." (p. 3.4-29)

In contrast, elsewhere in the Plan documents, where nutrient loading is attributed to anthropogenic sources (failing septic tanks, urban runoff, WWTP), it is described as a detrimental *pollutant*:

- As a rationale for Objective WTST3.1: (related to CM19 Urban Stormwater Treatment): "*Runoff from residential, agricultural, and industrial areas introduces pesticides, oil, grease, heavy metals, other organics, and nutrients that contaminate drainage waters and deteriorate the quality of aquatic habitats necessary for white sturgeon survival*." (p. 3.3-201, line 9)

- Related to CM19: "*Other urban pollutant sources, which can be transported directly or indirectly by stormwater runoff to the Delta, include nutrients from failing septic systems, and viruses and bacteria from agricultural runoff*." (p. 3.3-43, line 18)

The contrasting treatment of nutrient loading (desirable if produced by conservation measures, but undesirable if coming from anthropogenic sources) conflicts with customary nutrient source assessments that take place, for example, in the context of TMDL development, in which loads of particular nutrient compounds (e.g., phosphate, nitrate) from natural and anthropogenic sources are appropriately treated as equally available for microbial or plant uptake.

Elsewhere in Plan documents, hypothetical ecological detriments of anthropogenic nutrient loading (especially ammonia) are leveraged as "disclaimers" in case benefits are not produced from conservation measures:

> "*The upgrade to the Sacramento Regional County Sanitation District, an important regional conservation action (i.e., an action not associated with the BDCP), may need to take place to fully realize the benefit of conservation measures for delta smelt. These upgrades are designed to reduce ammonia discharges (detailed in Section 3.5, Important Regional Actions)*." (p. 3.3-109, line 14)

Given that ammonium and other nutrients will be generated in restored wetlands (see comments below for Appendix 5E. Habitat Restoration and Section 5.D.4.4.2 Ammonia/um-Effects of Covered Activities) - the inequal treatment of nutrient loading is especially problematic.

<u>Section 3.4: Conservation Strategy</u>

- Page 3.4-13, line 13

> *"The facility will, during operational testing and as needed thereafter, demonstrate compliance with the then-current NOAA and CDFW fish screening design and operating criteria, which govern such things as approach and passing velocities and rates of impingement. In addition, the screens will be operated to achieve the following performance standard and will be deemed to be out of compliance with permit terms if the standard is exceeded: Maintain survival rates through the reach containing new north Delta intakes (0.25 mile upstream of the upstream-most intake to 0.25 mile downstream of the downstream-most intake) to 95% or more of the existing survival rate in this reach. The reduction in survival of up to 5% below the existing survival rate will be cumulative across all screens and will be measured on an average monthly basis."*

The new north Delta diversion facilities must be operated to maintain NOAA and CDFW fish screen criteria. No evidence is provided to suggest that fish survival can be maintained at 95% of the existing survival rate in this reach during operation. What happens if fish survival is reduced by more than 5% during operational testing, and the performance standard is deemed to be out of compliance with permit terms?

Are larval fish included in the 95% survival standard? Larval fish would likely be undetected if they are entrained through the screens and small fish impinged on the screens may also be undetected if they are quickly consumed by predatory fish. Fish survival studies need to continue over the course of the project, because river hydraulics, predator abundance, channel margin enhancement, or other unforeseen factors may change over time and alter fish survival in the project area.

- Page 3.4-16, line 1

> *"Low-level pumping maintained through the initial pulse period ... After pulse period has ended, operations will return to the bypass flows identified below under Post-Pulse Operations. These parameters are for modeling purposes. Actual operations will be based on real-time monitoring of fish movement."*

The actual parameters used to set operation need to be described in the plan. If actual operations would be based on fish monitoring results, the monitoring plan needs to be described in detail. The ability to continually and accurately monitor the number and species identity of fish swimming near the screens over a full range of hydraulic conditions should be clearly provided in the conservation plan.

If the bypass flow is set to 5000 cfs in July-September and 7000 cfs in October-November, it will provide drought-like flows into the Delta from the Sacramento River every year during these seasons. What scientific evidence indicates that maintaining annually low Sacramento River flows, during the warm summer months, will not significantly impair ecosystem health in the watershed? Would the lack in flow variability disrupt seasonal behavioral responses of native organisms?

- Page 3.4-30, line 15, Table 3.4.1-4

Many factors regarding fish screen effectiveness at the proposed north Delta diversion facilities should be studied in controlled experiments before deciding to build these structures. Only plans for setting the proposed northern intakes operational standards are described in detail in the Draft BDCP. Greater evidence should be provided to determine if native fish can avoid impingement over the proposed length of screen and that out-migration juvenile salmonids will use the internal refugia and restored channel margins.

> *"Confirm screen operation produces approach velocities no greater than 0.33 foot per second (fps) in daytime and 0.2 fps at night when delta smelt are present [indicator of smelt presence to be determined]."*

Water approach velocities at the new north Delta diversion facilities will be no greater than 0.33 foot per second (fps) in daytime and 0.2 fps at night when delta smelt are present, but the indicator of smelt presence had not been specified. Unless there is a reliable method to determine the absence of delta smelt, they should be assumed to be present at all times, and the approach velocities should remain at these specified levels continuously to be protective. Furthermore, water should only be diverted during positive river flows, because delta smelt are more likely to pass the screen traveling upstream during reverse flow conditions.

> *"Observe fish activity at screen face (using Didson cameras or other technology to be determined prior to facility operations) and use mark/recapture study of salmonid and smelt proxy fishes to evaluate impingement injury rate."*

The potential impacts of fish screen impingement should be tested prior to project construction. Fish impingement potential is greatly unknown for screens as large as the ones proposed for the north Delta diversion facilities. Fish impinged on these screen would be easy targets for local predators. Predation events would occur quickly and infrequently, and therefore would be difficult to detect during occasional monitoring activities.

Fish susceptibility to impingement can be measured in laboratory flumes where environmental conditions (flow, temperature, predator densities, etc.) can be controlled. Proxy fishes for delta smelt need to have (1) similar swimming capacities and (2) similar fish screen avoidance ability, both of these behaviors can be measured in laboratory studies.

> *"Monitor refugia to evaluate effectiveness relative to design expectations. Method is likely to entail use of a Didson camera to observe fish behavior within refugia, but more specific monitoring protocols and performance metrics are to be developed once refugia design has been completed, and prior to facility operation."*

The benefits of fish refugia are greatly unknown, untested and should receive further testing in laboratory and river settings prior to being constructed within these large intake structures. This new technology should be further refined prior to implementation, so it offers fish the greatest protection possible. The spacing and shape of predator exclusion bars, internal and approach velocities, size/shape of refugia areas, internal light levels, and acoustic vibrations during pump operations may significantly impact fishes' use of constructed refugia.

DIDSON cameras are unable to determine the species of fish occurring near screen intakes so other monitoring techniques will be necessary and should be detailed in BDCP. Fish passage, impingement, and survival studies needs to be monitored over the course of the project and are not limited to the first 6 months to 5 years of facility operation.

> *"Develop a physical hydraulic model to measure hydraulics and observe fish behavior in a controlled environment. Size/shape of refugia areas can be modified to optimize fish usage. Predators can be added to examine predation behavior near refugia."*

Predators should be tested in laboratory experiments and monitored at similar refuges built into other newly screened intakes in the watershed, well in advance of the new north Delta diversion facilities construction. These modeling and controlled laboratory experiments should be completed before accepting the BDCP as the effectiveness of these fish screens is a major portion of the conservation strategies.

DIDSON cameras are unable to determine fish species, so other detection techniques will be necessary. It is important to monitor fish behavior in the refuges over time (not just in one study prior to facility operation) because small predatory fish may take up residence in the refuges, which may cause severe mortality to small fish entering the refuges over time.

Therefore, refuges should be monitored quarterly until their long-term effectiveness is fully understood.

- Page 3.4-140, Table 3.4.4-3, Goal L2, Objective L2.9

> *"Increase the abundance and productivity of plankton and invertebrate species that provide food for covered fish species in the Delta waterways. Restoration of tidal natural communities is expected to improve some rearing habitat elements for Chinook salmon, Sacramento splittail, longfin smelt, delta smelt, sturgeons, and possibly steelhead."*

The likelihood of restored shallow water habitats becoming inhabited by non-native clams needs to be better understood before large scale tidal restoration projects are initiated. As explained in Table 3.4.4-2, Clam grazing is poorly understood and can significantly reduce the amount of food available for covered fish by redirecting productivity into clam biomass. Clam foraging efficiency increases in shallow water habitats, and can cause net losses of phytoplankton (Lucas and Thompson 2012, and BDCP page 5.F-4, line 8).

Experiments are needed to determine the environmental conditions that favor or limit clam abundance in shallow-water habitats before new habitats are constructed. Currently there is insufficient evidence to predict that newly restored shallow water habitats will increase phytoplankton and zooplankton abundance and provide food to covered fish species in the Delta waterways, instead of increasing clam biomass in the benthos and a further reduction of pelagic food abundance.

- Page 3.4-157, line 25

It is very important that these habitats project out into the water far enough to offer habitat and ecological function. Most shoreline restorations should be made with setback levees that allow for sizable shallow water habitat. These areas should have reduced flow velocities, proper substrate, habitat complexity, and native aquatic and native terrestrial vegetation, to support aquatic insect and juvenile fish growth with a transitional land-water interface. Fish are drawn to the biological community inhabiting natural shallow water habitats, not simply to the presence of a constructed bench on the edge of a levee that creates a shallow water area.

Building a bench on the waterward side of a federal levee is unlikely to significantly enhance the littoral community. Typically rivers widen in shallow water areas and have a gradual transition from shallow water to riparian communities. Levee channels are very deep, so a large portion of the river would need to be filled in to create a large shallow water zone inside the levees. Filling in part of the river to create a bench will increase water velocities and erosion potential in the area, and will likely result in a steep bench that attracts predatory fishes.

Channel margins should project to the water > 25 ft from the levee to provide adequate room for near-shore ecological processes. The scale on figure 3.4-21 is not to scale, but the scale shown is desirable (the flood plain bench should project into the waterway further than a tall tree would grow). This figure shows a levee that has been setback many yards with a gradual increase in depth in the adjacent waterway, to allow for emergent vegetation, large woody debris, and tree growth in moist soil.

- Page 3.4-301, line 9

> *"The pilot program would begin with a preliminary assessment phase to compare two approaches for reducing local predator abundances: removal of predator hot-spot structures (e.g., abandoned boats, derelict pier pilings) and general predator reduction in reaches with known high predation loss."*

Predator reduction would be most beneficial at *hot-spots* that lower the small fishes' ability to detect or escape from predators (such as being impinged on a large water intake screen, or passing over a weir). Other approaches in the pilot programs are unlikely to significantly reduce fish predation on delta smelt or out-migrating juvenile salmonids. The predator abundance in the watershed is likely controlled by prey abundance. Removal of many hotspots (abandoned boats, derelict pier pilings) will only disperse fish over a greater area, but will not reduce their population size or overall predation pressure. Targeted predator removals at hot-spots might temporarily reduce predation at a particular location, but predator removal efficiency and recolonization rates are unknown. Predator reduction techniques (including boat electrofishing, hoop net, fyke trap, trawl seine, beach seine) can stress, injure, or kill fish species of concern, and must be considered against the potential benefits of predator reductions.

- Page 3.4-307, line 2 and 5.F-87, line 31

> *"Periodic bass sportfishing tournaments are proposed under CM15 to achieve intensive removal efforts, while limiting program costs and potential by-catch issues. These efforts are expected to lower predation losses of entrained juvenile and adult delta smelt. However, sustaining reduced predator abundances in the forebay is expected to be difficult because of the large area, continual influx of predators through the radial gates, and incidental take of covered fish entrained into the forebay."*

A substantial reduction of large predatory fish in the system is likely to increase the number of smaller predatory fish, causing a net increase of predation on small salmonids and delta smelt. Fishing tournaments should return large-sized fish (>3 years old) to the system, so they can continue to consume smaller-sized predatory fish (including conspecifics).

In general, the presence of large-sized bass in the Delta reduce the total number of smaller-sized bass, which pose a greater cumulative predation risk to delta smelt and small salmonids (because smaller sized predators target smaller-sized fish as their food source).

<u>Section 3.5: Important Regional Actions</u>

- Section 3.5.1 Ammonia Load Reduction

Section 3.5.1 omits key publications that reveal (1) the lack of consensus and contrary opinions regarding alleged detrimental effects of ammonia/um on the lower food web of the Delta, (2) deficiencies in the experimental work to date that prevent conclusions about effects of ammonium on primary production, and (3) viable alternative interpretations of field data unrelated to ammonium/nitrate interactions. Examples of pertinent information from several key publications that are not currently acknowledged in any of the Plan's narratives on ammonia are provided below.

The San Francisco Estuary Institute (SFEI) published an 189-page synthesis report evaluating physiological and experimental evidence for postulated negative effects of ammonium on phytoplankton and zooplankton in the San Francisco Estuary (Senn and Novack 2014)[3] - a draft of which was publicly available in 2012. Their conclusions regarding the three key elements of the "ammonia inhibition" hypothesis are summarized in their Executive Summary as follows:

Key element of the Ammonium Inhibition Hypothesis	Conclusions in SFEI Synthesis Report (emphasis added)
P.1. The presence of NH4 + at elevated levels (>1-4 µmol/L) inhibits the uptake of nitrate by phytoplankton	"*There is strong support in the scientific literature for P.1, with numerous studies demonstrating either that multiple species of phytoplankton exhibit a strong preference for NH4+ or that NO3 uptake is actively inhibited by elevated NH4+ concentrations*." (Senn & Novack 2014, p. 5)
P.2. The rate of NO3- uptake (when NH4+ is absent or less than 1-4 uM) is greater than the rate of NH4+ uptake. Thus, when NO3- uptake is suppressed, and only NH4+ is being taken up by phytoplankton, the overall rate of N uptake is lower	***"P.2 is not well-supported by the broader scientific literature on N uptake rates by phytoplankton**. Few well-controlled studies have actually investigated N uptake rates during experiments in which both NO3- and NH4+ were available over a range of concentrations. Thus, there remains a critical gap in the literature on this topic. While there are limited studies that explicitly compare NO3- vs. NH4+ uptake kinetics, the more broadly accepted conceptual model is that, when nutrients are abundant, cells access whichever N source is most readily available, and that uptakerates of NO3- and NH4+ are similar*." (Senn & Novack 2014, p. 5)

[3] Senn, D. B. and Novick, E. (2014). Suisun Bay Ammonium Synthesis Report. Contribution No. 706. San Francisco Estuary Institute, Richmond, California

P.3. The lower rate of N uptake resulting from this mechanism translates into lower rates of primary production	"***P3 is not well supported by the broader scientific literature***. *As with P2, the more broadly accepted concept is that most phytoplankton taxa grow equally well when using NH4+ or NO3- as their nitrogen source (see Section 2 for further discussion). Multiple studies have found similar growth rates (rates of carbon fixation) across a range of taxa when using NH4+ or NO3... As with P.2, few studies have done growth experiments in which phytoplankton have the choice between NH4+ and NO3-, so there also remains a critical gap in the literature on this related topic... In addition, in some components of RTC studies, experimental artifacts (e.g., acclimation time to light conditions in enclosures) or competing explanations have not been sufficiently ruled out, including the potential role of other contaminants, either co-occurring in treated wastewater effluent, or other sources such as agricultural runoff, the complexity introduced by field conditions or simulated-field conditions, when multiple underlying factors are changing over space or time (e.g., phytoplankton community composition, grazing, acclimation to experimental light conditions, increases or decrease in light attenuation as a function of space in field studies, stratification) can make it difficult to directly evaluate the role of the NH4+inhibition mechanism."* (Senn & Novack 2014, p. 6)

In other words, although there is experimental evidence (from the Delta and elsewhere) that ammonium in culture experiments can delay the uptake of nitrate by phytoplankton, there is no scientific consensus or experimental basis from which to conclude that this phenomenon results in lower primary productivity in the Delta.

An expert panel convened by the State Water Board to evaluate the effect of Delta outflows and other stressors on the Delta food web similarly found that (1) the ecological significance of ammonium/nitrate interactions for the Delta food web is not known, (2) experimental approaches used to date are not able to reveal the influences of ammonium/nitrate interactions on primary production rates in the field, and (3) that alternative hypotheses unrelated to ammonia inhibition may explain patterns in field data. In its May 5, 2014 report (Reed et al. 2014)[4], the expert panel makes the following conclusions:

> *"There is a large body of work indicating that ammonium concentrations greater than some threshold inhibit the uptake of nitrate by phytoplankton. Because of these nutrient utilization dynamics, high ammonium concentrations and growth on ammonium will always correlate with low phytoplankton biomass, while growth on nitrate will always correlate with high biomass accumulation, i.e., blooms. If phytoplankton growth is truncated for reasons other than nitrogen limitation (e.g., light, grazing) prior to reaching "bloom" conditions, then no nitrate will be consumed and some ammonium will remain, which has been interpreted (we believe incorrectly) as evidence that ammonium had inhibited bloom formation."* (Reed et al. 2014, p. 48, emphasis added)

> *"...ammonium inhibition of nitrate uptake has been implied to be ammonium inhibition of phytoplankton productivity, and has been interpreted as the cause of lower phytoplankton biomass in the LSZ. There is an alternative explanation for these observations that considers the importance of other factors in truncating algal blooms, and the role of advection in creating "bloom-like" conditions the LSZ... Because of these nutrient utilization dynamics, high ammonium concentrations and growth on ammonium will always correlate with low phytoplankton biomass accumulation, while growth on nitrate will always correlate with high biomass accumulation. Thus, any "bloom" will have the appearance of "requiring" nitrate because all of the ammonium will be consumed while increasing phytoplankton biomass to the beginning of the "bloom" stage. Subsequent phytoplankton growth will then depend on the only remaining source of fixed N, which in this case is nitrate, and growth on nitrate will appear to have "caused" the bloom. Nitrate consumption is, in fact, simply a consequence of the bloom. Furthermore, if phytoplankton growth is truncated for reasons other than nitrogen limitation (e.g., light, grazing) prior to reaching "bloom" conditions, then no nitrate will be consumed and there may be some ammonium remaining, which could be interpreted (we believe incorrectly) as evidence that ammonium had inhibited bloom formation."* (Reed et al. 2014, p. 49, emphasis added)

> *"As mentioned above, ammonium inhibition of nitrate uptake has been interpreted as ammonium inhibition of phytoplankton growth. A critical question that has not been adequately addressed is whether or not phytoplankton grow "better" (faster, more efficiently) on nitrate than on ammonium."* (Reed et al. 2014, p. 51)

> *"Relatively poor photosynthetic performance of phytoplankton in mesocosms using Suisun Bay water was noted by Parker et al. (2012c) and attributed to ammonium toxicity; however, this could have resulted from sampling phytoplankton that had recently been advected into the estuary from fresher water, resulting in salinity-related*

[4] Reed, D., J.T. Hollibaugh, J. Korman, E. Peebles, K. Rose, P. Smith, and P. Montagna. Workshop on Delta Outflows and Related Stressors. Panel Summary Report. Prepared for the Delta Science Program. May 5, 2014.

> *stress. This seems a more likely explanation since a recent review (Collos and Harrison 2014) concludes that ammonium is only toxic to phytoplankton at concentrations much higher than those found in Suisun Bay, or even in the Sacramento River immediately downstream of the SRWTP... Thus, the occasional "blooms" seen in the LSZ under higher flow conditions may well be the result of advection of phytoplankton from the Delta into the LSZ, and not from higher growth rates in the LSZ, regardless of the cause, including the release of putative ammonium toxicity."* (Reed et al. 2014, p. 52)

A recent comprehensive evaluation of hydrodynamics and the combined effects of grazing by all major consumer categories in the San Francisco Estuary (Kimmerer and Thompson 2014) ruled out a controlling role of ammonium - or nutrient ratios - on primary production rates:

> "*Low primary productivity is clearly attributable to the combination of high turbidity and high grazing rate by zooplankton and clams, particularly P. amurensis. The putative contributions of nutrient concentrations or ratios in the low productivity of this region (Dugdale et al. 2007, Glibert et al. 2011) appear negligible compared to the large, direct effects of grazing."* (Kimmerer and Thompson 2014)

Finally, novel large scale field experiments recently conducted by university and USGS researchers, in which SRWTP effluent was withheld to create large parcels of low ammonium water that were tracked for several days, showed that longitudinal patterns in phytoplankton biomass in the Sacramento River are independent of ammonium concentrations (results presented at the Delta Inflows workshop in April 2014; Grovhoug and Mussen, 2014).[5]

- Section 3.5.1.1.

  <u>The Plan is misleading when it cites the toxicity study by Teh et al. (2011)</u>.

> *"Ammonia may also have toxic effects on invertebrates that are prey items for covered fish species (Essex Partnership 2009; Teh et al. 2011). If food is limiting to delta and/or longfin smelt, a reduction in the abundance of prey could reduce the abundance of these fish species. A recent study of the nonnative copepod, P. forbesi (Teh et al. 2011) indicated that biota can be affected at concentrations as low as 0.38 mg/L of total ammonia nitrogen."* (p. 3.5-3, line 14)

Teh et al. (2011) is a report to the Central Valley Regional Water Quality Control Board that has not been peer reviewed and contains extremely deficient methods descriptions. The chronic toxicity test endpoints (NOEC, LOEC; 0.38 mg/L total ammonia) reported by Teh et al. for the single copepod species *Pseudodiaptomus forbesi* were not reproducible when the raw data

[5] Grovhoug, T., and T. Mussen. 2014. Presentation available at http://deltacouncil.ca.gov/delta-science-program-workshop-interior-delta-flows-and-related-stressors-presentations

provided in report appendices were analyzed using standard statistical software designed for aquatic toxicity data (CETIS) (Pacific EcoRisk 2011)[6]; the correct toxicity thresholds may be more than twice as high as those reported in Teh et al. Several other issues regarding use of the data are raised in the Pacific EcoRisk critique, including the possibility that toxicity test data was tabulated improperly before statistical analysis.

Section 3.6: Adaptive Management

- Section 3.6. General Comment.

  Reversibility is presented as a basic principal enabling adaptive management, but the reversibility of project elements and conservation measures is not evaluated. Section 3.6 is a complicated description of processes, responsible parties, and decision and review criteria that would constitute the BDCP Adaptive Management Program. Among the principles listed to guide the development of the adaptive management program for the BDCP are (emphasis added):

  - "*The scope and degree of reversibility of each conservation measure and other factors determine the form of adaptive management that should be applied (e.g., "active" or experimental adaptive management versus "passive" adaptive management)*." (p. 3.6-1, line 34)

  - "*Prioritization and sequencing of conservation measures should be assessed at multiple steps in the adaptive management cycle. Specifically targeted institutional arrangements are required to establish effective feedback mechanisms to inform decisions about whether to retain, modify, or replace conservation measures*." (p. 3.6-2, line 12)

  Sections 3.6.4.3 - 3.6.4.5 (monitoring and research) list myriad parameters (environmental and programmatic) that would be monitored to gauge "effectiveness" and would presumably serve as principal bases for adaptive management decisions. However, reversible elements of conservation measures are not described in the Plan documents, and no clues are provided about how BDCP plans to prioritize or sequence conservations measures at the outset. The documents are lacking concrete examples of adaptive management, so that the reader is left with optimistic theory about adaptive management, but no way to gauge its feasibility given the types of water operations, flow criteria, and conservation measures proposed. Habitat restoration is not inherently "reversible," nor is the construction of a new conveyance. However the *operation* of water facilities is reversible, including the abandonment of water facilities if need be. This important distinction should be explained to the Plan audience, because it affects policy and governance and views about costs and benefits.

[6] Pacific EcoRisk, Inc. 2011. A Critical Review of: Full Life-Cycle Bioassay Approach to Assess Chronic Exposure of *Pseudodiaptomus forbesi* to Ammonia/Ammonium - Final Report Dated August 31, 2011. Prepared for Larry Walker Associates and Central Contra Costa Sanitary District.

- Section 3.6 General Comment.

  No concrete examples (scenarios) of adaptive management are provided, pairing plausible deleterious developments and plausible resultant management actions. Regarding habitat restoration and adaptive management, it is stated (in Appendix 5E):

  > *"Due to the scale of restoration and the complexities of the Delta foodweb, this restoration should be approached in an experimental (i.e., adaptive) manner to ensure that lessons learned on early restoration projects are incorporated into subsequent projects. Using this approach, the effectiveness of restoration actions is expected to increase over time."* (p. 5E.0-4)

  This passage implies that mistakes or unintended consequences at one restoration site will inform steps taken at other sites, but what can be done to repair damage already done? Concrete hypothetical examples of adaptive management should be provided in the Plan documents. For example, in realistic terms, what can the Implementing Office do if it is found that DO is unacceptably low in a restored marsh, or *Corbicula* has colonized a restored site, or *Egeria* colonies are replaced by another invasive species after herbicide treatment? Will breached levees be resealed if a restored habitat proves to be detrimental to covered fish or their food supplies? Would salinity modification or temporary draining be considered? Will flows be increased to new tidal marsh somehow if monitoring indicates a deficiency? Will that be legally possible? Can the depth of a restored site be altered mechanically if it proves to be too deep or too shallow for intended ecosystem functions? Without concrete examples, how can the public gauge the probability that adaptive management will be meaningful, practical, or within the realm of regulatory or legal possibility?

  In their February 25, 2014 draft cover letter for comments on the BDCP EIR/EIS[7], the Delta Independent Science Board commented on this lack of concrete forethought:

  > *"Because it is unlikely that all the actions and measures in BDCP will play out as planned, it would seem prudent to have contingency plans generally outlined before discovering that things aren't working, yet such contingency plans are rarely mentioned. As a consequence, we have misgivings about how well the adaptive management process proposed will actually function as a key component of BDCP." (Feb. 25, 2014 Draft Cover Letter, ISB)*

  To help clarify the adaptive management process, BDCP should also include a review of the FLaSH program in Section 3.6.3, revealing the governance structures, time frames for planning, experimentation, monitoring, data evaluation, and reporting, and the demonstrated level of ability of management to reach conclusions to date. This is a real-world example of research-oriented multi-agency adaptive management in the Delta and will help stakeholders understand

[7] Available at http://deltacouncil.ca.gov/event-detail/10304

the realities and limitations of adaptive management of legally, hydrologically, and biologically complex systems.

Section 3.6.4: Monitoring and Research

- Section 3.6.4. General comment.

  Monitoring and research should be identified as conservation measures. To reduce uncertainty associated with achieving biological objectives, compliance and effectiveness monitoring and research to reduce uncertainty associated with achieving biological objectives should be identified as conservation measures. These conservation measures should also be a condition of the permit.

- Section 3.6.4. General comment.

  Many success criteria, as stated, are not quantitative or qualitative. Many "Success Criteria" as stated in Table 3.D-2 are actually just names of parameters or landscape features, with no quantitative or qualitative values associated.

- Section 3.6.4. General comment.

  Much of the monitoring is inadequate to measure compliance or effectiveness of conservation measures over the permit term. As stated in Table 3.D-2, much of the monitoring is insufficient to provide for adaptive management or gain proper understanding of the effects of conservation measures. Categories of deficiency are listed below; specific examples of deficiencies are provided in Table A.1 below.

  - Lack of baseline monitoring. The monitoring of plankton and invertebrates for CM4 (restored tidal habitat) is partially aimed at quantifying the export of plankton from restored tidal habitat to adjacent open water habitat. However, the monitoring is slated to begin *5 years following* restoration until end of permit term. Zooplankton population sizes are very dynamic interannually and at short time scales (i.e., weeks to months) (Kimmerer 2004). Areas downstream of anticipated restoration sites need to have abundant, temporally dense, baseline data *prior to restoration* in order to demonstrate later whether the hypothesized benefit of plankton export from restoration areas actually occurs. Other examples of monitoring actions that are missing baseline data collection are noted in the table below.

  - Inadequate frequency. Monitoring of short-lived organisms such as plankton is specified as "annual" in several cases rather than as monthly (or more frequent) within monitoring years. A notable exception is the monitoring of plankton abundance for CM6: Channel Margin Enhancement.

- Inadequate duration. Monitoring is frequently truncated after a small number of years (e.g., 3-5). This short time span will not capture the effect of climate change, or other longer-term phenomena, on the performance of the project.

- Monitoring schemes do not consider water-year types. Arbitrary intervals (e.g., every 5 years) are indicated for most parameters, and will therefore prevent evaluation of the effectiveness of conservation measures during different water-year types with substantially different flows and flow-related factors.

- Monitoring of delta smelt fecundity is missing. Objective DTSM1.1 is stated as follows: *"Increase fecundity of delta smelt over baseline conditions as measured through field investigations and laboratory studies conducted through year 10 and refined through adaptive management."* No effectiveness monitoring of delta smelt fecundity is indicated in Section 3.4.1.5.1 (Compliance and Effectiveness Monitoring Actions for CM1), nor in Appendix 3.D.

- Entrainment of plankton should be directly monitored. Phytoplankton, zooplankton, and larval fish should be monitored in the canals between the Tracy and Skinner fish facilities and the export pumps to quantify entrainment of plankton. Plankton concentrations should be monitored behind the fish screens in the north Delta intakes.

- Monitoring required to gauge quality of restored habitat is missing. Several types of monitoring are omitted that will be required to gauge the benefit of protected or restored aquatic sites and to perform adaptive management. For example, there is no provision for monitoring of invasive aquatic vegetation inside restored sites. There is no mention of monitoring clam abundance and filtering capacity at restored sites. There is no mention of monitoring of primary production rates in restored habitat. The only way to understand whether the restored habitats are providing postulated primary productivity benefits will be to determine net primary production after accounting for grazing rates of consumer categories. OC pesticides and OP pesticides should be monitored in restoration areas and downstream from them during site preparation, because site disturbance will mobilize sediment-bound contaminants.

- No monitoring of algal toxins is indicated. The project's effect on residence time, and the predicted increases in Delta water temperatures (the latter were not correctly modeled – see comments elsewhere) may encourage the growth of toxic algae. No monitoring of microcystins or other algal toxins is listed for any of the conservation measures. Although plankton counts may provide an indication of the occurrence of cells or colonies of hazardous algae, it won't indicate whether they are producing toxins (they don't always produce toxins) or whether the toxins are exceeding health standards.

- o <u>No monitoring of primary production rates is indicated for CM2 or CM4, or CM6 – despite the fact that a postulated increase in local primary production is used as a rationale for all three conservation measures</u>, as follows:

  - Regarding purpose of CM2 (Yolo Bypass). "*Increased frequency of inundation will enhance existing connectivity between the Sacramento River and Yolo Bypass floodplain habitat. Also, it can increase production of zooplankton and dipteran larvae (prey resources for covered fish species), mobilization of organic material, and primary production, with conditions suitable for spawning, egg incubation, and larval stages for covered fish species such as Sacramento splittail (if inundation is greater than 30 days).*" (p. 3.4-41, line 8)

  - Regarding purpose of CM3 (Tidal habitat restoration): "*The overall intent of CM4 is to develop a broadly distributed mosaic of restored tidal natural communities that address the foraging needs of covered fish species by increasing habitat suitability, primarily by supporting a more productive aquatic foodweb.*" (p. 3.4-117, line 32)

  - Regarding Objective L2.3 (Connect rivers and their floodplains): "*Also, because inundated portions of floodplains are shallower, have longer residence times, and are generally warmer than the mainstem river, they can have greater rates of phytoplankton production than do the channels of the rivers (Sommer et al. 2004; Lehman et al. 2008).*" (p. 3.3-41, line 16)

A key premise of the BDCP is a postulated increase in aquatic primary production in restored aquatic habitats that will "trickle-up" to covered fish species. Phytoplankton counts do not provide a measure of primary production; carbon uptake rates should be regularly measured in restored habitat.

- Table 3.D-3

<u>Several activities that are characterized as *research* in Table 3.D-3 should be reclassified as *effectiveness* monitoring, and conducted over the long term</u>. Examples are as follows:

Under CM2 Yolo Bypass Fisheries Enhancement:

- Evaluate the effectiveness of the fish passage gates at Freemont Weir;
- Determine growth rates of juvenile salmonids that have entered the Yolo Bypass during Fremont Weir operation;
- Document Sacramento splittail spawning and spawning success in the Yolo Bypass during Fremont Weir operation;
- Determine severity of predation effects on covered fish using the Yolo Bypass;

- Determine plankton and invertebrate production rates during periods the Fremont Weir is operated.

Under CM4 Tidal Natural Communities Restoration:

- Quantify the primary and secondary production, including food suitable for covered species, both within restored tidal marsh natural communities and transported from restored areas to adjacent open-water habitat and its fate;
- Determine the extent and patterns of establishment of nonnative clams in restored sub tidal aquatic habitats;
- Document and evaluate water quality condition in restored aquatic habitats.

Under CM5 Seasonally Inundated Floodplain Restoration:

- Evaluate the distribution and abundance of covered fish species and predators at restoration sites.

Table A.1. Specific Deficiencies in the Compliance Monitoring Specified in Table 3.D-1. Emphasis (underlining) is added.

Conservation Measure	Compliance Monitoring Action	Timing/Duration Stated in Appendix 3.D	Deficiencies
CM1 Water Facilities and Operation	Confirm screen operation produces approach velocities no greater than 0.33 foot per second in daytime and 0.2 foot per second at night when delta smelt are present [*indicator of smelt presence to be determined*]... <u>This monitoring should be performed to evaluate the range of river stages accounting for the majority of total flow variability</u> and should evaluate both clean and dirty screens at a representative range of river stages. Once compliance has been demonstrated, monitoring may cease	Approximately 6 months beginning with initial facility operations.	Duration inadequate. How can a one-time 6-month period of monitoring account for "the range of river stages accounting for the majority of total flow variability". How does the stated duration of monitoring account for interannual variation in flow and water year types?
CM2 Yolo Bypass Fisheries Enhancement	Site-level assessment—plankton and invertebrate sampling: Assess increases in plankton and invertebrate abundance, and transport of plankton and invertebrates off of Yolo Bypass to areas occupied by delta smelt.	Every 5 years after modifications to Fremont Weir are completed	No Baseline Data. Inadequate Duration. Why wouldn't it be important to quantify baseline conditions for several years prior to the modifications? What if water year types are not adequately represented during the 5-year period after the modifications?

Conservation Measure	Compliance Monitoring Action	Timing/Duration Stated in Appendix 3.D	Deficiencies
CM2 Yolo Bypass Fisheries Enhancement	Site-level assessment: Assess use of Yolo Bypass by covered fish species.	Monthly seine/net surveys between November 10 and May 15 through year 15.	Wouldn't isotope studies of otoliths be effective in determining past use of Yolo Bypass for fish caught elsewhere?
CM5 Seasonally Inundated Floodplain Restoration	Document in a GIS database the extent of floodplain successfully restored by installing and monitoring automated monitoring devices or other appropriate measures to determine inundation depth, stage, and frequency. Obtain data from Integrated Regional Wetlands Monitoring, as relevant. Based on physical data, estimate amount of floodplain restored for each covered species expected to use area.	Prior to floodplain restoration and annually for the first 5 years following restoration actions	Wouldn't it make sense to monitor during a variety of water year types? Cessation of monitoring after 5 years will hinder adaptive management. What if inundation depths, etc. change in the future such that the BDCP has not resulted in the promised suite of new habitats? How will we know, if monitoring ceases after 5 years and before new water operations have begun?

Specific deficiencies in the Effectiveness Monitoring Specified in Table 3.D-2.

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM1 Water Facilities and Operation	Monitor refugia to evaluate effectiveness relative to design expectations. Method is likely to entail use of a Didson camera to observe fish behavior within refugia, but more specific monitoring protocols and performance metrics are to be developed once refugia design has been completed, and prior to facility operation. <u>Monitoring will evaluate refugia operation at a range of river stages and with regard to target species or agreed proxies</u>. Once compliance has been demonstrated, monitoring may cease....	To be determined	To be determined	Approximately 6 months beginning with initial facility operations.	Duration inadequate. How can a one-time 6-months period of monitoring account for "the range of river stages accounting for the majority of total flow variability". How does the stated duration of monitoring account for interannual variation in flow and water year types?
CM1 Water Facilities and Operation	Observe fish activity at screen face (using Didson cameras or other technology to be determined prior to facility operations) and use mark/recapture study of salmonid and smelt proxy fishes to evaluate impingement injury rate. Performance metrics to be determined prior to study initiation (same as post construction study 7, *Evaluation of Screen Impingement* [Fish Facilities Technical Team 2013]).	To be determined	To be determined	Study to be performed <u>at varied river stages and diversion rates</u>, during first 2 years of facility operation.	Duration inadequate. How can the permittees expect the full range of "river stages" and "diversion rates" possible during the permit term to occur during the first 2 years of facility operation?

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM1 Water Facilities and Operation	Determine overall impact on survival of juvenile salmonids throughout the diversion reach related to the operation of the new facilities. Use mark/ recapture and acoustic telemetry studies (or other technology to be determined prior to facility operations) to evaluate any impacts of facility operations on juvenile salmonids, under various pumping rates and flow conditions, to insure that the survival objectives for juvenile salmonids traversing the diversion reach are being met	Survival through diversion reach	Survival of at least 95% of outmigrant juveniles entering the reach (0.25 mile upstream of the upstream intake), measured 0.25 mile downstream of the downstream intake	Study to be performed at varied river flows and diversion rates, during first 2 to 5 years of facility operation	Duration inadequate. How can the permittees expect the full range of "pumping rates" and "flow conditions" possible during the permit term to occur during the first 2-5 years of facility operation?
CM1 Water Facilities and Operation	Measure entrainment rates at screens using fyke nets located behind screens. Identify species and size of entrained organisms. Use trawl surveys in channel to calibrate density of entrained organisms. Performance metrics to be determined prior to study initiation (same as post construction study 8, *Screen Entrainment* [Fish Facilities Technical Team 2013], but with addition of trawl surveys).	To be determined	To be determined	Study to be performed at varied river stages and diversion rates, during first 2 years of facility operation	Duration inadequate. How can the permittees expect the full range of river stages and diversion rates possible during the permit term to occur during the first 2 years of facility operation? What about different water year types (dry, wet, etc.)?
CM1 Water Facilities and Operation					No direct monitoring of entrainment of plankton is proposed.

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM2 Yolo Bypass Fisheries Enhancement	Annually assess juvenile salmonid through-Delta survival and/or continue conducting studies assessing juvenile growth rates using hatchery origin juvenile salmonids. Begin monitoring upon final BDCP permit authorization and continue through year 15. Report results in annual progress report.	To be determined following selection of methodology	Performance consistent with juvenile steelhead survival target set by objective STHD1.1	Annually through year 15	Is this action aimed at salmonids (second column) or steelhead (third column)? What about longer-term changes that might reduce steelhead survival, like climate change? How do the permittees plan to monitor the effectiveness of CM2 through the permit term?
CM2 Yolo Bypass Fisheries Enhancement					No monitoring of primary production rates is indicated in the Yolo Bypass.
CM4 Tidal Natural Communities Restoration	Conduct a site-level assessment of warm season dissolved oxygen concentrations.	Water quality	Maintenance of high warm-weather dissolved oxygen concentrations and low temperatures relative to comparable seasonal norms for reference managed wetlands	Annually for first 5 years after restoration	Duration inadequate. What if the first 5 years after restoration do not represent the range of climatic, hydrologic, and biological conditions that affect DO? Climate change will increase temperature, which will decrease DO saturation.

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM4 Tidal Natural Communities Restoration	Conduct a site-level assessment of use by native and nonnative fishes	Use of restoration sites by covered fish species	Detection of site use by Chinook salmon, splittail, and the following covered fish species: longfin smelt and delta smelt in the Suisun Marsh and Cache Slough ROAs; steelhead and delta smelt in the Cosumnes/ Mokelumne ROA	Monthly seine/net surveys during one water year between the second and fifth year following site construction	Non-native species are not referenced in the success criteria. Duration of monitoring is woefully inadequate (1 water year)

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM4 Tidal Natural Communities Restoration	Conduct plankton and invertebrate sampling in restored tidal natural communities.	Plankton and Invertebrate abundance in restored floodplain (Is this a typo? Shouldn't this action be for restored tidal habitat?)	Presence within and transport from restored tidal natural communities to adjacent open-water habitat occupied by covered fish species	Every 5 years following floodplain restoration until end of permit term (Is this a typo? Shouldn't this action be for restored tidal habitat?)	Can this mean just one survey per year, every 5 years? This is not adequate. Zooplankton abundance is highly variable within and between years. Such infrequent monitoring will not detect invasive species arrivals fast enough to inform adaptive management. Careful attention will have to be paid to tidal pumping to ensure that the abundance being monitored is for plankton being transported out of restoration sites as opposed to plankton being transported into restoration sites from adjacent water bodies. The success criterion for CM4 for monitoring of plankton abundance in Appendix 3.D. is vague and does not acknowledge the numeric criteria of 7,000 calanoid copepods/cubic meter articulated in the associated biological objective.

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM4 Tidal Natural Communities Restoration					No monitoring of primary production rates is indicated for tidal wetlands.
CM4 Tidal Natural Communities Restoration					No monitoring of clam abundance is specifically indicated. No monitoring of clam filtering rate (which requires size distribution of clams) is indicated.
CM5 Seasonally Inundated Floodplain Restoration	Plankton and invertebrate sampling in restored floodplain, at each restoration site	Plankton and invertebrate presence in restored floodplain (plankton and invertebrate abundance may fluctuate based on predation by juvenile fish, water temperature, and fluctuations in the duration, extent, and frequency of floodplain inundation)	Plankton and invertebrate presence, as well as presence of juvenile fishes that may feed upon them (presence of juvenile fishes may result in decreased plankton and invertebrate abundance [Grosholz and Gallo 2006])	Every 5 years following floodplain restoration until end of permit term	Frequency and duration is not adequate. Zooplankton abundance is highly variable within and between years. Such infrequent monitoring will not detect invasive species arrivals fast enough to inform adaptive management.
CM5 Seasonally Inundated Floodplain Restoration					No monitoring of primary production rates is indicated.

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM5 Seasonally Inundated Floodplain Restoration	Plankton and invertebrate sampling in restored floodplain, at each restoration site	Plankton and invertebrate abundance in restored floodplain	Increase	Every 5 years following floodplain restoration until end of permit term	Intra- and Interannual varation in plankton abundance renders this frequency inadequate to measure success. Also, shouldn't water year types (which are not on a 5-year schedule) be captured by monitoring, since floodplain inundation will depend on water year type? Such infrequent monitoring will not detect invasive species arrivals fast enough to inform adaptive management.
CM6 Channel Margin Enhancement	Measure plankton and invertebrate abundance in aquatic habitat within and adjacent to enhanced channel margins.	Laboratory counts of water and seine samples taken in the field	Increased plankton and invertebrate abundance	Six times per year for first 5 years after site construction; three times per year every fifth year thereafter	Why is plankton monitoring going to be more frequent in enhanced channel margin projects than in seasonal floodplain and tidal habitat? There is a lack of consistency between habitats. The monitoring in the other habitats should look more like that stated here. Metrics stated suggest that clam abundance will not be measured in levee setbacks.

Conservation Measure	Effectiveness Monitoring Action(s) (emphasis added)	Metric	Success Criteria	Timing & Duration	Deficiency
CM13 Invasive Aquatic Vegetation Control					A threshold maximum velocity for successful *Egeria* establishment (0.49 m/s) has been proposed by BDCP. Owing to the importance of velocity as a factor in *Egeria* colonization, continuous monitoring of current speeds near the substrate should be conducted in sensitive areas to evaluate the consequences of operations scenarios in various water year types.

Appendix 3G: Proposed Interim Delta Salmonid Survival Objectives

- Page 1, line 14 and Page 11, line 5

> *"These BDCP survival objectives would provide 50% of the total improvement in overall survival necessary to meet target cohort replacement rates (CCR). The remaining 50% of the necessary improvements in juvenile survival are expected to be achieved through recovery actions distributed throughout the salmonid life-cycle."*
>
> *"In recognition that the BDCP cannot be responsible for producing the entire increase in survival deemed necessary to achieve sustainability, these Interim BDCP Survival Objectives are approximately one-half of the estimated overall improvement needed to achieve the long term CRR targets. This is based on the assumption that other restoration and recovery efforts will result in substantial improvements in survival throughout the salmonids range."*

It seems reasonable that the habitat restoration and improved water operations in BDCP will only achieve half of the desired increase for salmonid populations, but how will salmonid population increases due to BDCP-funded actions be identified separately from population increases resulting from conservation actions performed by other agencies unrelated to the BDCP, or beneficial changes in climatic condition? The proposed Interim Delta Survival Objectives appears to attribute all increases in salmonid populations to BDCP, allowing the Conservation Plan to meet its objective when salmon populations are only restored to half of their overall desired level.

Will improvements in salmonid populations resulting from improved water quality be counted into the improvements from BDCP? It would be best to provide the actual long term CRR targets and then allocate increases to BDCP and other restoration activities, otherwise BDCP will claim that all improvements in salmonid populations resulted from their conservations plan. The current wording will adaptively manage the BDCP program to sustain fish at half the proposed CRR targets (50% improvement). This effectively sets the bar for maintaining Delta operations (Delta outflow rates, Sacramento River cold water pools, fish entrainment mortality, predation losses at water export facilities, and habitat restoration projects) to support salmonid populations at half of their desired levels.

What happens if juvenile salmonid populations do not reach desired CCR abundances? Will BDCP lose its take permit or will adaptive management processes need to be restructured with additional guidance and regulations from fisheries agencies?

- Page 10, line 32

> *"NMFS anticipates more immediate improvements in survival of San Joaquin-origin Chinook salmon and steelhead to accrue based on early conservation actions, including RPAs required by the NMFS and U.S. Fish and Wildlife Service Biological Opinions, improved Delta inflows, habitat restoration projects such as Dutch Slough, and*

> *improvements in water quality from the upgraded Sacramento Regional Wastewater Treatment Plant."*

How are non-BDCP improvements to CRR, such as improved water quality, identified and counted separately from the BDCP improvements?

Chapter 5: Effects Analysis

Overarching Comments:

- The chapter is difficult to review and comprehend because it is poorly organized, inconsistent and suffers from inadequate cross-referencing. The chapter makes the interpretation of net effects of BDCP implementation difficult at best. The Independent Panel charged with review of the Effects Analysis has stated that it "universally believes that by itself, Chapter 5... inadequately conveys the fully integrated assessment that is needed to draw conclusions about the Plan…" [Delta Science Program Independent Review Panel Report (DSP-IRP Report), BDCP Effects Analysis Review, Phase 3, March, 2014, page 5]
- Chapter 5, and most importantly the conclusions stated in Chapter 5, do not appropriately reflect the high uncertainty regarding the project effects that were described in the technical appendices supporting the chapter. In particular, the Chapter 5 summary did not recognize the critical uncertainties associated with the presumed beneficial effects of tidal wetland restoration. Instead, conclusions were reached that tend to favor the positive effects of the project, and no competing hypotheses are not offered or considered.
- The objectivity of the analysis captured in Chapter 5 needs to be improved. The chapter does not contain an integrated assessment of net effects of the proposed project. The DSP-IRP has called for the net effect assessment approach to be revamped. While considerable effort has been made to document the complex information that needs to be considered in determining net effects, a coherent synthesis of that information using a systematic approach was not presented. Instead, "professional judgment" was used, which often resulted in a one-sided opinion regarding the net positive effect of the project. As a result, the chapter conveys an unsatisfying message of "trust us". The expectations of effects developed through "professional judgment" are more accurately portrayed as working hypotheses of the relationship between actions, stressors and biological outcomes.
- Despite acknowledgment of extensive uncertainties in the chapter and its associated appendices, the Effects Analysis asserts the beneficial effects of the BDCP conservation measures. The net effects analysis tends to overreach conclusions of positive benefits for covered fish species. In large part, given that the alleged benefit of the BDCP is weak in many respects, the BDCP will depend on adaptive management to ensure that the predicted benefits will occur. However, the proposed adaptive management framework and governance structure is inadequate, non-rigorous, inadequately transparent and inclusive, and lacking true commitment. The adequacy of the BDCP therefore rests on the rigorous application of adaptive management to ensure that alleged benefits are attained through a progressively refined plan. The DSP-IRP has strongly recommended that a commitment be made under BDCP to create and

implement an exceedingly rigorous adaptive management that includes adequate monitoring and independent science review. [DSP-IRP Report, page 9] The Panel also recommends the identification and inclusion of triggers as part of the adaptive management structure. [page 18]

- Only one configuration of restoration sites within Restoration Opportunity Areas (ROAs) were modeled using hydrodynamic models. Details regarding the locations, timing, and configurations of the modeled suite of restoration projects are not available. Given the potential impact of such areas on hydrodynamics, tidal volumes and hydraulic residence times in the Delta, the actual BDCP project may have a much different effect on fish populations and water quality than has been described in the BDCP Effects Analysis. As a result, it is not possible to evaluate the sensitivity of these factors and outcomes over a range of different restoration scenarios.
- Chapter 5 does not adequately account for potential detrimental direct and indirect effects of the project on the Delta food web. For example, the effect of clams on the aquatic food web is not incorporated into the food web analyses presented in Chapter 5. This is a significant deficiency, based on the current scientific information which indicates (1) the 1987 invasion by the brackish-water clam *Potamacorbula* had a significant impact on the Delta food web.[DSP-IRP Report, pages 34, 37, 59, and 70] and (2) the non-native freshwater clam *Corbicula* can consume all of the primary production in colonized locales. Yet, according to the DSP-IRP, the effects of the BDCP water operations and habitat restoration may be to expand the populations of invasive clams in the Delta. In addition, direct entrainment of lower food web organisms by existing and planned export facilities is not acknowledged or quantified. Also, ater operations that reduce flow, increase water residence time and increase temperatures may promote *Microcystis*. [DSP-IRP Report pages 17, 34, 70]. Consequently, *Microcystis* blooms may be more common under the BDCP.
- Restoration actions are likely to increase the production, mobilization and bioavailability of methylmercury (Appendix 5d-24, lines 41-44). [DSP-IRP Report, page 67].

Specific Comments

- 5.1.1 Basis for Evaluation, Page 5.1-1

The first paragraph states that the effects analysis, which is a fundamental, required element of the BDCP, is based on an extensive body of monitoring data, scientific investigation, and analysis of information on the Delta complied over several decades. Long term monitoring and research programs conducted by the Interagency Ecological Program, state and federal resource agencies, and academic investigators with the specific intent of assessing the effect of the water project operations has contributed to this information base. However, despite this wealth of information, a clear presentation and description of the effects of the existing water project operations on covered species is missing from the BDCP effects analysis. Such information is vital to the understanding of the historical impacts on the Delta ecosystem and the projected future impacts of the proposed

BDCP project. This is a fundamental flaw in the effects analysis that should be corrected prior to the approval of the BDCP by state and federal fisheries agencies.

- Section 5.2.7. (Effects Analysis for Covered Fish)

  <u>One third (13/39) of the species-specific Biological Objectives for covered fish were omitted from the Effects Analysis</u>**.** In these cases, BDCP apparently lacks the information or tools to gauge the likelihood of achieving the objective, is unable to specify what actions (including water operations) would produce the biological benefit, or is not sure that covered activities are capable of producing the benefits promised (e.g., zooplankton production in restored habitat). As Table 5.2-8 reveals, the public is asked to believe that the adaptive management program will be capable of devising means to accomplish one third of the fish-specific biological objectives after the permit is granted. It seems likely many of the biological objectives will be redefined as they are discovered to be unattainable.

- Section 5.2.7. (Effects Analysis for Covered Fish)

  <u>Key input from resource agencies that influenced the Net Effects analysis for covered fish is not revealed in Section 5.2.7.</u> The Net Effects analysis for covered fish was apparently substantially influenced by a series of workshops August 2013 involving resource agency staff. No materials from the workshop are cited or appear to be publicly available. Consequently, the public cannot evaluate ICF's interpretation and characterization of the workshop participants' professional opinions regarding ranking of attributes for the effects analysis for fish.

- Section 5.2.7. (Effects Analysis for Covered Fish)

  <u>The Net Effects scores for Covered Fish are not usable.</u> The Net Effects tables are blurry and unreadable. The dual numeric scores for "importance" and "change" underlying the qualitative net effects scores are not revealed, but obscured by use of qualitative "bins" (e.g., "low", "medium"). The method for combining attribute scores presented on p. 5.5-1 is unnecessarily abstruse. The directions of the "net" effect of an attribute (negative or positive) in the tables are not discernible.

<u>Chapter 5: Appendix 5B - Entrainment (and pertinent sections of Appendix 5C-Flows, etc.)</u>

- Appendix 5B. General Comment

<u>Entrainment of phytoplankton and zooplankton is not evaluated.</u>

Missing from the Effects Analysis is an analysis of the entrainment of <u>plankton</u> from the Delta, and its effect on covered fish. Export of lower food web organisms is not quantified at all, nor is the lost food web productivity caused by direct entrainment (which is ongoing and directly measureable for the south Delta facility) compared to postulated gains in productivity from restored habitat using any kind of common ecological currency. Because this information is missing, it is not possible to surmise whether the BDCP will result in a net increase, or a net decrease, in suitable planktonic food organisms for covered fish.

Food web benefits from the BDCP are hypothesized to result primarily from (1) management of the "volume" of the low salinity zone via the positioning of X2, and (2) provision of new physical habitat or improvements to existing physical habitat (e.g. tidal habitat restoration, channel margin enhancements), in which, it is hypothesized that appropriate food webs will develop providing necessary invertebrate diet items for covered fish. Regarding lower food web support, Delta-smelt specific biological goal #2 (DTSM2), and its associated Objectives, reveal an explicit expectation that conservation measures will result in particular calanoid copepod densities:

> "***Goal DTSM2:*** *Increased quality and availability of habitat for all life stages of delta smelt and increased availability of high-quality food for delta smelt. The habitat objective can be met through a combination of Delta outflow and/or physical habitat restoration suitable for delta smelt."*
>
> *"**Objective DTSM2.1:** Increase the extent of suitable habitat, as defined by flow, salinity, temperature, turbidity, food availability and presence of delta smelt, to provide for the conservation and management of delta smelt in the Plan Area by the achieving the following subobjectives."*
>
> *"a) Provide a monthly average of at least 37,000 acres of open-water habitat in hydrologically wet years*, and at least 20,000 acres of connected open-water habitat in hydrologically above-normal years*, of 1 to 6 psu habitat surface area during July–November. This habitat will meet all of the following criteria: extensive vertical circulation including gravitational circulation, contiguous with other open-water habitat, lateral mixing, and other hydrodynamic processes keeping Secchi disk depths less than 0.5 meter, <u>high calanoid copepod densities (over 7,000 per cubic meter)</u>, hydrologically connected to substantial tidal marsh areas, and maximum water temperatures less than 25°C. "*
>
> *"b) Increase the extent of tidal wetlands of all types in the Plan Area by 10,000 acres by year 10, 17,000 acres by year 15, and 48,000 acres by year 40. In Suisun Marsh, West Delta and Cache Slough ROAs, individual restoration projects <u>must show a net-positive flux of calanoid copepods and mysid</u>s off of the restored wetlands into open water occupied by delta smelt. Food production targets and export distances will be determined through field investigations and modeling, and refined through adaptive management."*
>
> *"c) Increase by 100% the surface area of open-water, very low-salinity (<1 psu) habitat in the Cache Slough ROA during July–November by 2060. This habitat will meet all of the following criteria: extensive lateral mixing, contiguous with other open-water habitat,*

hydrodynamic processes keeping Secchi depth less than 0.5 meter, high calanoid copepod density (over 7,000 per cubic meter), and temperature criteria described in item b, above."

The level of importance assigned by BDCP to copepod availability is reflected by the inclusion of (admittedly draft) numeric calanoid copepod targets in the biological objectives above. This implies that an analysis of how all pertinent project elements affect the production, transport, and fate of zooplankton (including water facilities and operations) is necessary for environmental review of the Plan.

In at least two passages, the Plan acknowledges that entrainment of plankton in the south Delta is an issue:

"*For decades, water has been diverted directly from the south Delta through SWP/CVP facilities to meet agricultural and urban water demands south and west of the Delta. These diversions create an artificial north-south flow of water through the Delta (as opposed to the general east-west flow pattern that existed before the diversions) and, as detailed above, have resulted in the development of reverse flows in major Delta channels that result in entrainment of fish, invertebrates, nutrients, and other organic material.*" (Section 3.4.1.3.2 Page 3.4-7, line 26)

"*Operations of the south Delta SWP/CVP diversion facilities have been identified as primary factors in altering hydrodynamic conditions in Delta channels and associated fishery habitat (U.S. Fish and Wildlife Service 2008; Baxter et al. 2008). These operations contribute to local changes in water current patterns, water quality, and direct entrainment and losses of fish, macroinvertebrates, nutrients, phytoplankton, and zooplankton from the Delta environment (U.S. Fish and Wildlife Service 2008)*." (Section 3.4.1.3 Problem Statement, p. 3.4-6, line 21)

Although the effect is not quantified in the Plan documents, an unstated assumption of the BDCP appears to be that use of the north-Delta intakes, and dual conveyance operations, will allow plankton from the interior Delta to escape entrainment and make its way through available channels to the low salinity zone.

"Operational criteria presented in CM1 Water Facilities and Operation set seasonal limits on Old and Middle River reverse flows. These limits are intended to reduce the risk that south Delta SWP/CVP exports will cause direct losses or salvage of covered fish species or increases in the export of nutrients and food resources produced in restored southern and eastern Delta marshes" (Section 3.2.3.1. p. 3.2-8, line 10, emphasis added)

However, the metrics that will govern operations of the dual conveyance (combined north and south Delta diversions) do not include minimization of entrainment of high quality phytoplankton and zooplankton (for example, there is no performance standard for plankton entrainment), and there is no guarantee that they will do so. For example, the primary intent of operation of the Delta Cross Channel and proposed new operable gate at the Head of Old River is to accomplish "traffic control" for covered fish (e.g., by preventing or allowing passage of fish, establishing sufficient by-pass flows at diversions, and management of OMR directional flows) or to meet D1641 water quality criteria (such as DO or salinity) at particular nodes in the channel network. Export volumes will be governed by a complicated set of flow criteria including OMR flows, Delta outflow, X2 location, north Delta bypass flows, and export-to-inflow ratios (E:I ratio), for which compliance is based on quantities and directions of water movement or detection of non-larval fish in salvage, and which may be triggered by presence of fish at particular nodes. The flow criteria in Tables 3.4.1-1 and 3.4.1.2, and the operations decision trees ultimately control the quantities of water past certain nodes in the system, but do not address the fate and transport of pelagic fish food. <u>The fate and transport of planktonic organisms (including larval fish) is not a part of the operations "equations"</u>. The effects analysis for entrainment (presented in detail in Appendix 5B) is limited to the modeling of the numbers of (non-larval) fish that would be physically removed at north- or south-Delta intakes. In fact, in the 451-page Appendix 5B.Entrainment, the words "zooplankton", "plankton", and "phytoplankton" do not occur.

<u>Entrainment loss of plankton originating in the north Delta</u>. Entrainment of plankton from the north Delta will occur both directly at the north Delta intakes, but also indirectly as Sacramento River water is diverted into the interior Delta and withdrawn in the south Delta. Movement of water out of the Sacramento River into the Delta Cross Channel is not expected to change much even after operation of the north Delta intakes:

> "*Construction and operation of the new north Delta intakes are expected to entail relatively minor changes (average monthly changes of less than 10%; Appendix 5.C, Flow, Passage, Salinity, and Turbidity, Attachment 5.C.A, Section C.A.4.2.10, Delta Cross Channel and Georgiana Slough Flows) in the frequency and volume of Sacramento River water flows into the Delta Cross Channel. Moreover, those flows will continue to be manipulated through the flow criteria and real-time operations discussed below, and are subject to future revision via adaptive management to minimize adverse effects on covered species and natural communities.*" (Section 3.4.1.3.3 Delta Cross Channel Effects on Fish Migration, p. 3.4-8, line 16)

This modeling result implies that water removed from the Delta using the existing *south Delta* intakes will continue to include a large percentage of Sacramento River water that has been drawn southward through the Delta, and that unquantified amounts of plankton transported in the Sacramento River will ultimately be vulnerable to entrainment both in the north and south Delta.

Particle tracking results presented in Attachment 5C.A (representing particle releases across the full range of CALSIM-modeled major river inflows) show that when both south and north intakes are operational (ESO_LLT), up to a maximum of ~30% of the particles present at a particular time in the Sacramento River at Sutter Slough would be directly entrained at the south Delta export facilities within 30 days, depending on river inflows (Figure C.A.-163). These values do not include the plankton removed from the Sacramento River by the north Delta intakes.

Entrainment loss of plankton originating in the south Delta. Even after construction and operation of the proposed north Delta intakes, direct diversion of water from the south Delta is expected to continue at high rates, indicating that substantial entrainment of plankton from the south Delta via Old River and Grant Line Canal will continue indefinitely. In addition, south Delta exports are predicted to change the least in the future during April and May, which is when juvenile delta smelt are rearing and could benefit from subsidies of plankton transported from the south Delta:

> *"Across the five water-year types, exports from the south Delta were modeled to change from 100% of total exports under the existing biological conditions to an average of 55–56% under the evaluated starting operations. The proportion of total exports from the south Delta facilities under the BDCP was lowest in wet water years (36–37%) and highest in critical water years (80–81%). ...The smallest average differences in south Delta exports between evaluated starting operations scenarios and baseline scenarios generally were in April and May."* (Appendix 5.B. Entrainment, p. 5.B-383, line 4)

Total entrainment. Table C.A-34 provides the simulated total exports and percentage of total exports from the south Delta for operations scenarios. Part D of the table shows that on an average annual basis over half (56%) of total exports will be from the South Delta by the end of the permit term. This implies that a substantial amount of total exports (44%) will be derived from the north Delta intakes, making plankton biomass in the Sacramento River considerably vulnerable to entrainment at the new north intakes.

Long-term zooplankton monitoring stations do not occur at the Delta boundaries for all of the Delta inflows, however, there is no reason that zooplankton abundance at the south Delta intake facilities could not already be monitored, to provide direct entrainment estimates. Phytoplankton records (chlorophyll-a, taxonomic) are available from the EMP for pertinent nodes that would allow for estimates of phytoplankton inputs and entrainment, such as various stations in the San Joaquin River, the Sacramento River @ Hood, Old River, and Clifton Court Intake. The modeling tools that were used to estimate the effect of numerous operations scenarios on parameters such as turbidity and salinity could be leveraged to estimate the numbers of phytoplankton (or taxonomic subgroups, such as diatoms), or bulk chlorophyll-a that would be removed from the channel network by combined north- and south Delta exports under the ELT and LLT scenarios, with the caveat that restored wetland contributions to phytoplankton in Delta channels are not reliably estimated with the tools that BDCP has developed (see comments for Attachment 5C.F. Nutrient Model Report regarding DSM2/QUAL). Where phytoplankton data are not available, particulate organic carbon can be derived from long-term records of total organic carbon (TOC) and dissolved organic carbon (DOC) from the EMP.

The missing plankton entrainment analysis is significant. Cloern and Jassby (2012)[8] produced a phytoplankton carbon budget for the Delta that accounted for inflows, primary production, burial, in-Delta diversions, Delta outflow, and SWP/CVP exports – averaged for March-October for 1975-1993. In their analysis, average phytoplankton carbon entrained by the SWP/CVP (8 tons C/day) exceeded that in Delta outflow (5 tons C/day). Direct entrainment was estimated to remove almost 20% of in-Delta net primary production (8/44). This estimate does not include the loss of secondary productivity (zooplankton) that would be in addition to losses of primary production.

<u>The effect of water operations scenarios on riverine food subsidies to the LSZ is not examined</u>. Maintenance of downstream transport of food and organic matter is listed as one of five principal considerations during the design of bypass flows for the north Delta intakes:

> “*Maintain downstream transport of food and organic material:*
>
> *The Sacramento River is used as a major corridor through which food and other organic material from upstream are transported downstream to the Delta and bays. The Delta and bays acquire production from upstream areas to support their ecosystems*.” (Section 3.4.1.3.5 Flow Modification Effects in the Sacramento River, p. 3.4-10, line 11)

Unfortunately, just as the Plan does not quantify direct entrainment of “food and other organic material” at the north and south Delta intakes, it does not quantify the effect of operations scenarios on the net downstream flux of planktonic food organisms to the low salinity zone (LSZ). Kimmerer and Thompson (2014)[9] showed that combined grazing by clams, and micro- and macro-zooplankton exceeded primary production in the low salinity zone almost continuously between 1987-2010, greatly increasing the trophic importance of phytoplankton and zooplankton subsidies delivered to the LSZ through Delta outflow.

Particle tracking results presented in Attachment 5C.A (representing particle releases across the full range of CALSIM-modeled major river inflows) show that the percentage of particles released in the Sacramento River at Sutter Slough that would make it downstream past Chipps Island after 30 days ranges from ~10% to ~90% during the late permit term (ESO_LLT scenario), depending on inflows. The higher value implies that over the range of river inflows expected during the permit term, operations will substantially reduce the subsidy of some months (Figure C.A.-160).

[8] Jassby, A.D., J.E. Cloern, B.E. Cole. 2002. Annual Primary Production: Patterns and Mechanisms of Change in a Nutrient-Rich Tidal Ecosystem. Limnol. Oceanogr. 47: 698-712.
[9] Kimmerer, W.J., and J.K. Thompson. 2014. Phytoplankton growth balanced by clam and zooplankton grazing and net transport into the low-salinity zone of the San Francisco Estuary. Estuaries Coasts DOI 10.1007/s12237-013-9753-6

Appendix 5.B, Specific Comments

The effects analysis does not adequately address the potential for the new northern intake screens to increase fish predation risk. The proportion of Sacramento River-origin salmonids that may pass close enough to the intakes is uncertain but may be appreciable given the likely siting near the outside of river bends to minimize sedimentation and maintain sweeping velocity. Existing survey data suggest that most delta smelt and longfin smelt would be well downstream of the intakes, but those that do occur in the intake vicinity and near the shoreline are likely to contact the screens and could suffer injury and potentially mortality. It is proposed that approach velocity would be limited to 0.2 feet/second (ft/sec) when delta smelt are present. Laboratory studies have shown that the probability of delta smelt entrainment- related mortality is greater with higher sweeping velocity and at night, however, screen contact rates for Sacramento splittail and salmonids decrease with increased sweeping velocities, so it is apparent that water export operations will have differing effects on different species from the north Delta intakes. Further studies are necessary to estimate the potential impacts of the new northern intake screens on native fish survival.

- Page 5.B-304, line 11

> *"Because of the lack of an established relationship between passage time, screen contact rate and injury or mortality, it is not possible to conclude with certainty what the effects of the north Delta intakes may be on juvenile Chinook salmon or indeed on juvenile steelhead, which Swanson and coauthors (2004b) noted behaved similarly in the Fish Treadmill tests. This uncertainty would be addressed with monitoring and targeted studies examining impingement and passage time along the intakes."*

It may be impossible to detect and precisely measure impingement rates for small fishes on these proposed water intake structures. Due to the large screen surface area, it would be extremely challenging to monitor occasional impingement of small fish across the screen area and over long periods of time. Furthermore fish impingement susceptibility needs to be evaluated at multiple environmental conditions including tests conducted during the day, night, high river velocity, low river velocity, high turbidity, high temperature, etc.). Small impinged fish are likely to be quickly consumed by predatory fish, so their impingement duration on screens could be very short and frequently undetected.

Monitoring plans to determine impingement and related negative screen interactions for covered fish species at the proposed north Delta intakes need to be proven in field pilot experiments at other screened facilities and fully described in the BDCP, so they can be confidently relied upon to evaluate fish impingement and screen efficiency.

- Page 5.B-306, line 14

> *"Recent research suggests that adult delta smelt may use tidal currents to facilitate movement upstream by migrating to channel margins during ebb tides and into the channel during flood tides (Burau 2011). Depending on which side of the channel the fish move to, such behavior may place delta smelt close to the channel margins and*

potentially close to the proposed north Delta intakes. Flows towards the intakes may also increase the chance of delta smelt within the vicinity encountering the screen."

This study suggests that delta smelt may have a particularly strong risk of becoming impinged on the north Delta intake screens when migrating upstream in the Sacramento River. If these fish seek refuge near the shoreline during ebb tides they would approach the north Delta intake screens while they are in full operation.

Intensive monitoring is necessary to detect of delta smelt impingement near these intakes and should be further described in the plan document.

Chapter 5, Appendix 5C-Flow, Passage, Salinity, Turbidity

- Appendix 5C. General Comment

The arrangement and sequence of hypothesized restoration projects that was used to model project effects on flows and other parameters are not presented. An evaluation of whether other restoration sequences would change the effects analysis is not provided.

- Section 5C.A.9

Particle tracking results should have included releases above the north Delta intakes. Particle tracking results presented in Section 5C.A.9 do not include the fate of particles released above the north Delta intakes. Although Figure C.A.-156 shows a DSM2 particle insertion location at Freeport, none of the figures in the section show results for particles released at Freeport, and the "ultimate fate lines" in Figure C.A-156 imply that Freeport was outside of particle tracking domain. The fate of Sacramento River particles is only illustrated for particles released at Sutter Slough, which is downstream of the north Delta intakes. Consequently, there is no way to evaluate the distribution of fates of particles as they approach the north Delta intakes. Particle releases above the north Delta intakes are also not presented in Section 5C.5.3 (Fish Passage, Movement, Migration); results presented in 5C.5.3 are based on flow (cfs) and not on particle tracking simulations.

Chapter 5: Attachment 5C.F. Nutrient Model Report and EIR Chapter 8 Water Quality

- Attachment 5C.F. General Comment

Simulated project effects on nutrient concentrations did not account for nutrient processes in restored tidal habitats. The DSM2/QUAL nutrient model used to simulate the effects of operations scenarios on nutrient concentrations treated future restored tidal wetland acreage within ROAs as fully mixed open reservoirs with no tidal influences and used data from subtidal channels (e.g., EMP monitoring locations in Delta channels) for model calibration and validation, not data from wetland habitats. How well the rate equations for non-conservative terms (nutrients, DO, chl.a) in the DSM2/QUAL model pertain to shallow, tidally influenced, emergent macrophyte dominated, brackish wetlands was not discussed in the report. Nutrient processes in shallow, tidal wetlands (or other aquatic habitats slated for creation) were not reviewed as part of the nutrient effects analysis.

Liberty Island was added to the DSM2 grid in 2010. Two other flooded islands (Mildred Island and Frank's Tract) are in the DSM2 grid. Mildred Island and Frank's Tract are not representative of the shallow, dendritic, tidal habitat that is proposed for creation within the DSM2 domain. Liberty Island is somewhat more representative of planned restoration habitat. However, the DSM2/QUAL model performed badly for Liberty Island. A limited amount of real nutrient data from Liberty Island (18 monthly grab samples for 4 locations) was compared to the model predictions for the Liberty Island grid. The DSM2/QUAL model under predicted measured NO3 and PO4 by approximately a factor of two. Algae were over predicted by the DSM2/QUAL model by almost an order of magnitude. The model's ability to predict future water quality in the Plan area, when restored tidal wetland habitat will be receiving, processing, and exchanging nutrients with subtidal channels, is unknowable. Consequently, the conclusions reached in EIR Chapter 8-Water Quality for DSM2/QUAL-simulated parameters are not supported by substantial evidence, and the EIR's analysis of these impacts must be revised and recirculated for public review and comment.

Chapter 5: Appendix 5.D. Contaminants

- Section 5.D.0 Executive Summary, Page 5.D-1

  The first sentence in the Executive Summary alleges that contaminants have been associated with the Pelagic Organism Decline (POD). In making this allegation, a number of references are cited as support for this statement. It is instructive to consider these references, one-by-one, to illustrate the lack of support for this allegation.

  - Baxter et al. (2010) is an IEP document that lists a whole host of possible factors that have been identified in connection with the POD. There is no definitive information in this reference that raises the role of contaminants in the POD above that of a loose working hypothesis.
  - Brooks et al. (2012) contains no definitive information that links contaminants to the POD. The article is a collection of information that poses questions and suggestions regarding the potential role of contaminants but provides no definitive analysis and reaches no supportable conclusions.
  - Johnson et al. (2010) directly and extensively examined the possible role of contaminants in the POD and found nothing to support such a conclusion. The report suggested the need for further monitoring and research to continue to examine this question.
  - Glibert (2010) is an article that alleged a specific linkage between contaminants (in particular, ammonia) and the POD based on CUSUM statistical analysis. The statistical approach was refuted and the associated conclusions reached in the paper were heavily

criticized by respected members of the Delta scientific community in a rebuttal article published by the same journal (Cloern et al. 2011)[10].

Glibert et al. (2011) is an article that advances the theory of ecological stoichiometry as a suggested working hypothesis for the Bay-Delta ecosystem. The hypothesis is untested. The paper itself acknowledges the need for significant additional research to validate the theories proposed in the paper. It is clearly not a definitive work establishing a link between contaminants and the POD. In summary, there is no citable source that establishes a direct or indirect linkage between the POD and water quality conditions in the Delta. As a result, the subject language should be eliminated.

- Section 5.D.0, Page 5.D-1

In the first paragraph, last sentence, it is implied that sublethal levels of contaminants in Delta fish have been observed to cause various effects, including impaired growth and reproduction and increased susceptibility to disease. The citation provided to support this statement (Werner et al, 2008) does not directly support this statement and does not demonstrate the existence of such conditions as a result of contaminant levels in the Delta. Instead the cited reference mentions these effects as potential issues and points to further research to assess their possible occurrence.

- Section 5.D.4.2. Selenium. General Comment

<u>Potential increases in selenium in the south Delta are downplayed.</u> Potential increases in selenium in the south Delta owing to an increase in the proportion of south Delta water coming from the San Joaquin River (up to a 24% increase in contribution of San Joaquin River water at least one modeled year) seemed to be too easily dismissed. Even if (as apparently modeled) the eventual downstream proportion of San Joaquin River water was very low (i.e., in Suisun Bay), the higher concentrations encountered in the south Delta provides an opportunity for selenium to be incorporated into phytoplankton and zooplankton before they are transported downstream to more dilute waters in the west Delta.

- Section 5D.4.2.1

<u>In Section 5D.4.2.1, clams are inappropriately characterized as a sink for selenium:</u>

> *"Elevated selenium concentrations also have been identified in Suisun Bay. Although particulate concentrations of selenium (the most bioavailable) in this region are considered low, typically between 0.5 and 1.5 micrograms per gram (µg/g), the bivalve Potamocorbula amurensis (overbite clam) contains elevated levels of selenium that range*

[10] Cloern, J.E., A.D. Jassby, AD., J. Carstensen, W.A. Bennett, W. Kimmerer, R. Mac Nally, D.H. Schoellhamer, and M. Winder (2012) Perils of correlating CUSUM-transformed variables to infer ecological relationships (Breton et al. 2006; Glibert 2010). Limnology and Oceanography, 57: 665 - 668

from 5 to 20 µg/g (Stewart et al. 2004). Given the fact that Potamocorbula may occur in abundances of up to 50,000 per m2, this area can be considered a sink for selenium because 95% of the biota in some areas are made up of this clam." (p. 5D.27, line 40)

Strictly speaking, clams cannot be considered a sink for selenium unless selenium-containing tissues are permanently buried in sediment. If they are consumed (e.g., by waterfowl or fish) or decompose, selenium is remobilized.

- Section 5.D.4.4. Ammonia/um

Section 5.D.4.4 presents an outdated and unbalanced view of the current state of knowledge about the potential role of ammonium in the Delta food web**.**

The description of scientific facts presented in this section is not a fair representation of the current understanding of ammonia's role in the Delta and Suisun Bay. The section also overstates the magnitude and certainty of postulated effects of reduced ammonia loadings by including only a portion of the scientific literature on this topic. As explained in our more detailed comments on Section 3.5.1., one of the most comprehensive scientific reviews of ammonia's role in the estuary, completed by the San Francisco Estuary Institute (SFEI)[11], was not summarized or even cited in the Plan, but was publicly available in draft form during the development of the BDCP public review documents. The SFEI report identifies significant deficiencies in the experimental approaches used to date by the proponents of the ammonium inhibition hypothesis which prevent conclusions regarding the ecological significance of ammonium/nitrate interactions in the Bay-Delta. As also explained in detail in our comments on Section 3.5.1, an expert panel convened by the Delta Science Program similarly identified insufficiencies in the experimental evidence linking ammonium with low phytoplankton production and proposes alternative explanations for observed patterns in phytoplankton biomass and productivity, and changes in phytoplankton community composition. Other key omissions and sources of bias in the Plan's characterization of the role of ammonium are outlined in our more detailed comments above for Section 3.5.1.

- Section 5.D.4.4. Ammonia/um

The Plan is misleading when it cites a pilot toxicity study conducted by Teh and others:

> *"A recent study indicated that biota can be affected at concentrations as low as 0.38 mg/L of total ammonia nitrogen, based on a study of Delta copepods by Teh and coauthors (2011)."* (p. 5.D-40, line 4)

Teh et al. (2011) is a report to the Central Valley Regional Water Quality Control Board that has not been peer reviewed and contains extremely deficient methods descriptions. The chronic

[11] Available at http://www.sfei.org/sites/default/files/SuisunSynthesisI_Final_March2014_0.pdf

toxicity test endpoints (NOEC, LOEC; 0.38 mg/L total ammonia) reported by Teh et al. for the single copepod species *Pseudodiaptomus forbesi* were not reproducible when the raw data provided in report appendices were analyzed using standard statistical software designed for aquatic toxicity data (CETIS) (Pacific EcoRisk 2011)[12]; the correct toxicity thresholds may be more than twice as high as those reported in Teh et al. Several other issues regarding use of the data are raised in the Pacific EcoRisk critique, including the possibility that toxicity test data was tabulated improperly before statistical analysis.

- Section 5.D.4.4.2 Ammonia/um-Effects of Covered Activities

The Plan erroneously concludes that restoration activities will not result in the addition or mobilization of ammonia to the aquatic system. BDCP relies on a simplistic analysis of water operations' effects on dilution of SRWTP effluent to conclude that the project will not influence ammonia concentrations in the Plan area. The authors neglected to conduct even a cursory review of the pertinent scientific literature:

> *"Restoration conservation measures are not expected to significantly affect distribution or levels of ammonia/um in the Delta. Nitrogen is associated with fertilizers, which are used heavily throughout the Delta. However, WWTPs have been identified as the primary sources of ammonia, contributing. 90% of the ammonia load to the Sacramento River. Thus, restoration of cultivated lands to marsh and floodplain is not expected to significantly affect ammonia concentrations"* (p. 5.D-43, line 8)

It is absolutely incorrect to assume that restoration activities will have no influence on ammonia conditions in the estuary. Literature indicates that after rewetting or hydrologic reconnection, fluxes of soluble reactive phosphorus and ammonia from sediment can be very high in restored wetlands and floodplains (especially in summer), while nitrate in source waters may be consumed by denitrification in restored wetlands (Duff et al. 2009; Kreiling et al. 2013; Surridge et al. 2012)[13]. Although the measurements were not made in restored habitat, Cornwell et al.

[12] Pacific EcoRisk, Inc. 2011. A Critical Review of: Full Life-Cycle Bioassay Approach to Assess Chronic Exposure of *Pseudodiaptomus forbesi* to Ammonia/Ammonium - Final Report Dated August 31, 2011. Prepared for Larry Walker Associates and Central Contra Costa Sanitary District.

[13] Duff, J.H., K.D. Carpenter, D.T. Snyder, K.K. Lee, R.J. Avanzino, and F.J. Triska. 2009. Phosphorus and nitrogen legacy in a restoration wetland, Upper Klamath Lake, Orgeon. Wetlands, 29:735-746.

Kreiling, R.M.B., J.P. Schubauer, J. P., W.B. Richardson, et. al. (2013). Wetland management reduces sediment and nutrient loading to the upper Mississippi river. J. Environ. Quality, 42:573-83.

Surridge, B.W.J., A. L. Heathewaite, and A.J. Baird. 2012. Phosphorus mobilisation and transport within a long-restored floodplain wetland. Ecol. Engin. 44: 348– 359.

(2014)[14] reported positive net fluxes of inorganic dissolved nitrogen out of sediment cores taken in September 2012 at shallow (<3 m) sites in the Delta and Suisun Bay/Marsh, and from several (but not all) cores taken in March 2012. Denitrification caused net consumption of nitrate by sediments from Delta cores in both seasons.

Chapter 5: Appendix 5E. Habitat Restoration

- Appendix 5E. General Comment.

  Required physical characteristics of restored habitat needed for correct biological functioning are not identified in transparent fashion or with rigor or specificity.[15] In Section 5F.3.1.3 (Appendix 5.F Biological Stressors) a draft "recipe" for defining Egeria habitat is provided (less than 3 meters deep, salinity below 8-10 ppt, and maximum water velocity less than 1.61 fps). Similar specificity for suites of attributes needed to discourage stressors or encourage desired biota is not provided for any of the restored habitat types. The public is not given any means to gauge whether the BDCP has valid approaches for building correctly functioning restored sites.

- Appendix 5E. General Comment.

  The implications of sequencing of restoration activities are not evaluated. Other than general goals (total acreage in ROAs, Conservation Zones, or "Complexes", divided ELT or LLT) no explanation of the planned sequence and locations of restoration activities, are provided, and no criteria for setting priorities or sequencing is discussed. No evaluation is provided for how the sequencing of restoration projects could affect tidal prism, salinity, and other physical attributes within the project area. Appropriately, a large amount of attention in Appendix 5E is paid to current land elevation and the future bathymetry and areal extent of restored aquatic habitat. Missing from the Plan documents is information about how the redistribution of tidal prism will affect opportunities for restoration, and no information is provided in the appendix to explain how the hydrologic models used to evaluate the scale of restoration possible in various ROAs accounted for tidal prism as an overall resource. For example, the Plan should explain that (1) per a given sea level, the total tidal prism available for redistribution within the Plan Area is finite, (2) how the chronology of restoration activities (affected by many non-scientific factors such as funding, property acquisition, legal challenges, etc.) will influence which ROAs "use up" available tidal prism first, and (3) how these factors are accounted for in the time-horizons for the project (ELT, LLT). Tidal prism is mostly discussed in the appendix as a variable that will increase with sea level rise – but within each time frame, restoration activities will take place using a limited amount of tidal prism.

[14] Cornwell, J. C, P. M. Glibert, and M. S. Owens. 2014. Nutrient fluxes from sediments in the San Francisco Bay Delta. *Est. Coasts*. DOI 10.1007/s12237-013-9755-4

[15]

- Appendix 5E. General Comment.

Available science regarding the potential for restored wetlands and floodplains to serve as a net sink or source of nutrients to adjacent water bodies is not reviewed in the Plan documents. BDCP's premise that export of nutrients from restored wetlands provides an ecological benefit in adjacent waters is not justified. None of the (vast) scientific literature addressing biogeochemical processes in tidal habitat or non-tidal wetlands is reviewed in the Plan. There is no acknowledgement of wetland biogeochemistry in EIR Chapter 8 – Water Quality. Whether the rate equations for non-conservative terms (e.g., nutrients, DO, chl.a) in the DSM2/QUAL model apply to shallow, tidally influenced, emergent macrophyte dominated, brackish water bodies was not discussed in Attachment 5C.F. - Nutrient Model Report.

The numerous excerpts listed above in the general comments for Chapter 5 reveal an abundantly apparent premise in the Plan that export of nutrients out of restored wetlands serves as an ecological benefit in adjacent waters. This premise is not necessarily justified for at least two reasons.

1) The Bay/Delta is customarily referred to as a high-nutrient/low productivity system, and academic debate has ensued to explain why primary and secondary productivity in the Bay/Delta is not as high as might be expected given its nutrient characteristics. At least two of the factors suspected of causing a muted response to high nutrients in Bay/Delta (clam grazing and turbidity) are not directly addressed by BDCP conservation measures. BDCP "finessing" of X2 location will likely result in tradeoffs between recruitment and establishment of *Corbicula* and *Potamocorbula* in the western Delta, but not the exclusion of clams *per se* from critical habitat. One of the goals of CM 13 (Invasive Aquatic Vegetation Control) is an increase in turbidity (to support pelagic fish feeding and predator avoidance). It is not clear why the BDCP assumes that nutrients delivered to subtidal habitat from restored habitat will not be subject to existing constraints as fuel for primary of secondary production.

2) Literature indicates that after rewetting or hydrologic reconnection, fluxes of soluble reactive phosphorus and ammonia from sediment can be very high in restored wetlands and floodplains (especially in summer), while nitrate in source waters may be consumed by denitrification in restored wetlands (Duff et al. 2009; Kreiling et al. 2013; Surridge et al. 2012)[16]. Enhanced mobility of phosphorus in restored wetlands

[16] Duff, J.H., K.D. Carpenter, D.T. Snyder, K.K. Lee, R.J. Avanzino, and F.J. Triska. 2009. Phosphorus and nitrogen legacy in a restoration wetland, Upper Klamath Lake, Orgeon. Wetlands, 29:735-746.

Kreiling, R.M.B., J.P. Schubauer, J. P., W.B. Richardson, et. al. (2013). Wetland management reduces sediment and nutrient loading to the upper Mississippi river. J. Environ. Quality, 42:573-83.

Surridge, B.W.J., A. L. Heathewaite, and A.J. Baird. 2012. Phosphorus mobilisation and transport within a long-restored floodplain wetland. Ecol. Engin. 44: 348– 359.

and floodplains is currently being studied in the context of its potential to contribute to eutrophication in adjacent rivers and streams, and is potentially regarded as a drawback of habitat restoration (Kuwabara 2012, Loeb et al. 2008; Banach et al. 2009)[17]. The geologic nature of the re-submerged substrate (peat, previously fertilized soil, etc) and the availability of iron oxides will influence the potential for prolonged soluble phosphorus mobilization from restored wetlands.

Section 5.E.4. CM4 Tidal Natural Communities Restoration

- Section 5.E.4. General Comment.

  The discussion of phytoplankton production in restored habitat dodges the hard truth that clam colonization may cause restored habitat to be (at least locally) a net detriment to food supplies for pelagic fish species. Although Section 5.E.4 (starting on p. 5.E-145) provides a greater acknowledgement of impact of clam grazing in shallow Delta habitat than did past drafts of the Plan, it still neglects to be clear that when clams are present in shallow habitat, net primary production is likely to be negative (not just null). As explained in the study that BDCP relies on to make its optimistic case for productivity (Lopez et al. 2006)[18], this means that the clams at a restored site can consume all of the phytoplankton locally produced **plus** phytoplankton transported to the site from adjacent habitats. The implications of this phenomenon for BDCP are profound. The implications are that if restored habitat becomes colonized by clams, the habitat may not only fail to produce phytoplankton for local consumers – it may also consume phytoplankton produced in adjacent channel habitat that is tidally connected to it. In other words, restored habitat may end up being a net detriment to pelagic fish, as far as food subsidies are concerned.

- Table 5.E.4-39

  The tabulated summary of productivity benefits in restored habitat is misleading. The hypothesized productivity benefits of restored tidal habitat are summarized in Table 5.E.4-39 (p. 5.E-149). The table is misleading because it doesn't contrast proposed benefits with reasonably

[17] Banach, A.M., K. Banach, K., R.C.J.H. Peters, R.H.M. Jansen, E.J.W. Visser, Z. Stpeniewska, J.G.M. Roelofs, and L.P.M. Lamers. 2009. Effects of long-term flooding on biogeochemistry and vegetation development in floodplains; a mesocosm experiment to study interacting effects of land use and water quality. Biogoesciences 6: 1325–1339.

Loeb, R., L.P.M. Lamers, and J.G.M. Roelofs. 2008. Prediction of phosphorus mobilsation in inundated floodplain soils. Environ. Pollut. 156: 325-331.

Kuwabara, J.S., B.R. Topping, J.L. Carter, T.M. Wood, J.M. Cameron, J.R. Asbill-Case, and R.A. Carlson. 2012. Changes in benthic nutrient sources within a wetland after hydrologic reconnection. Env. Toxic. Chem. 31: 1995-2013.

[18] Lopez, C.B., J.E. Cloern, T.S. Schraga, A.J. Little, L.V. Lucas, J.K. Thompson, and J.R. Burau. 2006. Ecological values of shallowwater habitats: implications for the restoration of disturbed ecosystems. Ecosystems 9: 422–440.

hypothesized *detriments* of restoration for the food web. Although the ability of clams to clear the water column of phytoplankton is discussed in the associated text, in the end, clam grazing and other productivity sinks are not used to produce an honest range of expectations for productivity in restored habitat. Although less commonly referenced in discussions about sinks for Delta primary productivity, zooplankton grazing is a significant sink in addition to clam grazing. Recent analysis of long-term data by Kimmerer and Thompson (2014) revealed that combined grazing by clams and zooplankton has almost continuously exceeded primary production in the low salinity zone since 1987, both shoals and deeper channels can serve as net sinks for phytoplankton.

Kimmerer and Thompson summed up prospects for habitat restoration to deliver foodweb benefits for pelagic fish, as follows:

> *"The state of California is planning a substantial investment in restoration of marshes and shoals to provide physical habitat and to enhance production of planktonic food for the endangered delta smelt and other pelagic fishes (http:// baydeltaconservationplan.com/). If the accumulation of phytoplankton biomass is controlled principally by grazing, as our results indicate, such restoration may have little influence on the pelagic foodweb and the recovery of these fishes (Lopez et al. 2006).*" (Kimmerer and Thompson 2014)

The findings of the Kimmerer and Thompson study constitute significant new information indicating that the BDCP and EIR/EIS's assumptions about the effects of habitat restoration are either baseless, or, at best, significantly overly optimistic. To accurately assess the potential effect of the BDCP the worst-case scenarios regarding phytoplankton productivity in restored habitat (i.e., no benefit or actual detriment), which are based on recent scientific evidence (as opposed to the purported benefits, which are merely speculative and not based on any evidence in the record) must be presented in the Plan and clearly acknowledged and accounted for in the EIR/EIS, at a minimum as part of a spectrum of outcomes given the acknowledged large uncertainty of restoration outcomes regarding food web support for covered fish. The worst-case scenarios, which are evidence-based, should be included in a column in Table 5.E.4-39 adjacent to the (entirely theoretical) benefits.

- Section 5.E.4. General Comment.

Postulated export of food web organisms from restored habitat to adjacent pelagic habitat is highly exaggerated. In June 2013 a symposium ("Tidal Marshes and Native Fishes in the Delta: Will Restoration Make a Difference?") was held at UC Davis to evaluate, among other things, the ecological functions assigned to tidal marsh restoration by the Ecosystem Restoration Program (ERP). Consensus conclusions from the symposium were recently published as an article in San

Francisco Estuary and Watershed Science[19]. Authors concluded that the likelihood that restored tidal habitat will export meaningful amounts of pelagic fish food (zooplankton) to adjacent channel habitat is low, as follows:

> *"Movement of plankton from a tidal marsh (beyond the immediate area of tidal exchange) is likely to be limited and to decrease strongly with distance. Even under ideal circumstances, plankton in water discharged from tidal marsh cannot greatly affect the standing crop of plankton in large, deep channels. Feeding by clams and other introduced species can further reduce contributions of marsh plankton to open-water foodwebs."* (Herbold et al. 2014, p. 2)
>
> *"Restored tidal wetlands are unlikely to have much effect on food webs in the upper estuary's open waters. The shallow depth and small volume of water on tidal wetlands compared to the vast volume of open water in Delta channels and Suisun Bay means that flux of wetland phytoplankton and zooplankton would be inconsequential to pelagic food webs. We are unaware of reports from the worldwide literature in which substantial quantities of zooplankton are exported from marshes to open waters, whereas several studies show net import of zooplankton to fish consumption on site."* (Herbold et al. 2014, p.4)

- Section 5.E.4.4.1.1. Habitat Suitability Analysis

<u>Projected timelines for Habitat Suitability Indices imply that there are few expected benefits of restoration until the end of the permit term.</u> Starting on p. 5.E-97, timelines for HU (habitat units) and Habitat Suitability Indices (HSIs) are provided for ROAs for pertinent fish species and life stages. These graphs show that HSIs for most ROAs are not expected to diverge from current conditions (EBC2) until the 50-year mark (ESO_LLT). In many cases, habitat suitability in various ROAs is not predicted to change at all during the 50-year permit term. In many cases, the HSI for early life stages is predicted to *decline* by the LLT. Although the analysis reveals greater extent of habitat by the LLT, the quality of the habitat may not improve for sensitive life stages. This implies that there are few expected benefits of restoration until the end of the permit term, and some detriments that would not show up until the 50-year mark. If true, what are the implications for adaptive management? Is there an implicit assumption of BDCP that we will need to wait until 50 years have passed to find out if restoration is providing suitable habitat for covered fish?

[19] Herbold, B., D.M. Baltz, L. Brown, R. Grossinger, W. Kimmerer, P. Lehman, P.B. Moyle, M. Nobriga, and C.A. Simenstad. 2014. The role of tidal marsh restoration in fish management in the San Francisco Estuary. San Fran. Estuar. Watersh. Sci. March 2014.

- Section 5.E.4.4.1.1. Habitat Suitability Analysis

  The expected future decline in turbidity due to depletion of upstream sediment supply was not factored into the Habitat Suitability Indices. As a result of this omission, HSIs for future periods are inflated for Delta and longfin smelt, which require turbid water for successful feeding behavior.

  > *"The analysis did not model turbidity over the implementation period because of a lack of tools to project turbidity changes. As a result, it was assumed that turbidity would remain constant between scenarios. However, there is reason to believe that turbidity may decrease in the future because of changes in sediment input and retention in the Delta (unrelated to the BDCP) (Schoellhamer 2011), which would decrease the HSI values derived in this analysis."* (p. 5E-15, line 8)

The EIR/EIS states that it incorporates the Effects Analysis. The failure to account for the future decline in turbidity due to the depletion of upstream sediment supply is a fatal flaw in the HSIs and the Effects Analysis, and undermines the accuracy and reliability of the EIR/EIS's analysis of BDCP impacts to Delta and longfin smelt. The EIR/EIS must be revised to clearly address the effects of a BDCP-related future decline in turbidity on Delta and longfin smelt, including any feasible mitigation, and recirculated for public review and comment.

Chapter 5, Appendix 5F – Biological Stressors on Covered Fish

- Section 5.F.6.4 Invasive Mollusks –Uncertainties and Research Needs

  The hypothesized relationship between clams and nutrients (and nutrient stoichiometry) referenced in the text does not recognize top-down phenomena.

  > *"The role of nutrients in facilitating Potamocorbula invasion also has been hypothesized (Glibert et al. 2011), but the mechanism of the potential relationship is unknown. Further research on Potamocorbula responses to different nutrient variables is warranted. Nutrient variables could include concentrations, forms (e.g., ammonium, inorganic and organic phosphorus), and ratios (DIN:P). Potamocorbula response variables of interest could include metabolism (filtering and consumption rates, e.g., Paganini et al. 2010), larval recruitment success, and comparison of distribution patterns with nutrient measurements in the field."* (p. 5F-124, line 17*)*

  The stoichiometry hypothesis of Glibert et al. proposes that clam distributions are influenced by water column nutrient conditions. However, evaluators of relationships between nutrients and clam occurrence/abundance must consider both "sides of the coin." Unacknowledged by BDCP are the myriad ways in which clam colonies can exert a top-down influence on N and P in the water column, and on nutrient cycling between sediments and water, independent of external loadings. Examples of processes mediated by clams that could affect water column nutrients are:

  - sequestration of N and P in clam (short term in soft tissues, long term in shells);
  - excretion of N by clams;
  - alteration of the ratio of N and P released from bottom sediments (such as induced by bioturbation, which affects the redox potential and chemical composition of pore water).

- Section 5.F.7 Microcystis. General Comment

  The Plan does not acknowledge that other species of hazardous phytoplankton occur in the Delta, and that they have different nutrient requirements than *Microcystis*. In 2010, *Aphanizomenon flos-aquae* was the most abundant toxin-producing cyanobacterium in the Bay/Delta (Mioni et al. 2012). *Anabaena* spp., which also produce toxins, are also reported from the Delta.[20]. Both types of cyanobacteria are "nitrogen-fixers" (capable of using atmospheric nitrogen as their nitrogen source instead of compounds like ammonium and nitrate) and therefore do not rely on dissolved inorganic nitrogen supplies to fuel growth. Microcystis does not fix nitrogen. In fact, the competitive advantage of nuisance species of nitrogen-fixing cyanobacteria (e.g., *Aphanizomenon* and *Anabaena*) can increase in estuaries when N:P ratios are reduced if overall nutrient supplies are decreased and if seed populations are present (Piehler et al. 2002),[21] meaning that they may benefit from decreasing nitrogen loads in the Delta.

- Page 5.F-iv, line 2

  No evidence is provided that the adaptive management team will be able to provide any substantial changes in water export operation that would offer fish greater protection from mortality at these intakes if survival rates fall below 95%. Developing alternate performance measures, monitoring, and research studies after the diversions are created and in operation will not reduce their impact on fish mortality.

  It is good to know that invasive aquatic vegetation and predatory fish could be removed from restoration zones to protect emigrating salmon, but these activities need to have their methods further detailed in the BDCP, with a clear criteria provided to explain the conditions that would trigger implementation, an implementation strategic plan, and an implementation schedule.

- Page 5.F-84, line 25

  Predator removal practices can only offer very temporary solutions at specific locations. It is very unlikely that predator removal programs will be able to remove 100% of the predators

[20] *Anabaena* has been observed in IEP phytoplankton monitoring in the upper SFE.

[21] Piehler, M. F., J. Dyble, P.H. Moisander, J. L. Pinckney, and H. W. Paerl. 2002. Effects of modified nutrient concentrations and ratios of the structure and function of the native phytoplankton community in the Neuse River Estuary, North Carolina, USA. Aquatic Ecology 36:371-385.

occupying an area, so the expected removal efficiency should be provided. As discussed on **Page 5.F-84, line 25**, predator removal practices can injure or stress protected fishes and may decrease their overall survival likelihood downstream of the diversion area.

If biweekly predator reduction programs are conducted at the three proposed north Delta intakes, or existing water intake facilities in the south Delta, they should be funded by the water export operation funding and not by funds supporting the system-wide conservation strategies.

- Page 5.F-113, line 1

> *"There is also evidence of a strong long-term positive relationship between pH and Potamocorbula abundance, and Potamocorbula's pelagic larval stage appears to exhibit accelerated rates of calcification in summer when temperature and pH are elevated (Glibert 2010; Glibert et al. 2011). These adaptations may allow Potamocorbula to outcompete other species during droughts or under dry conditions (Glibert 2010; Glibert et al. 2011), and when discharge of ammonia and ammonium from wastewater treatment plants results in ammonium toxicity for other species (Ballard et al. 2009)."*

The Ballard et al. 2009 reference does not provide any evidence that ammonium from wastewater treatment plants results in ammonium toxicity to any aquatic species during drought or dry conditions, or at any other time. The Ballard et al. 2009 citation is incorrect and must be removed.

Chapter 6: Plan Implementation

- Section 6.4 Regulatory Assurances, Changed Circumstances, and Unforeseen Circumstances: General Comment

The very nature of the permits to be granted under the BDCP underscores the importance of long-term, substantive input of Delta region stakeholders into the future implementation of the BDCP itself. Indeed, the permits to be issued by the federal and state agencies to those in the Authorized Entity Group will last for 50 years. Further, under the "No Surprises Rule,"[22] the permittees cannot be held responsible for continued species decline. According to the No Surprises Rule: "Once an HCP permit has been issued and its terms and conditions are being fully complied with, the permittee may remain secure regarding the agreed upon cost of conservation and mitigation. If the status of a species addressed under an HCP unexpectedly worsens because of unforeseen circumstances, the primary obligation for implementing additional conservation measures would be the responsibility of the Federal government, other government agencies, and other non-Federal landowners who have not yet developed an HCP." (63 FedReg 8867)

[22] 50 C.F.R. § 17.22(b)(5). A similar "no surprises rule" is provided under California's NCCPA. *See*, Fish & Game Code Section 2820(f)(2).

As a result, the process of "who" and "how" changed circumstances are identified, as well as what future "adaptive management" actions should be taken to address them, is vitally important to interests located, living, or working ***in*** the Delta region. Further, what is deemed to be "unforeseen circumstances" is equally important to Delta stakeholders because, under the "No Surprises Rule," responsibility for addressing future Delta decline due to "unforeseen circumstances" will likely fall on those Delta stakeholders, or the People of the State of California.

- Section 6.4.2.1: Process to Identify Changed Circumstances.

Under the BDCP, the Implementation Office or the Permit Oversight Group "may identify the onset of a changed circumstance, using information obtained from system-wide or effectiveness monitoring, scientific study, or information provided by other sources." (BDCP, Ch. 6, page 6-31, lines 24-25) Glaringly absent from this process of identifying "changed circumstances" which, in turn, requires the Authorized Entities Group to make changes to applicable Conservation Measures identified in the BDCP is any substantive role for the State Water Resources Control Board and the Delta Watermaster. Each of these independent state agency/offices have very important and discreet roles with regard to policies, regulations, permits, and other actions affecting the Delta, and they should both be given more substantive roles during the 50-year, "No Surprises" permit that the Authorized Entity Group will receive.

- Section 6.4.2.2: Changed Circumstances Related to the BDCP.

This section summarizes nine identified categories of "changed circumstances related to the BDCP", including: levee failures, flooding, new species listing, drought, wildfire, toxic or hazardous spills, nonnative invasive species or disease, climate change, and vandalism. (BDCP, Sec. 6.4.2.2, pages 6-32 through 6-45.) Specifically absent from these nine "anticipated" changed circumstances are non-ESA and CESA regulatory changes, changes to the "Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary" (Bay-Delta Plan), and even water availability decline, except as superficially treated in the "Drought" section.

It is erroneous to suggest – as the BDCP does – that changes to the Bay-Delta Plan by the State Water Board is not "reasonably anticipated" by the Authorized Entity Group and the Permit Oversight Group. Indeed, the State Water Board has been working on planned amendments to the Bay-Delta Plan for at least the past eight years to address various issues and known stressors to the Delta ecosystem. According to the State Water Board website, "The State Water Board is in the process of developing and implementing updates to the Bay-Delta Water Quality Control Plan (Bay-Delta Plan) and flow objectives for priority tributaries to the Delta to protect beneficial uses in the Bay-Delta watershed. Phase 1 of this work involves updating San Joaquin River flow and southern Delta water quality requirements included in the Bay-Delta Plan. Phase 2 involves other comprehensive changes to the Bay-Delta Plan to protect beneficial uses not addressed in Phase 1. Phase 3 involves changes to water rights and other measures to implement changes to the Bay-

Delta Plan from Phases 1 and 2. Phase 4 involves developing and implementing flow objectives for priority Delta tributaries outside of the Bay-Delta Plan updates."[23]

Many dozens of entities that are members of the State Water Contractors or the Federal Water Contractors (and thus part of the Authorized Entities under BDCP) have participated in or been represented at public workshops, hearings, and State Water Board meetings regarding various elements of the Bay-Delta Plan revisions. They, more than most, are intimately aware of the work that the State Water Board is doing on the Bay-Delta Plan revisions, and these parties and BDCP proponents should be able to reasonably anticipate changes that will likely affect salinity limits, flow standards, and potential water rights changes.

- Section 6.4.3. Unforeseen Circumstances

"Unforeseen circumstances" are defined in the BDCP as "those changes in circumstances that affect a species or geographic area covered by an HCP that could not reasonably have been anticipated by the plan participants during the development of the conservation plan, and that result in a substantial and adverse change in the status of a covered species." (BDCP, Sec. 6.4.3, page 6-45, lines 15-22.) The significance of whether changed circumstances affecting Delta species or the geographic area covered by the BDCP are deemed to be "unforeseen" is that the Permit Oversight Group "may not require the commitment of additional land or financial compensation, or additional restrictions on the use of land, water, or other natural resources other than those agreed to in the plan, unless the Authorized Entities consent." (BDCP, Ch. 6.4.3, page 6-45, lines 20-22.) Stated alternatively, if any "unforeseen circumstances" arise and require additional commitments of land or water to enhance species survival, none of the Authorized Entities would be required to pay for it. As such, individuals and entities located, living or working ***in*** the Delta will likely be in the position of having their interests affected.

- Section 6.4.4. BDCP Relationship to Significant Future Projects or Government Regulations.

Section 6.4.4 acknowledges that the State Water Board is developing new Delta flow standards which will likely affect the Delta, but then inappropriately concludes that such action "may affect the conservation strategy [of the BDCP] in ways that cannot be predicted." (BDCP, Sec. 6.4.4, page 6-46, lines 21-25.) Given all of the various models run on expected salinity levels, mercury loading, temperature variation, selenium loading and expected climate change impacts to BDCP Conservation Measures, it seems dubious to conclude that impacts associated with anticipated Delta flow standards "cannot be predicted." The Authorized Entities are certainly aware of the State Water Board's August 3, 2010 report, "Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem," wherein various potential ***reductions*** in allowable water exports from the Delta were analyzed and recommended.[24] Whether or not that report represents a future condition

[23] http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/

[24] http://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/deltaflow/docs/final_rpt080310.pdf

that is likely, the BDCP could easily include various modeling scenarios to account for reduced water exports equal to 20, 30, 40 or 50 percent, and develop appropriate Conservation Measures to account for these potentialities.

- Section 6.5. Changes to the Plan or Permits

Section 6.5 describes the processes that are to be followed to change the BDCP or permits issued thereunder. These changes are referred to as "administrative changes," "minor modifications or revisions," and "formal amendments" to the BDCP. "Minor modifications or revisions" are further defined to include, without limitation, "Adaptive management changes to conservation measures or biological objectives, including actions to avoid, minimize, and mitigate impacts, or modifications to habitat management strategies developed through and consistent with the adaptive management and monitoring program described in Chapter 3, Conservation Strategy." (BDCP, Sec. 6.5.2, page 6-49, lines 8-11.) Read in conjunction with Section 3.6, relative to changing Conservation Measures or biological objectives under the adaptive management process, it is clear that the Authorized Entities do not intend to submit substantive BDCP changes to the Delta Stewardship Council for Delta Plan concurrence.

Under the Sacramento-San Joaquin Delta Reform Act of 2009,[25] the Legislature created the Delta Stewardship Council,[26] an independent agency of the state charged with developing an over-arching "Delta Plan" to implement the "co-equal goals" of providing a more reliable water supply for California and protecting, restoring, and enhancing the Delta ecosystem.[27] The 2009 Delta Legislation envisioned a significant role for the Delta Stewardship Council as the BDCP was being developed and during its implementation. In fact, the 2009 Delta Legislation provides that the BDCP can be "considered" for inclusion within the Delta Plan, but specifically *prohibits* inclusion of the BDCP into the Delta Plan unless the Council finds that the BDCP meets nine, legislatively-established conditions. Some of these conditions relate to obligations under the Natural Community Conservation Planning Act, which in turn, include the development and implementation of Conservation Measures intended to restore the imperiled Delta ecosystem.

However, there is no provision within BDCP that requires any substantive changes to the Plan to be re-submitted to the Delta Stewardship Council for confirmation that it is consistent with the Delta Plan, and thereafter re-incorporated within the Delta Plan.

<u>Chapter 7: Implementation Structure</u>

[25] Water Code Section 85000, *et seq.*

[26] Water Code Section 85200.

[27] Water Code Section 85054.

- Chapter 7. General Comment

The overall structure and approach laid out in the BDCP is that virtually all of the governance and implementation authority remains in the control of the State and Federal Water Contractors. The Adaptive Management Team is dominated by Water Contractors, with no representation of Delta interests. Further, neither the Adaptive Management Team, nor any other decision-making entity within the BDCP "Implementation Office" includes representation from the State Water Board.

Given that the SWRCB retains independent statutory authority to establish both standards as well as permit terms that will govern future exports of water via the BDCP-enabled tunnel system, it seems both curious and short-sighted to exclude SWRCB representation on the Adaptive Management Team. Further, because the Delta Watermaster is charged under the 2009 Delta Legislation with enforcing permit terms adopted by the SWRCB, it seems appropriate that the Delta Watermaster also be included in the Adaptive Management Team.

Chapter 8: Implementation Costs & Funding Sources

- Chapter 8. General Comment

The federal and state Endangered Species Acts require that a habitat conservation plan contain specific information to ensure adequate funding to carry out all aspects of the HCP.[28] Case law interpreting the Federal Endangered Species Act on the need for ensuring adequate HCP funding has further held that the permit "applicant cannot rely on speculative future actions of others."[29] Yet, the BDCP ***specifically*** refers to and relies upon putative funding derived from a Water Bond that has yet to be placed before the voters, let alone actually passed. This does not satisfy the requirements of the federal and state Endangered Species Acts. Moreover, the Delta Reform Act of 2009 specifically provides that proponents of a new Delta water conveyance facility must pay to mitigate all impacts associated with the construction, operation, and maintenance of such facility.[30] We have found no information in either the BDCP or the supporting EIS/EIR which indicates that the BDCP has analyzed potential impacts of the Delta conveyance facility on the Sacramento Regional Wastewater Treatment Plant at Freeport. With anticipated BDCP water intake facilities located within several miles of the SRWTP discharge point, there will likely be any number of impacts on the future operation and permitting of the SRWTP caused by the BDCP.

[28] *See*, 16 U.S.C. § § 1539(a)(2)(A)(ii) and 1539(a)(2)(B)(iii); California Fish & Game Code § 2820(a)(10). *See also*, *Nat'l Wildlife Federation v. Babbit,* 128 F.Supp.2d 1274 (E.D. Cal., 2000); *Southwest Center for Biological Diversity v. Bartel,* 470 F.Supp.2d 1118 (S.D. Cal., 2006).

[29] *Southwest Center for Biological Diversity v. Bartel*, *supra*, 470 F.Supp.2d 1118, 1155, *citing*, *Nat'l Wildlife Federation v. Babbit, supra*, 128 F.Supp. 2d 1274, 1294-95.

[30] Water Code Section 85089(a).

- Section 8.3. Funding Sources. According to this section, the BDCP will rely on three, primary, sources of funding for all aspects of the Plan: (1) federal government funding; (2) state government funding (including putative funding provided by future water bonds to be placed before the California voters); and (3) the State and Federal Water Contractors (including, for purposes of municipal water supply districts, individual ratepayers). Yet, the BDCP contains no financing plan and no legal assurances that any of the funds "expected" will actually materialize. An analysis of the sources of funds reveals that it cannot meet the "speculative future actions" test of ensuring HCP funding.

  According to Table 8-37 (BDCP, Ch. 8, page 8-65-66), the BDCP expects to receive $3.5 billion from the federal government, derived from various appropriations. However, the BDCP acknowledges that "additional federal legislation will be required to authorize the continued use of certain federal funds and to extend or broaden fund availability." (BDCP, Sec. 8.3.1, page 8-64, lines 16-18.) In terms of securing funding for BDCP implementation, it is speculative to rely on future acts of Congress to make-up what is expected to be approximately 14% of the entire BDCP budget.

  Regarding the sources of state government funds for BDCP implementation, Table 8-37 indicates that Plan proponents expect approximately $4.1 billion to come from the State of California, which accounts for approximately 17% of the entire BDCP budget. Section 8.3.5 of the BDCP provides, "Funds derived from the issuance of [the 2009 Water Bond] would be used, in part, to satisfy the State's financial commitments to the BDCP." (BDCP, Sec. 8.3.5.1, page 8-84, lines 9-11.) According to the capital cost estimates for the entire BDCP project, the Authorized Entities are relying on the not-yet passed Water Bond for approximately 10% of the entire BDCP budget.[31] Furthermore, Table 8-37 indicates that BDCP proponents assume the passage of a "Second Water Bond" at some, unstated, time in the future that will provide an ***additional*** $2.2 billion dollars to fund BDCP actions.[32] All totaled, the BDCP proponents expect the voters of California to pass future water bonds in the amount of $3.75 billion to fund BDCP actions – an amount approximately equal to 25% of the entire BDCP budget.

  The remaining BDCP budget ($17 billion) is expected to be funded by the State and Federal Water Contractors, according to Table 8-37. Yet a review of Section 8.3.4.4 reveals that even this source of funds is speculative. According to that section, "[t]he most credible assurances of funding from the participating state and federal water contractors result from an economic benefits analysis…" and two primary conclusions derived from the economic analysis that: (1) the costs are affordable by the ratepayers, and (2) the benefits to be gained from the BDCP exceed the total cost. (BDCP, Sec. 8.3.4.4, page 8-81, lines 5-22.) What is missing from these "assurances" is any discussion of whether the State and Federal Water Contractors and their ratepayers would be willing to pay additional

[31] *See*, Table 8-35 (Ch. 8, page 8-63) and Table 8-46 (Ch. 8, page 8-85).

[32] BDCP proponents expect this "Second Water Bond" to be passed by the voters of California approximately 15 years into the permit term. (BDCP, Sec. 8.3.5.1, page 8-85, lines 3-6.)

billions of dollars in the event that state water bond funding and/or federal appropriations do not materialize. Moreover, the analysis fails to assess the potential impacts of one (or more) State or Federal Water Contractors, or their member agencies, withdraw or refuse to continue to participate in the Plan. Finally, the BDCP analysis speculatively assumes benefits based on expected water deliveries from the newly-constructed conveyance facilities, an assumption that fails to account for the possibility of reduced Delta water exports as a result of the State Water Board's future Delta flow standards, a major regulatory action that will likely not be taken until after the BDCP is approved under the current time-schedule.[33]

All of these issues, whether taken together or individually, raise serious questions about the long-term financial assurances required under federal and state law for an approvable HCP.

EIR/EIS Specific Comments (Note: EIR/EIS general comments can be found throughout our comment letter)

Comments Pertaining to compliance with Delta Reform Act

The Delta Reform Act states that the BDCP will not be incorporated into the Delta Plan if it does not meet the Delta Reform Act's requirements. It also imposes conditions on BDCP implementation. The Draft EIR/EIS fails to adequately address specific requirements of the Delta Reform Act in the following major areas:

- The EIR/EIS is to provide a comprehensive analysis of a reasonable range of flow criteria, rates of diversion, and other operational criteria. This range is to include flows necessary for recovering the Delta and restoring fisheries under a reasonable range of hydrologic conditions. This range is to include the flow criteria developed by the SWRCB in August 2010 which identified flow conditions and operational requirements to provide fishery protection under the existing Delta configuration.
- Using the above information, the EIR/EIS is to identify the remaining water available for export and other beneficial uses.
- The Act requires that construction of a new Delta conveyance facility shall not be initiated until arrangements have been made to pay for the cost of mitigation required for construction, operation and maintenance of any new Delta conveyance facility. Accordingly, the mitigation measures need to be clearly specified and linkages to impacts of the proposed project should be plainly identified so that the financial obligations are apparent.

The Draft EIR/EIS either fails to include or fails to clearly address these major requirements of the Delta Reform Act. Therefore, the BDCP cannot be incorporated into the Delta Plan unless these flaws are remedied.

[33] *See,* "The High Price of Water Supply Reliability: California's Bay Delta Conservation Plan Would Require Significant Investment," S&P Capital IQ, McGraw-Hill Financial, February 13, 2014. (https://www.globalcreditportal.com/ratingsdirect/renderArticle.do?articleId=1258528&SctArtId=214529&from=CM&nsl_code=LIME)

Additionally, the Delta Plan requires that actions be taken to reduce reliance on the Delta as a water supply. CEQA requires that the EIR/EIS give proper consideration to measures that would reduce reliance on the Delta, including improved water use efficiency, increased storage, and local water supply projects (e.g. desalination and water recycling). These measures should be addressed either as an alternative to the proposed plan or as proposed mitigation measures to address significant impacts of the proposed project. The Draft EIR/EIS fails to consider or properly address these measures as alternatives to the proposed project.

<u>Section 3, Define Existing Conditions</u>

- Sections 3D.2.1 (Existing Conditions), 3D.2.2 (No Action Alternative) and 3D.2.3 (No Project Alternative)

The selection of two different baselines for the CEQA and NEPA elements of the BDCP analysis of project impacts is confusing and unnecessary. It makes it virtually impossible for the public to understand the impact analysis or to discern the incremental impacts of the proposed project. Additionally, the decision to choose future conditions (projected to the year 2060) in one of the baselines introduces such variability and uncertainty into the baseline as to render the impact analysis effectively impossible for the average citizen to interpret or understand.

CEQA guidelines encourage the use of "existing conditions" as a baseline for the impact analysis. In fact, under CEQA, the use of a future baseline is only permissible under specific conditions, i.e. where use of an existing conditions analysis would be misleading or without informational value (as stated on Page 3D-2 in Section 3 of the subject document). As a result, the BDCP impact analysis under CEQA is purportedly based on existing conditions. However, since numerous assumptions about the impacts of a multitude of other ongoing programs were made, the "existing conditions" baseline is not distinct and is not a helpful basis for the assessment of incremental changes.

Under NEPA guidelines, there is no requirement to use a baseline other than the existing conditions. Despite this fact, a decision was made to select a baseline for impact analysis under the "No Action" alternative which includes projected future conditions in the year 2060. No information is presented to defend or rationalize this decision. Instead, text is provided to state that "nothing in NEPA or NEPA case law precludes NEPA lead agencies…from including anticipated future conditions in the impact assessment".

Given the opportunity to provide clarity and simplicity (in terms of providing an impact analysis that can be more readily understood), the choice was made to instead go in the opposite direction – i.e. to choose to use different baselines for CEQA and NEPA, which reflect different time frames with different sets of assumptions used to define baseline conditions. This choice creates a lack of clarity and greatly impedes the public's ability to understand the impact of the proposed project.

- Section 3D.3, Descriptions for the EIR/EIS

In all the assumptions listed to "describe" the baseline conditions, e.g. in Table 3D-2 and 3D-4, at least one major ongoing effort was noticeably absent – that effort is the action by the SWRCB to adopt Delta flow objectives and to potentially restrict Delta exports through the proposed BDCP project. The EIR also fails to mention the multiple workshops that have been held by the SWRCB to develop scientific information that will be used in the final adoption of Delta flow requirements or the schedule for adoption of Delta flow standards by the SWRCB.

In a July 2013 letter by Delta Stewardship Council staff and consultants, the requirements in the Delta Reform Act of 2009 to address Delta flow requirements in the EIR/S were re-emphasized, having been previously raised in letters submitted in April 2012 and June, 2010. The 2013 letter states that the Delta Reform Act requires that the EIR/S include a comprehensive analysis of a reasonable range of flow criteria, rates of diversion, and other operational criteria to meet the requirements for approval of an NCCP. The 2013 letter also reiterated that the EIR/EIS must take into account the SWRCB's August 2010 "Development of Flow Criteria for the Sacramento/San Joaquin Delta Ecosystem". The Delta Reform Act intended that the results of that 2010 SWRCB study would be used to inform planning decisions for the BDCP. The 2013 letter asked that the SWRCB's 2010 flow criteria be addressed directly in the EIR/S.

Review of the EIR/EIS indicates that the SWRCB 2010 Delta flow criteria were mentioned in Section 3 and that one alternative (Alternative 8) considered a "version" of the recommendations that the SWRCB made in its report. It is not clear that the evaluation of Alternative 8 was adequate to meet the requirements of the Delta Reform Act. The EIR/EIS should describe how it provides the comprehensive analysis required under that act.

Section 8, Water Quality Impacts

- Section 8.1.6

  The use of two different baselines (the CEQA and NEPA baselines) and the evaluation of water quality impacts in 2060 yields information that is extremely difficult to understand or verify. A simple analysis of near term water quality changes from existing ambient water quality is needed to provide the public with understandable information and to provide context/grounding for the long term impacts that are presented and to allow a proper assessment of compliance with state and federal antidegradation policies.

- Inadequate Consideration of Federal Antidegradation Policy

  In various places in the BDCP EIR/EIS (e.g. in Section 8 and in Table 31-1), it is stated that significant unavoidable increases in salt as measured by EC and/or TDS) and methylmercury will occur in the Delta as a result of the implementation of the proposed project (Alternative 4) as embodied in CM 1, the Water Facilities and Operations control measure evaluated in the BDCP Effects Analysis.

  The EIR/EIS predicts significant increases in current ambient concentrations of EC and methymercury at various Delta locations. The Delta is currently 303(d)-listed for EC and methylmercury, a federal Clean Water Act listing which is made when water quality objectives are not attained. The projected increased concentrations associated with CM 1 represent significant degradation in water quality and further impairment of already impaired beneficial uses in the Delta.

Under the federal antidegradation policy, "major federal actions" that affect water quality (pursuant to NEPA and the Endangered Species Act) trigger the application of the federal antidegradation policy and requirements. Those requirements **prohibit actions that would lower water quality in areas where existing water quality objectives are not attained** (e.g. Tier I waters) [USEPA, Region 9, 1987, Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12, June 3).

The Draft EIR has failed to adequately articulate or address the federal antidegradation requirements, which place significant constraints on the proposed project and associated mitigation. The "key questions" to be addressed by the surface water quality impact assessment (Section 8.4.1, page 8-127, lines 37-40 and page 8-128 lines 1-4) do not adequately address the requirements of the federal antidegradation policy. The "key questions" add a threshold consideration ("to cause or substantially contribute to significant adverse effects on the beneficial uses of water in these areas of the affected environment") which does not exist in the federal antidegradation policy. As such, the evaluation contained in the Draft EIR/EIS fails to properly address the fact that significant degradation of water quality in 303(d) listed waters is prohibited under the federal policy. The acknowledged degradation of EC which will occur in 303(d) listed areas such as Suisun Bay and portions of the Delta is not allowed under the federal policy. The proposed EC mitigation measures (WQ-11, WQ-11a and WQ-11b) that are described in the Draft EIR/EIS are inadequate in that they will not ensure that the EC levels will be maintained in 303(d) listed waters.

Similar points apply to the "significant and unavoidable" degradation of methylmercury levels that is predicted to occur in the 303(d) listed Delta as a result of implementation "habitat restoration projects" associated with the proposed project. The Delta is 303(d) listed for mercury – actions which cause significant degradation of mercury levels in the Delta are prohibited. The proposed control measure for mercury CM 12 does not adequately assure the prevention of unallowable degradation of mercury levels in the Delta.

- Failure to Fulfill requirements of the Delta Reform Act

The Delta Reform Act requires that the EIR/EIS provide special attention to water quality impacts. A number of water quality impacts identified in the EIR/EIS are deemed to be significant and unavoidable. Such impacts include increased levels of EC, chloride, and methylmercury and increased violations of water quality objectives. The EIR/EIS does not provide or describe specific and effective mitigation to avoid or reduce such impacts.

Many of the proposed water quality mitigation measures are non-specific, not clearly enforceable and deferred to the future. For instance, the Draft EIR/EIS fails to identify the number of acres of farmland in the Delta that would be impacted by water quality (e.g. EC) degradation associated with the project. The absence of such information prevents the development of definitive mitigation.

Instead, the EIR/EIS relies on vague statements and does not make specific commitments. For example the proposed mitigation measure for salinity (WQ-11) states "proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions, followed by development and implementation of the actions, if determined to be necessary".

This is not a clear commitment to mitigate the significant impacts that the proposed project will create on central and west Delta salinity. The failure to propose definitive mitigation measures that would directly offset the projected impacts is a significant flaw in the Draft EIR/EIS and contradicts the mandate under the Delta Reform Act.

- Section 8.3.2.13, Central Valley Drinking water Policy, page 8-123

The paragraph describing the Central Valley Drinking Water Policy should be deleted or significantly modified to reflect the contents of the recently adopted (July 2013) Basin Plan amendment into the Sacramento-San Joaquin Basin Plan. The existing paragraph is outdated and places undue emphasis on organic carbon and disinfection by-products, which were found to be adequately addressed by existing Basin Plan language. The adopted policy includes new narrative water quality objectives and an implementation plan for *Cryptosporidium* and *Giardia*.

Appendix B

Regional San Comments on BDCP and Associated Draft EIR/EIS

Flow Science Technical Memorandum on BDCP Flow Related Impacts to SRWTP

REVISED TECHNICAL MEMORANDUM

April 18, 2014

Jason Lofton, Bob Seyfried, and Linda Dorn
Sacramento Regional County Sanitation District
10545 Armstrong Avenue, Suite 101
Mather, CA 95655

Re: Analysis of SRWTP emergency storage basin and re-treatment requirements under BDCP scenarios
FSI 098116

In previous work, Flow Science Incorporated (Flow Science) analyzed the expected requirements for emergency storage basin (ESB) volume and re-treatment volume at the Sacramento Regional Wastewater Treatment Plant (SRWTP) corresponding to four Bay Delta Conservation Plan (BDCP) scenarios (Flow Science 2010). This technical memorandum summarizes additional work by Flow Science to analyze the expected requirements for ESB and re-treatment volume at the SRWTP under seven updated BDCP scenarios as follows:

1. **EBC1:** Existing baseline condition without Fall X2. This is the "Existing Condition" defined in the current BDCP EIR/EIS documents. This scenario does not incorporate projected sea-level rise.
2. **EBC2:** Existing baseline condition with Fall X2. This is believed to be more representative of actual existing conditions than EBC1. This scenario does not incorporate projected sea-level rise. Although DWR included model results for scenario EBC2 in the ADEIR documents released in March 2013, EBC2 is not included in the current BDCP EIR/EIS documents.
3. **NAA-LLT:** No action alternative, Late Long-term. This is essentially a future no-project condition that incorporates projected sea-level rise and the Fall X2 requirement, but no BDCP project conditions. This scenario does not incorporate any Delta habitat restoration.
4. **Alt4H1:** Alternative 4-H1, Late Long-term. This alternative incorporates BDCP project conditions ("Low Outflow") and projected sea-level rise, but not the Fall X2 requirement. This scenario incorporates Delta habitat restoration.

5. **Alt4H2:** Alternative 4-H2, Late Long-term. This alternative incorporates BDCP project conditions ("Spring High Outflow"), projected sea-level rise, but not the Fall X2 requirement. This scenario incorporates Delta habitat restoration.
6. **Alt4H3:** Alternative 4-H3, Late Long-term. This alternative incorporates BDCP project conditions ("Evaluated Starting Operations"), projected sea-level rise, and the Fall X2 requirement. This scenario incorporates Delta habitat restoration.
7. **Alt4H4:** Alternative 4-H4, Late Long-term. This alternative incorporates BDCP project conditions ("High Outflow"), projected sea-level rise, and the Fall X2 requirement. This scenario incorporates Delta habitat restoration.

Note that the four Alt4H# scenarios are intended to be representative of the potential future operations of the proposed BDCP project. The EIR/EIS states that the spring and fall outflow scenarios (H1 through H4) will be determined by a decision tree, and that any of the four outflow scenarios may be used each year. However, the decision tree—specifically, what "triggers" each operational scenario—has not been defined and is "subject to a new determination by the fish and wildlife agencies" (BDCP DRAFT EIR/ESI, pg. 3-207). However, the document does not introduce the future studies and data collection required to make this determination. Thus, it is not known which of these four operating scenarios is most likely to occur in the future.

METHODOLOGY

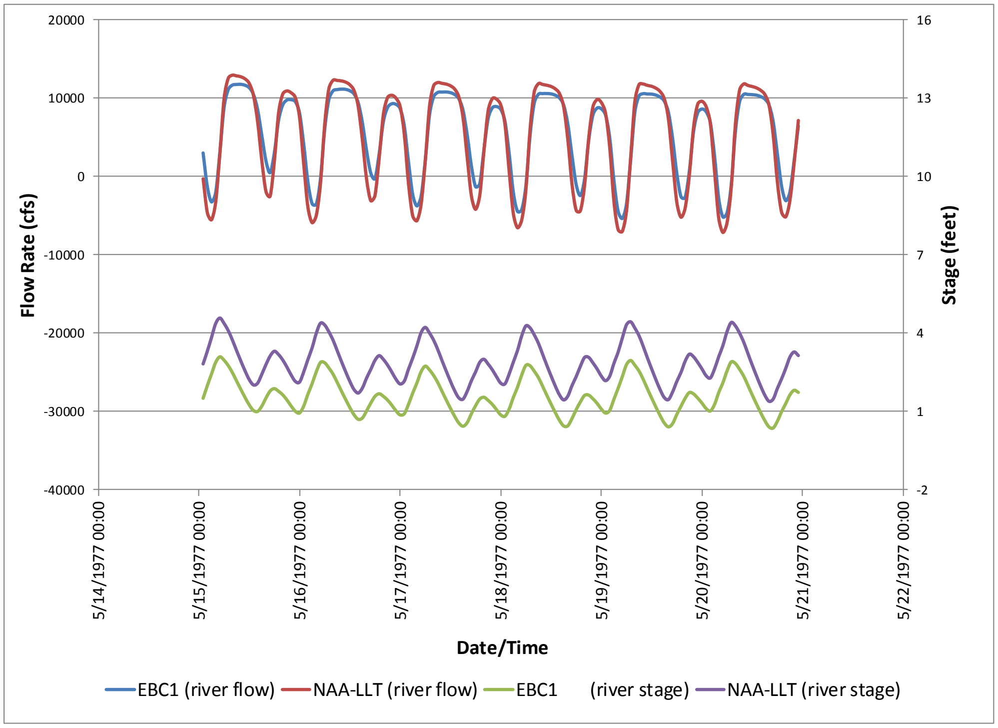
The SRWTP discharges secondary treated effluent into the Sacramento River at Freeport. The SRWTP is required to maintain a 14:1 ratio between the Sacramento River flow at Freeport and the SRWTP effluent discharge rate. When river flow rates drop such that the 14:1 ratio cannot be maintained, SRWTP must divert effluent to on-site ESBs until river flow rates return to levels that allow effluent discharge. If the required diversion volume exceeds 75 million gallons (MG), diversion volumes above 75 MG are redirected back to the SRWTP plant influent for re-treatment before being discharged to the river when river flows return to the appropriate level. Once SRWTP discharge resumes after a diversion event, effluent discharge includes both effluent from SRWTP's regular treatment stream and effluent from the ESBs. The SRWTP's total ESB capacity is 302 MG.

For this analysis, Flow Science used simulated Sacramento River flow rates (at Freeport) from BDCP DSM2 modeling, obtained from the California Department of Water Resources (DWR). For each of the seven scenarios—EBC1, EBC2, NAA-LLT, Alt4H1, Alt4H2, Alt4H3, and Alt4H4—a Matlab code was used to calculate an hourly time series of required ESB volume corresponding to the 16-year BDCP modeling period (Water Years 1976-1991). The Matlab code used to perform these calculations accounted for both the 14:1 river-to-effluent flow requirement and the SRWTP's maximum effluent discharge rate of 410 mgd (634 cfs). Influent to the SRWTP was calculated according to the methodology described in Flow Science (2013). The Matlab code was also used to calculate the number of diversion and re-treatment events, and the maximum required volume of diversion and re-treatment under each scenario.

FLOW DYNAMICS

The BDCP DSM2 model results obtained from DWR incorporated several factors affecting Sacramento River flow dynamics at Freeport. First, as noted above, the following scenarios incorporated projected 2045 sea-level rise: NAA-LLT, Alt4H1, Alt4H2, Alt4H3, and Alt4H4. The effect of sea-level rise on Sacramento River flow dynamics at Freeport is to increase the tidal influence over flow rates, particularly when flows from upstream are low and downstream tides are high. In these periods, sea level rise will generally cause higher water levels throughout the Delta, altering flow dynamics at Freeport and increasing the magnitude of peak flows at Freeport during reverse flow events. Figure 1 illustrates this effect. The figure compares Sacramento River flow rates and stages for EBC1 (an existing condition scenario with no sea level rise) with those for NAA-LLT (the no-action alternative scenario with a projected sea level rise) during a period of low flows from upstream and significant tidal influence (May 1977). The only operational difference between these two scenarios is that NAA-LLT incorporates sea-level rise but EBC1 does not. As Figure 1 shows, at high tide (i.e., when stage is at a local peak) flow rates during reverse flow events (negative flows in Figure 1) tend to be greater in magnitude in the NAA-LLT scenario than in the EBC1 scenario.

Figure 1 - Sacramento River flow rate and stage, EBC1 and NAA-LLT scenarios.

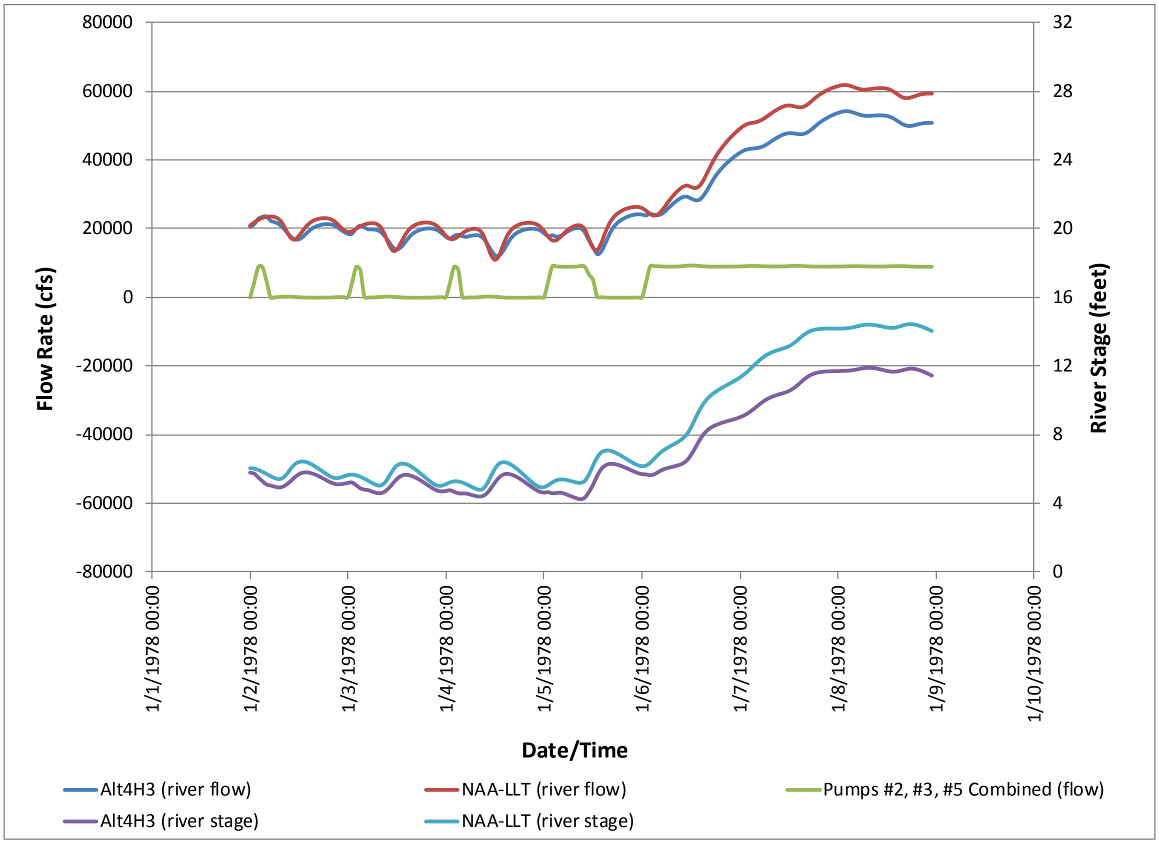


Second, the BDCP project scenarios (Alt4H1, Alt4H2, Alt4H3, and Alt4H4) incorporated substantial pumping of Sacramento River water from immediately downstream of Freeport as part of BDCP operations. These scenarios also incorporated substantial habitat restoration within the Delta. The pattern of BDCP pumping in these scenarios is variable. However, the following pattern is often observed, as illustrated in Figure 2: when minimum diurnal river flow rates are low but above zero, pumping typically occurs for a portion of the day when flow rates are relatively high; when river flow rates are consistently high (e.g., above around 20,000 cfs), pumping typically occurs over the entire day. When minimum diurnal river flow rates drop to or below zero, pumping typically ceases. During the period shown in Figure 2, when pumping was occurring, the total pumping rate (i.e., Pumps #2, #3, and #5 combined) was typically around the project design flow rate of 9,000 cfs.

The effect of this pumping is unclear. Figure 2 shows a comparison of the NAA-LLT scenario with the Alt4H3 scenario. According to scenario descriptions, the main operational difference between the two scenarios is that Alt4H3 incorporates BDCP pumping while NAA-LLT does not. Alt4H3 also incorporates habitat restoration within the Delta, while NAA-LLT does not. Resulting Sacramento River flow rates at Freeport show that NAA-LLT flows are consistently higher than those for Alt4H3. However, this difference in flow rates is not attributable to pumping under Alt4H3 since the pumping takes place downstream of Freeport. Thus, it seems likely that the habitat restoration (and/or differences in upstream operations) must be driving the observed differences in River flow rates. Sacramento River stage at Freeport is also consistently higher for NAA-

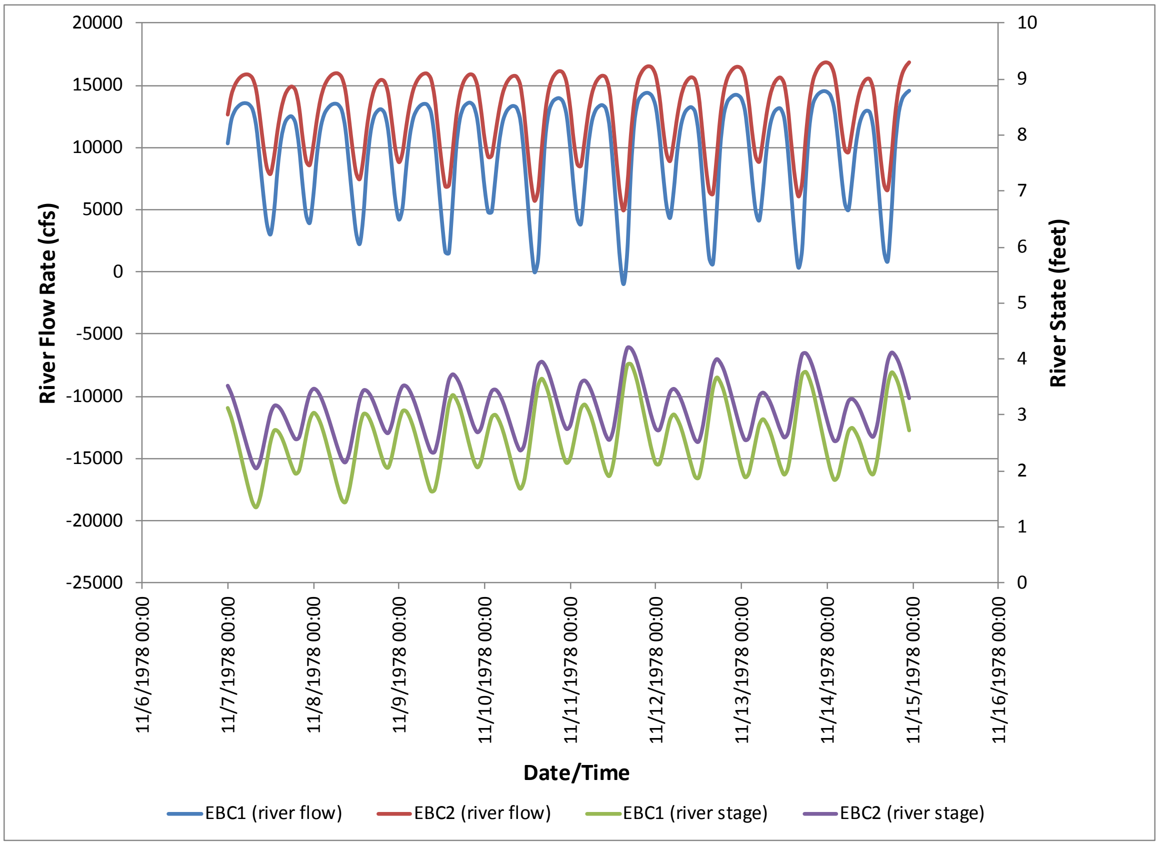
LLT than for Alt4H3. While some reduction in Alt4H3 stage might be expected as a result of downstream pumping, it seems pumping does not account for the entire difference in stage since NAA-LLT stage is often higher than that for Alt4H3 even during periods when there is no pumping. Thus, again, it appears that Delta habitat restoration (incorporated into Alt4H3 but not NAA-LLT) and/or differences in upstream operations may explain the differences observed. A complete understanding of the effect of habitat restoration on flow rates and stages would require further investigation beyond the scope of this work.

Figure 2 – Sacramento River flow rate and stage with BDCP pumping rates, NAA-LLT and Alt4H3 scenarios.



Third, four of the modeled scenarios incorporated the Fall X2 condition: EBC2, NAA-LLT, Alt4H3, and Alt4H4. Fall X2 is an operating condition whereby a salinity of 2 ppt is maintained at a specified distance upstream of the Golden Gate during the fall after near-normal (i.e., just above or below normal) and wet water year types. To achieve Fall X2 requirements, additional flows are released from upstream reservoirs. Thus, during the fall of relevant years, Sacramento River flow rates tend to be higher under Fall X2 conditions than under scenarios that do not incorporate Fall X2. This effect can be observed in Figure 3, which compares Sacramento River flow rates and stages for EBC1 (no Fall X2) and EBC2 (Fall X2) during the fall of 1978, which is the fall subsequent to the above normal water year 1978. Figure 3 shows that Sacramento River flow rates and stages were higher, and reverse flow conditions were less likely to occur, during this period for EBC2 than for EBC1.

Figure 3 – Sacramento River flow rate and stage, EBC1 (No Fall X2) and EBC2 (Fall X2) scenarios.



RESULTS

For each of the seven modeled scenarios, Flow Science produced a frequency distribution to describe the required ESB volumes calculated over the modeling period. These distributions are shown in Figures 4 through 10. For all scenarios, the calculated required ESB volume was zero 63% of the time or more. For all scenarios, calculated required ESB volume was less than 25 MG approximately 95% of the time.

Figure 4 – Required ESB volume frequency distribution, EBC1

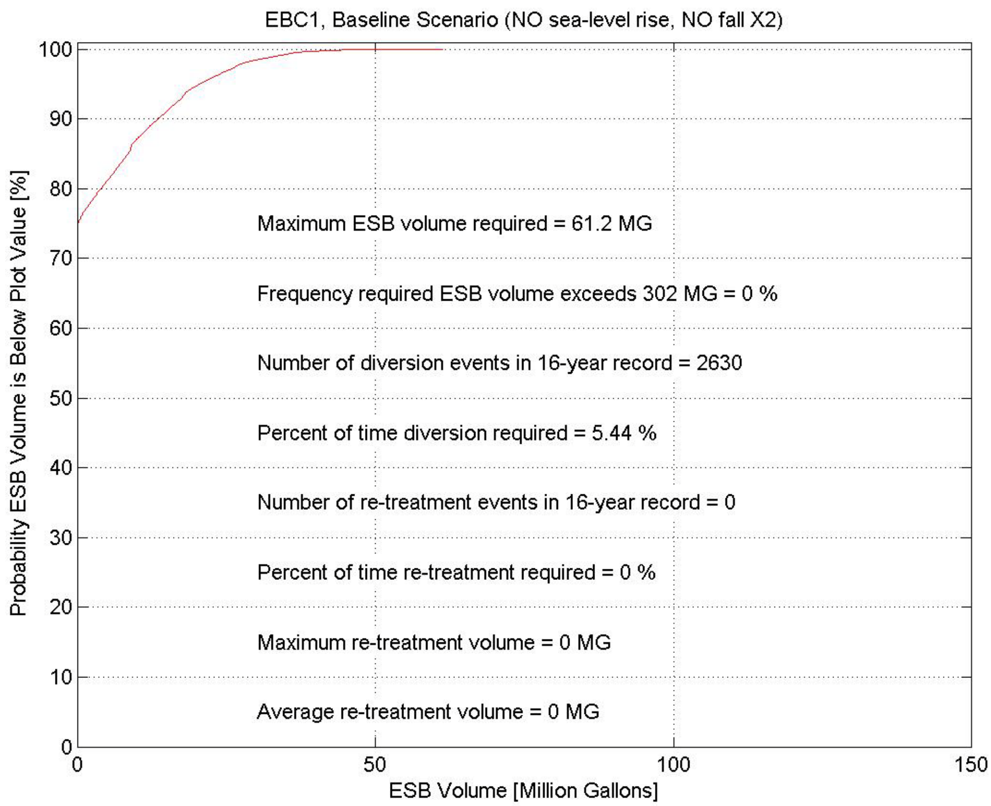


Figure 5 – Required ESB volume frequency distribution, EBC2

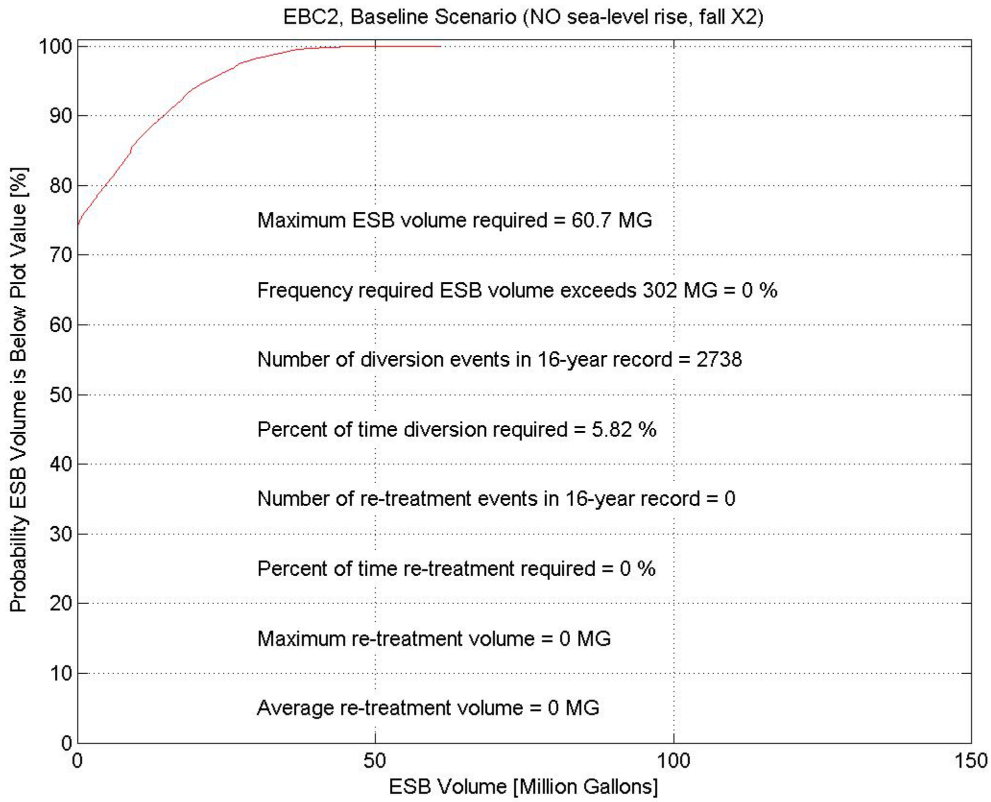


Figure 6 – Required ESB volume frequency distribution, NAA-LLT

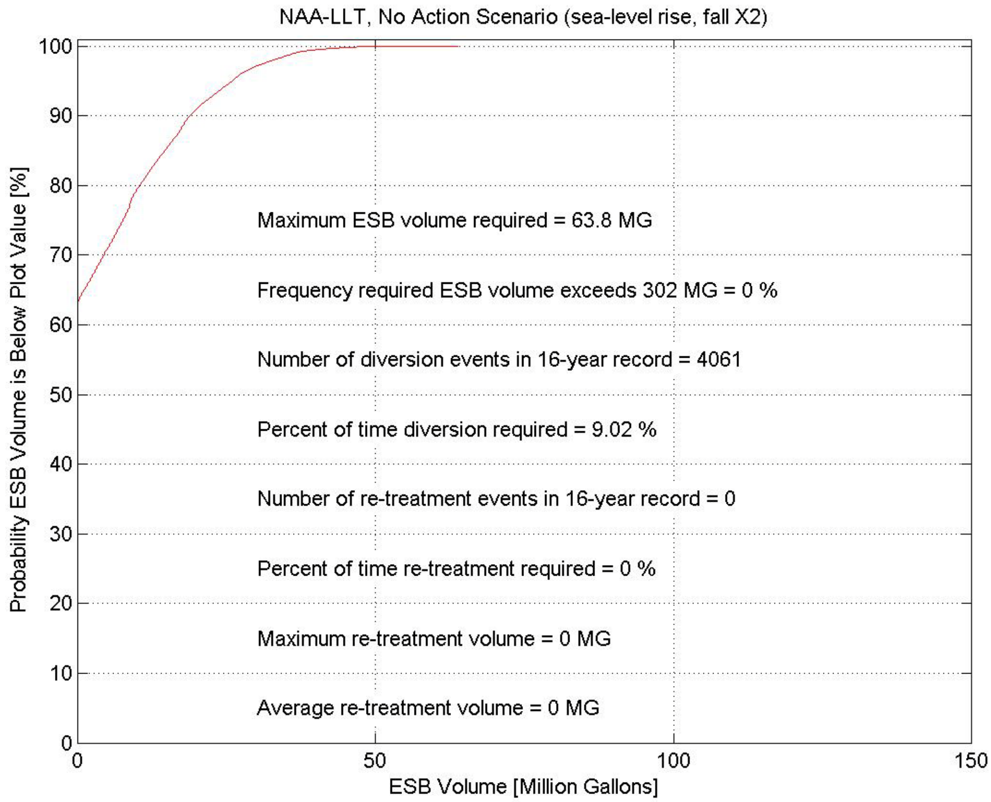


Figure 7 – Required ESB volume frequency distribution, Alt4H1

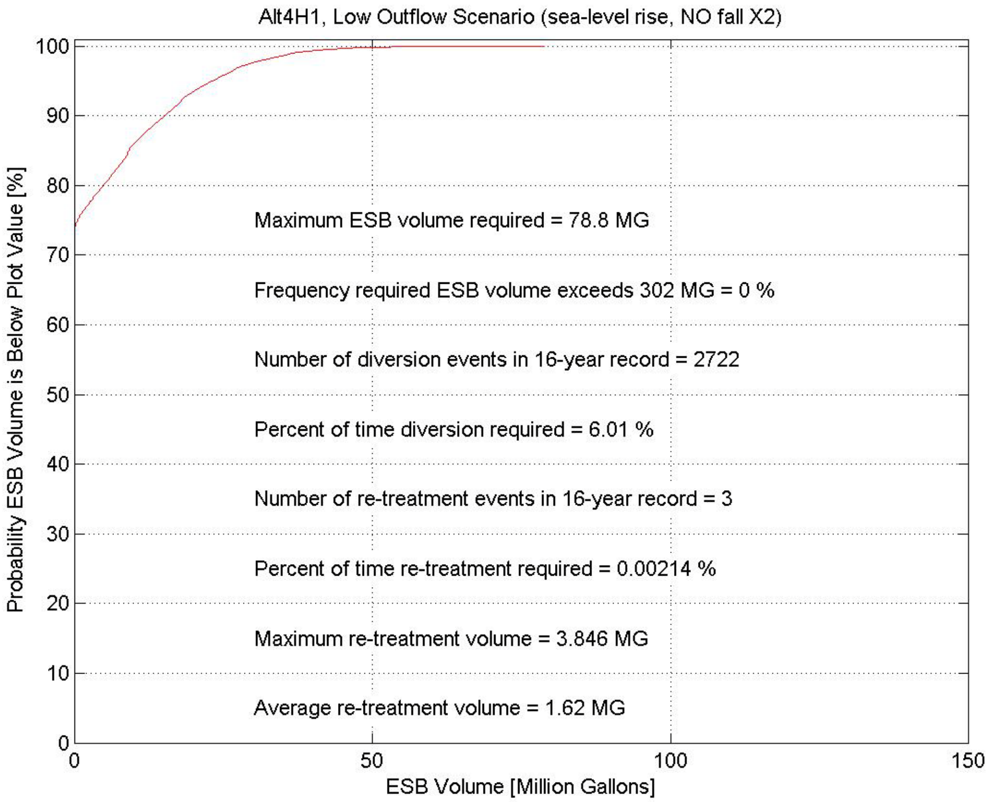


Figure 8 – Required ESB volume frequency distribution, Alt4H2

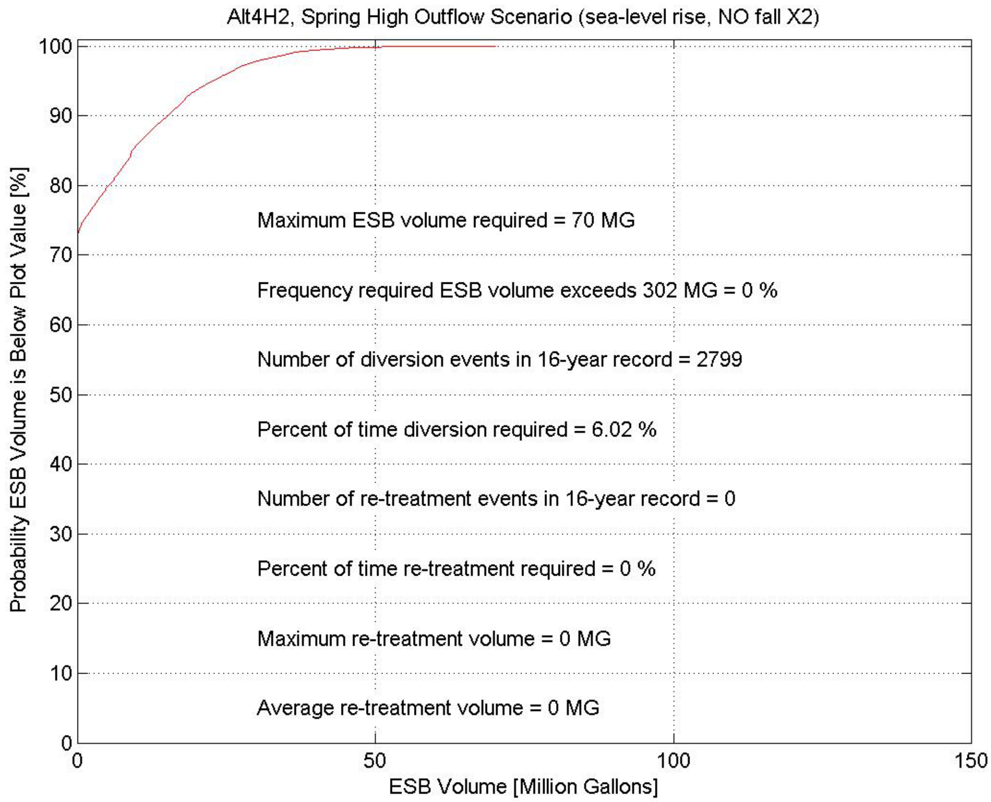


Figure 9 – Required ESB volume frequency distribution, Alt4H3

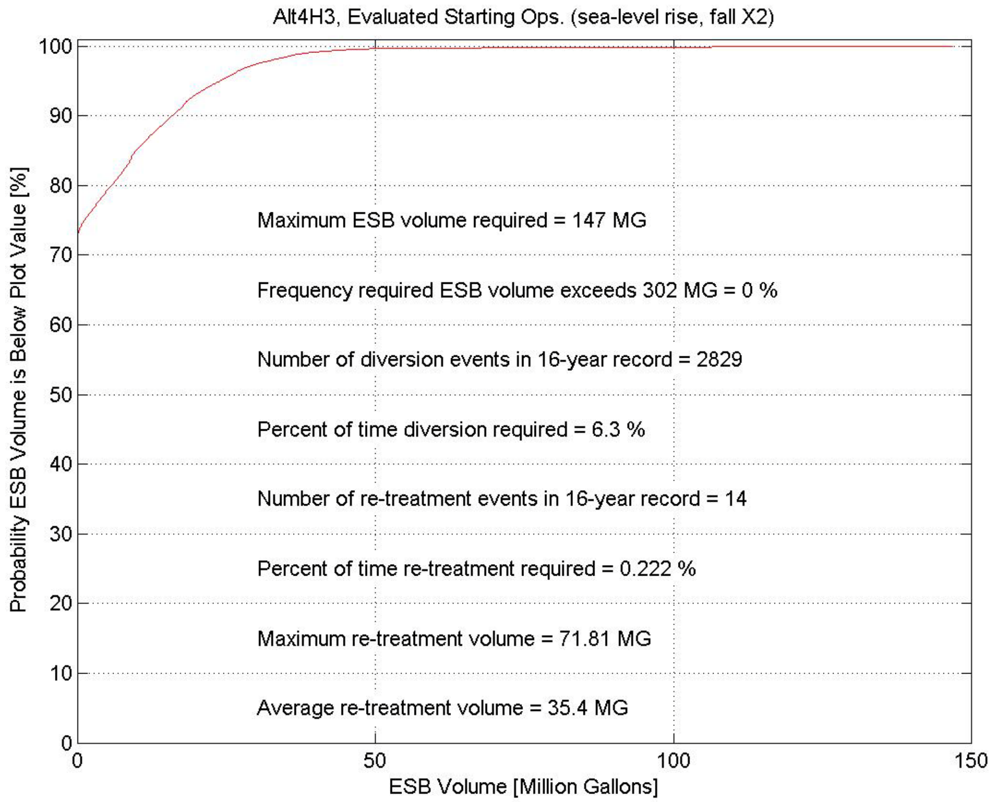


Figure 10 – Required ESB volume frequency distribution, Alt4H4

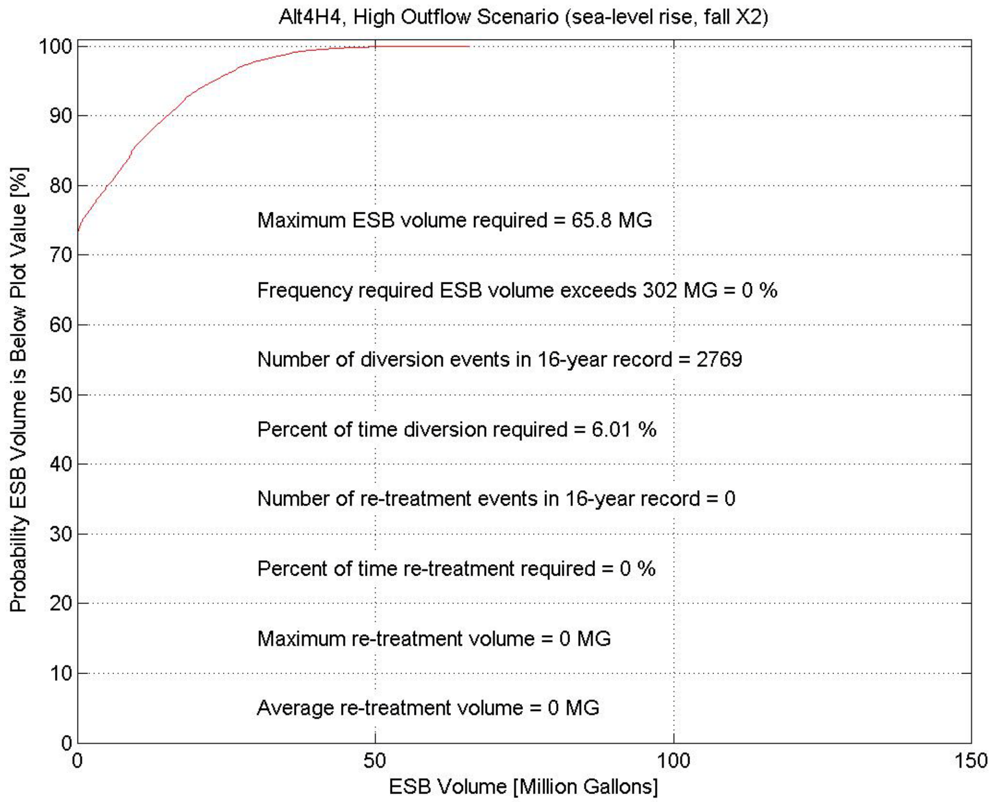


Table 1 summarizes the results of Flow Science's analysis. Under EBC2—the existing condition scenario most representative of actual existing (historical) conditions—the maximum required ESB volume was calculated to be 60.7 MG. Under the Alt4H1 BDCP scenario, the maximum required ESB volume was calculated to be 78.8 MG. Therefore, implementation of Alt4H1 was calculated to increase the required ESB storage by approximately 30% from existing conditions. Similarly, under the Alt4H3 BDCP scenario, the maximum required ESB volume was calculated to be 147 MG. Therefore, implementation of Alt4H3 was calculated to increase the required ESB storage by approximately 142% from existing conditions. Alt4H3 was calculated to produce the most re-treatment events of any of the scenarios, at 14 events. Given that the maximum required ESB volume calculated for the NAA-LLT scenario (which includes sea-level rise) was 63.8 MG, it seems that the increases in maximum ESB volume required by Alt4H1 and Alt4H3 over existing conditions are attributable to the BDCP operations themselves and not merely to sea-level rise. The other two BDCP project scenarios—Alt4H2 and Alt4H4—produced maximum required ESB volumes more in line with existing conditions—70 MG (a 15% increase) and 65.8 MG (an 8% increase), respectively.

Table 1 – Summary of analysis of SRWTP ESB and re-treatment requirements under BDCP scenarios.

BDCP Alternative	Fall X2?	Sea-level Rise?	Max. Required ESB Volume (MG)	# of Diversion Events	%-Time Diversion Required	# of Re-treatment Events	%-Time Re-treatment Required	Max. Required Re-treatment Volume (MG)
EBC1	No	No	61.2	2,630	5.44 %	0	0 %	0
EBC2	Yes	No	60.7	2,738	5.82 %	0	0 %	0
NAA-LLT	Yes	Yes	63.8	4,061	9.02 %	0	0 %	0
Alt4H1	No	Yes	78.8	2,722	6.01 %	3	0.0021 %	3.85
Alt4H2	No	Yes	70	2,799	6.02 %	0	0 %	0
Alt4H3	Yes	Yes	147	2,829	6.30 %	14	0.22 %	71.8
Alt4H4	Yes	Yes	65.8	2,769	6.01 %	0	0 %	0

The increased maximum required storage volume under the BDCP scenarios relative to the three other scenarios (EBC1, EBC2, and NAA-LLT) seems to be caused, primarily, by lower diurnal maximum downstream flow rates during February 1977, a period during which reverse flow rates at the bottom of the daily tidal cycle were particularly high. The decrease in diurnal maximum downstream river flow rates was significant since it meant SRWTP could not return as much stored effluent from the ESBs to the River at the top of the tidal cycle as it otherwise could. This effect is evident in a comparison of model results for the Alt4H1 and NAA-LLT scenarios during February 1977, as shown in Figure 11. While the NAA-LLT scenario produced higher upstream flow rates (typically around -5,000 cfs) than the Alt4H1 scenario (typically around -3,000 cfs), it also produced higher downstream flow rates (13,500 vs. 12,000 cfs), which allowed more stored effluent to be discharged than for the Alt4H1 scenario. Because less stored effluent could be discharged under the Alt4H1 scenario, stored effluent tended to build-up in the ESBs from tidal cycle to tidal cycle, producing the 78.8 MG peak value.

The number and total duration of SRWTP diversion events was similar for all scenarios except NAA-LLT. The number of diversion events for the similar scenarios ranged from 2,630 to 2,829 while the total duration of diversion events ranged from 5.44 % to 6.30 %. However, the NAA-LLT scenario resulted in 4,061 events for a total duration of 9.02 % of the modeled period. Flow Science's review of the model results indicates that the cause of the additional diversion events seems to be extended periods during which the daily minimum flow rate (i.e., the minimum hourly value in a single day) in the Sacramento River at Freeport was consistently lower than for other scenarios. For example, Figure 12 shows daily minimum Sacramento River flow rates at Freeport for the Alt4H1 and NAA-LLT scenarios for the period of August through November 1987. As Figure 12 shows, minimum daily flow rates were significantly lower under the NAA-LLT scenario than under Alt4H1 during this period, causing additional reverse flow and diversion events. It is likely that the lower flows are attributable to differences in Delta habitat restoration between the scenarios.

Figure 11 – Required ESB volume and Sacramento River flow rates for the Alt4H1 and NAA-LLT scenarios

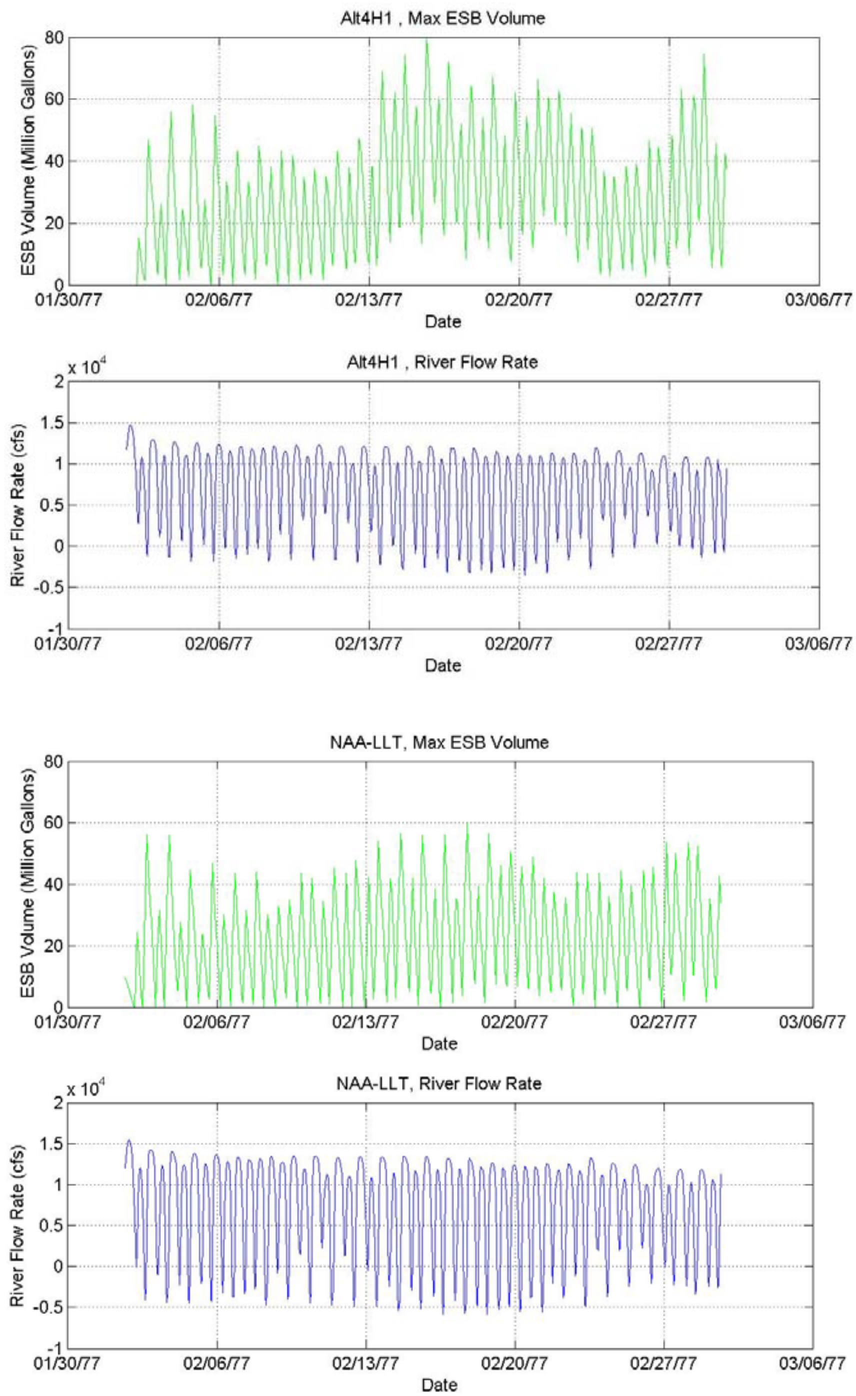
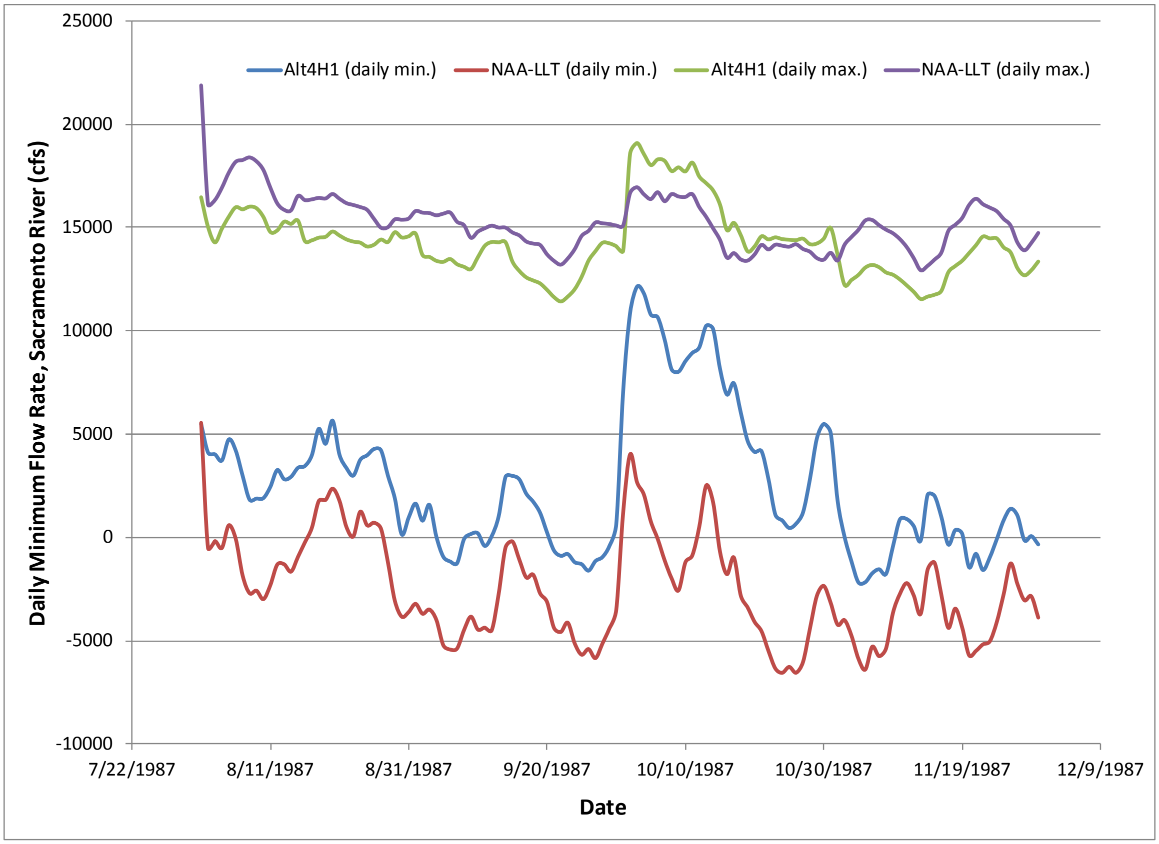


Figure 12 – Daily minimum and maximum flow rates in the Sacramento River at Freeport, Alt4H1 and NAA-LLT scenarios



The increased number and duration of diversion events in the NAA-LLT scenario does not translate into higher maximum required ESB volume since even during the periods when daily minimum river flows are lower than for other scenarios, daily <u>maximum</u> river flows are typically <u>higher</u> than for other scenarios, thereby allowing water stored in ESBs to be regularly discharged back to the river. This is the case during February 1977, the period during which the maximum required ESB volume occurs for the Alt4H1 and Alt4H3 scenarios, as noted above. Figure 12 shows the typically higher daily maximum river flows for the NAA-LLT scenario relative to Alt4H1. In short, under the NAA-LLT scenario diverted water does not typically build up in the ESBs as it does for scenarios where the maximum required ESB volume is high (e.g., Alt4H1 and Alt4H3).

SRCSD may wish to comment upon the apparent importance of habitat restoration in reducing the impacts of reverse flows at Freeport. For example, SRCSD may wish to note that if the BDCP project is constructed without habitat restoration, or with a habitat restoration in different locations, with different sizes, or with different habitat operational characteristics, reverse flows at Freeport may become more severe in the future and may have a greater potential to affect SRWTP discharge operations.

REFERENCES

Flow Science (2010). Emergency Storage Basin Analysis for BDCP Scenarios. Technical memorandum prepared for Sacramento Regional County Sanitation District, June 14.

Flow Science (2013). Water Quality Modeling in Support of Sacramento Regional Wastewater Treatment Plant, Advanced Wastewater Treatment Plant EIR. Prepared for Ascent Environmental, Inc., on behalf of Sacramento Regional County Sanitation District, November 27. Draft.

U.S. Department of the Interior, Bureau of the Reclamation and U.S. Department of Fish and Wildlife; the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; and the California Department of Water Resources (Reclamation, USFWS, NMFS, and DWR) 2013. Draft Environmental Impact Report / Environmental Impact Statement, Bay Delta Conservation Plan. Sacramento, CA: December 2013.

Appendix C

Regional San Comments on BDCP and Associated Draft EIR/EIS

Flow Science Technical Memorandum on BDCP Temperature Related Impacts to SRWTP

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TECHNICAL MEMORANDUM

To: Jason Lofton, SRCSD

From: Al Preston, Gang Zhao, Aaron Mead, and Susan Paulsen

Date: April 23, 2014

Subject: Impact of BDCP scenarios on Sacramento River temperature at Freeport
FSI 098116

Effluent discharge from the Sacramento Regional Wastewater Treatment Plant (SRWTP) must meet temperature requirements specified in its NPDES permit, which were derived from the California Thermal Plan. Whether SRWTP discharge meets these requirements depends, in part, on the difference between effluent temperature and Sacramento River temperature at Freeport. Thus, the temperature of the Sacramento River at Freeport—and, in particular, any changes to the river temperature that might result from implementation of BDCP alternatives—is of considerable interest to the SRCSD.

Flow Science recently reviewed documents and model results associated with the BDCP environmental review process in order to understand how proposed BDCP alternatives might impact Sacramento River temperatures at Freeport. This technical memorandum summarizes our findings to date.

REVIEW OF BDCP DRAFT CHAPTERS

As discussed in Flow Science (2013) (Attachment A), Flow Science reviewed draft chapters from the BDCP, focusing on information that might indicate the effect that BDCP would have on Sacramento River temperatures at Freeport. The following bullets summarize the claims of these documents most relevant to BDCP impacts on Sacramento River temperature at Freeport:

- Estuarine and Delta water temperatures are driven by air temperature. (This conclusion only applies to the interior and western Delta, and will not apply to upstream Delta locations such as Freeport.)
- Climate change effects on air temperature may subsequently have an effect on Sacramento River water temperatures.
- Climate change effects on precipitation and runoff may also affect Sacramento River water temperatures insofar as precipitation and runoff affect upstream reservoir operations.

- Water temperatures at Freeport may be cooled by up to 3^{o}C due to high upstream Sacramento River flows. However, these flows are not sustainable over the long-term. (The BDCP draft chapters do not define a threshold for these "high" flows, nor do they provide guidance as to what is meant by "long-term".)
- Comparisons of model results for existing and proposed BDCP conditions suggest that the BDCP would have only a minimual effect on Sacramento River temperatures at any location.

In addition to these claims, the BDCP draft chapters showed that DSM2 QUAL model results were used to try to understand the possible effects of BDCP alternatives on fish at numerous locations in the Delta. Specifically, model results allowed investigators to predict how frequently Delta temperatures would exceed conditions that are best for fish. Flow Science concluded that it would be difficult to use these results to infer the temperature changes that are expected to result at Freeport as a result of BDCP implementation. Flow Science also identified possible problems with the modeling used to support these conclusions. In particular, it appears that DWR used incorrect input files and has not updated the modeling to incorporate corrected input files. In addition, some of the assumptions used in the modeling (e.g., that river temperatures are independent of upstream reservoir operations) are suspect.

Thus, on the whole, Flow Science found the information presented in the BDCP draft chapters inadequate for determining the impact that BDCP operations might have on river temperatures at Freeport.

REVIEW OF MODELING RESULTS

Flow Science reviewed model input and output files for recent DSM2 modeling of BDCP scenarios by the California Department of Water Resources (DWR). The 24 scenarios listed in Table 1 were reviewed.

For all scenarios, DWR provided 15-minute interval output data for water years 1976-1991. All scenarios had simulation data for hydrodynamic variables (flow, velocity, and stage), and temperature at Freeport. Simulation data for algae, DO, NH_3, NO_2, NO_3, organic-N, and PO_4 were also provided at Freeport for most scenarios; the only exception was the Baseline_BDCP_V1_2012 scenario (No. 1 in Table 1), which only had algae, DO and PO_4 output at Freeport. For this work, only flow and temperature data were reviewed by Flow Science.

Following the release of these modeling data, DWR informed Flow Science that some of the temperature runs were set-up incorrectly. Specifically, the temperature boundary conditions used in the Draft EIR modeling (Reclamation et al., 2013) for the early late-term (ELT) and late late-term (LLT) runs were incorrect. DWR stated that the problem with these temperature boundary conditions was related to an error in applying climate-change corrections in the modeling. The error affected all simulations except scenario numbers 1 and 22 in Table 1.

Table 1— Modeled Scenarios

NO.	Model Directory Name	EIS/EIR Alternative #	Old Alternative #	Other
1	Baseline_BDCP_V1_2012.Final	EBC1		Not included in final HCP document
2	BDCP_2020D09E_ALT1A_ELT_SLR15_CC5_ROA25_Daily_2012.Final	2A ELT	1A ELT	
3	BDCP_2020D09E_ALT1A_LLT_SLR45_ROA65_Daily_102611_2012.Final	2A LLT	1A LLT	
4	BDCP_2020D09E_ALT2_ELT_SLR15_ROA25_Daily_071310_2012.Final	3 ELT	2 ELT	
5	BDCP_2020D09E_ALT2_LLT_SLR45_ROA65_Daily_071510_2012.Final	3 LLT	2 LLT	
6	BDCP_2020D09E_ALT2A_ELT_SLR15_ROA25_Daily_2012.Final	4 ELT	2A ELT	ESO_ELT
7	BDCP_2020D09E_ALT2A_LLT_SLR45_ROA65_Daily_2012.Final	4 LLT	2A LLT	ESO_LLT
8	BDCP_2020D09E_ALT2B_ELT_SLR15_ROA25_Daily_102611_2012.Final	5 ELT	2B ELT	
9	BDCP_2020D09E_ALT2B_LLT_SLR45_ROA65_Daily_102611_2012.Final	5 LLT	2B LLT	
10	BDCP_2020D09E_ALT3_ELT_SLR15_ROA25_Daily_072810_2012.Final	6 ELT	3 ELT	
11	BDCP_2020D09E_ALT3_LLT_SLR15_ROA25_Daily_072810_2012.Final	6 LLT	3 LLT	
12	BDCP_2020D09E_ALT4_ELT_SLR15_ROA25_Daily_121010_2012.Final	7 ELT	4 ELT	
13	BDCP_2020D09E_ALT4_LLT_SLR45_ROA65_Daily_121410_2012.Final	7 LLT	4 LLT	
14	BDCP_2020D09E_ALT4A_ELT_SLR15_ROA25_Daily_030912_Final	8 ELT	4A ELT	
15	BDCP_2020D09E_ALT4A_LLT_SLR45_ROA65_Daily_030912_Final	8 LLT	4A LLT	
16	BDCP_2020D09E_NoAction_SLR15_Daily_2012.Final	EBC2 ELT	NAA ELT	
17	BDCP_2020D09E_NoAction_SLR45_Daily_2012.Final	EBC2 LLT	NAA LLT	
18	BDCP_2020D09E_PP_ELT_SLR15_ROA25_Daily_2012.Final	1 ELT	PP ELT	
19	BDCP_2020D09E_PP_LLT_SLR45_ROA65_Daily_2012.Final	1 LLT	PP LLT	
20	BDCP_2020D09E_S6FX2_ELT_SLR15_ROA25_Daily_2012.Final	4 ELT	2A ELT	
21	BDCP_2020D09E_S6FX2_LLT_SLR45_ROA65_Daily_2012.Final	4 LLT	2A LLT	
22	BST_2020D09E_NoAction_Daily_2012.Final	EBC2	NAA	
23	Separate_Corridor_ELT_15SLR_2012.Final	9 ELT	5 ELT	
24	Separate_Corridor_LLT_45SLR_2012.Final	9 LLT	5 LLT	

On November 21, 2013, DWR provided corrected input boundary files with updated temperature input data to Flow Science via email and FTP[1], but DWR did not re-run the model. Additionally DWR indicated via email[2] (November 18, 2013) that they did not have plans to re-run the model with corrected input files.

[1] FTP links were emailed from Parviz Nader of DWR to Al Preston of Flow Science on November 21, 2013. Files were downloaded by Al Preston on November 21, 2013.
[2] Email from Brian Heiland of DWR to Al Preston of Flow Science, dated November 18, 2013.

To evaluate the extent of the corrections and the potential impact on the simulated Sacramento River temperatures and on the conclusions presented in the DEIR, Flow Science compared the old and corrected input boundary temperatures, and re-ran the DSM2 model for the two EBC2 scenarios (i.e., scenarios No. 16 and 17 in Table 1, corresponding to early long term (ELT) and late long term (LLT) conditions) using the corrected temperature input files.

Comparisons of the old and new input files and output data obtained using both sets of files are presented below. Figure 1 and Figure 2 show the differences in boundary temperatures for a 6-month period for the No Action ELT and No Action LLT scenarios (Nos. 16 and 17 in Table 1). These figures were obtained by subtracting the old (incorrect) boundary temperatures from the corrected boundary temperatures. Figures 1 and 2 show that the changes appear highly variable and large in magnitude. For example, Figure 1 shows that the Sacramento River temperatures for inflow to the DSM2 model domain in the corrected input file were as much as 7ºC (12.6ºF) cooler than the inflow temperatures in the uncorrected file toward the end of March 1976. Differences of this magnitude were observed throughout the simulation time period.

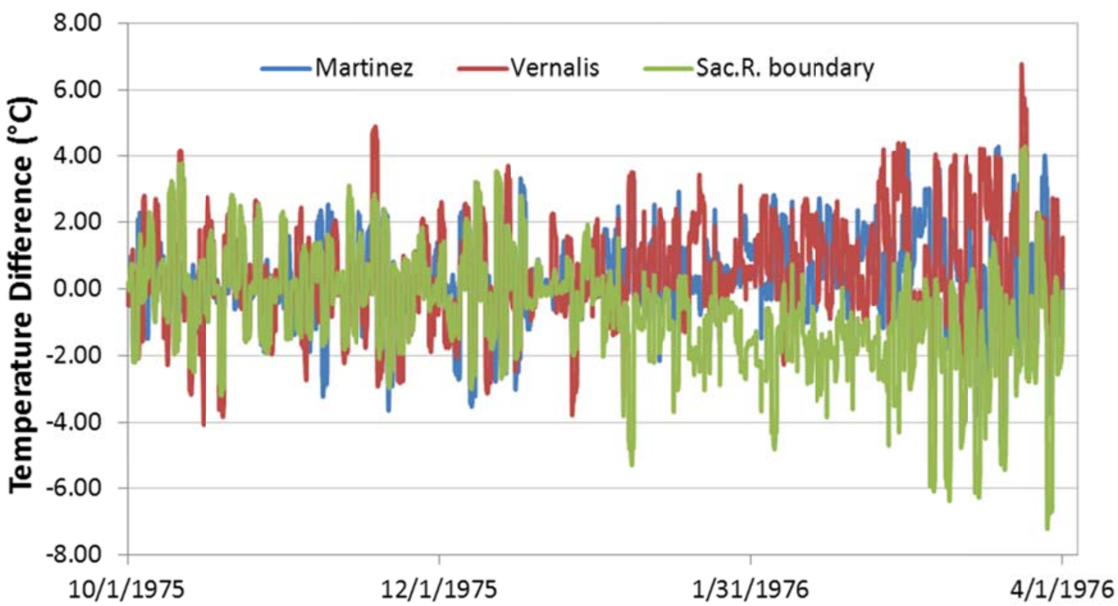

Figure 1. Difference in boundary temperature (T_{new} – T_{old}) for No Action ELT

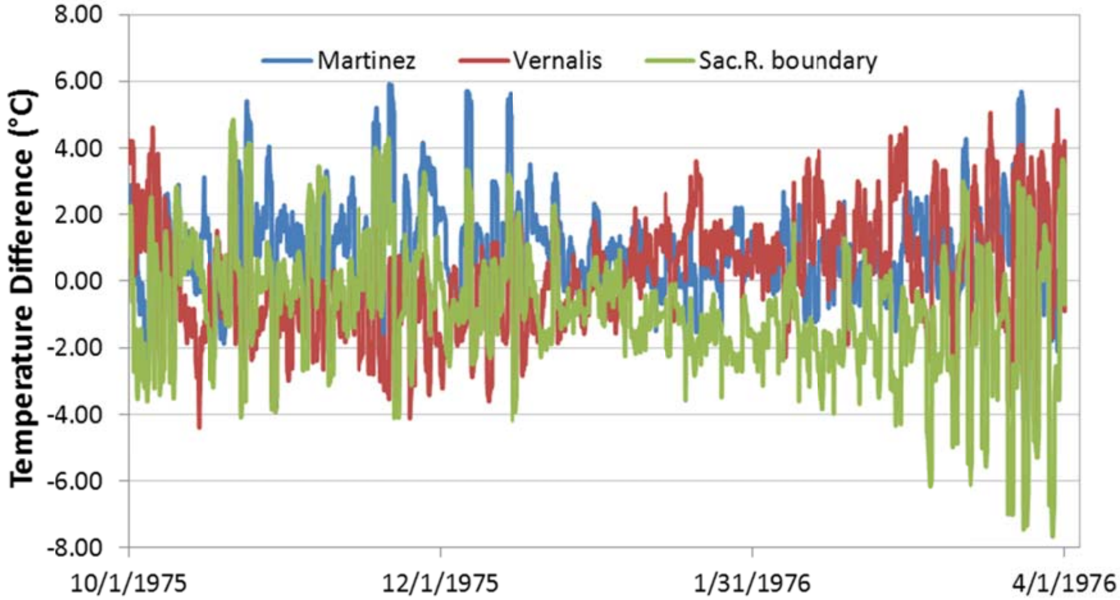

Figure 2. Difference in boundary temperature ($T_{new} – T_{old}$) for No Action LLT

Figure 3 and Figure 4 show the difference between old and new input boundary temperature data for the Sacramento River (from the uncorrected and corrected input files) and old and new temperature modeling results for the Sacramento River at Freeport (from Flow Science's DSM2 model runs, performed using these two sets of input files). As the figures show, changes in simulated river temperature at Freeport closely follow the changes in the Sacramento River boundary temperature. These two sets of changes follow each other closely because Freeport is only approximately 14 miles downstream of the DSM2 Sacramento River upstream boundary (located within the City of Sacramento) and little temperature change is expected within this relatively short distance. Some simple statistics of the changes over the simulation period are summarized in Tables 2 and 3 below.

As noted above, the corrections to the DSM2 temperature boundary conditions have a substantial effect on the temperatures at Freeport. In addition, 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). Therefore it appears that the DSM2 modeling methodology is in conflict with the BDCP draft documents that state that temperatures at Freeport may be affected by up to 3°C due to high river flows.

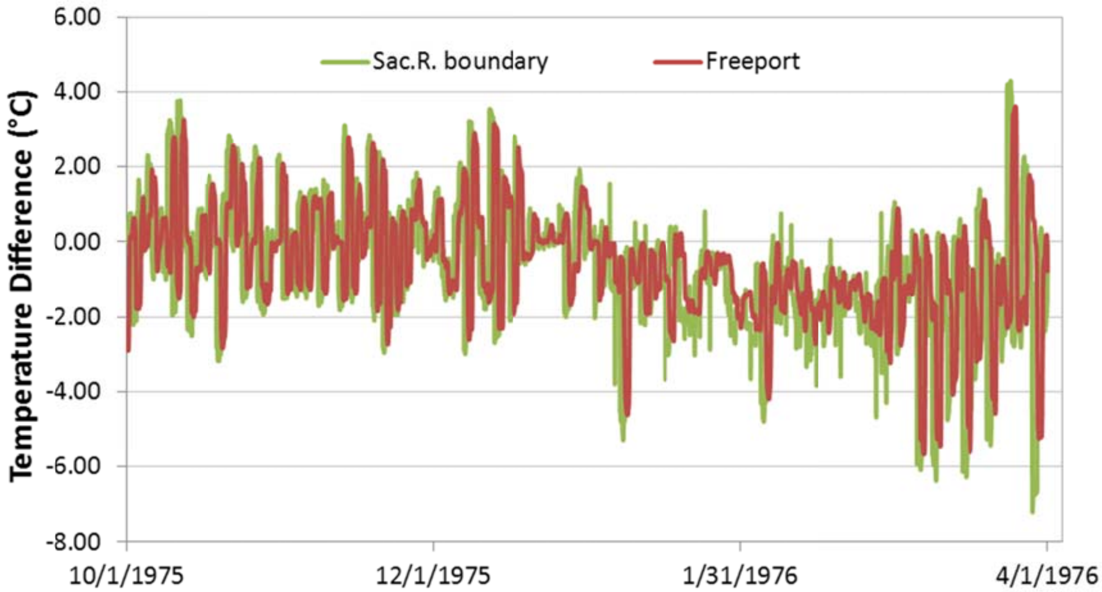

Figure 3. Difference in Freeport temperature ($T_{new} – T_{old}$) for No Action ELT

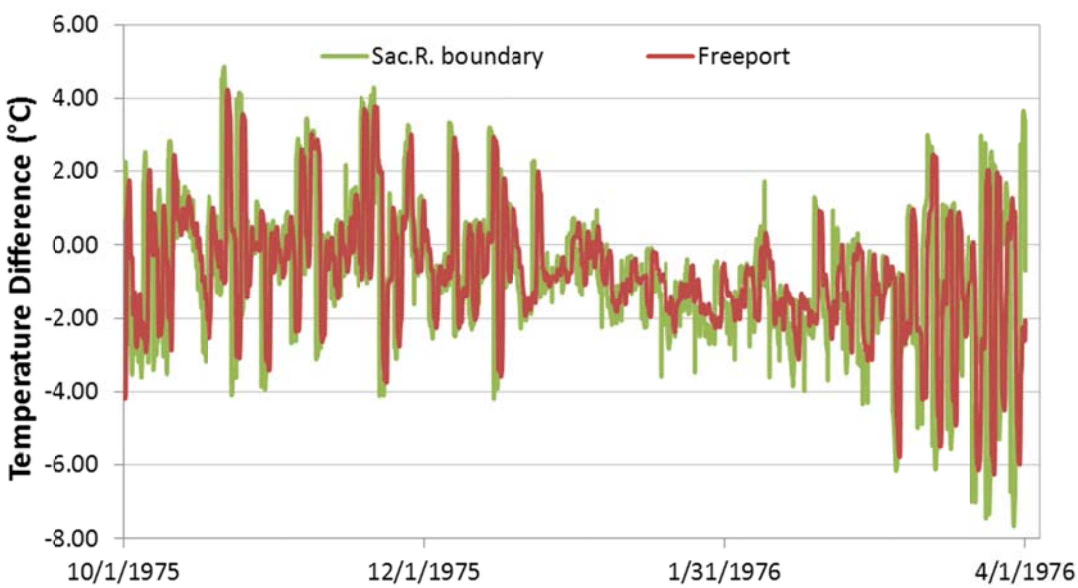

Figure 4. Difference in Freeport temperature ($T_{new} – T_{old}$) for No Action LLT

Table 2— Changes in input boundary temperature (°C) for WY76-91

Statistics	BDCP No Action ELT			BDCP No Action LLT		
	Martinez	Vernalis	Sac. R. bdry	Martinez	Vernalis	Sac. R. bdry
max	6.39	8.60	8.00	7.82	9.11	7.05
min	-6.40	-10.20	-8.99	-7.15	-5.68	-10.90
mean	0.01	0.07	-0.06	0.01	1.28	-1.25
median	0.00	0.00	0.00	0.19	1.10	-1.22

Table 3— Changes in simulated Freeport temperature (°C) for WY76-91

Statistics	BDCP No Action ELT	BDCP No Action LLT
max	7.78	4.80
min	-7.12	-8.96
mean	-0.05	-1.09
median	0.00	-1.06

RECOMMENDATIONS

Flow Science recommends that SRCSD comment that the EIR does not contain information—and the modeling data upon which the EIR is based are insufficient—to support any conclusions about how Sacramento River temperatures at Freeport may change in the future.

REFERENCES

Flow Science (2013). Review of availability of temperature model results for BDCP scenarios. Technical memorandum to Jason Lofton, SRCSD, from Al Preston and Susan Paulsen. November 14. FSI 098116.

U.S. Department of the Interior, Bureau of the Reclamation and U.S. Department of Fish and Wildlife; the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service; and the California Department of Water Resources (Reclamation, USFWS, NMFS, and DWR) 2013. Draft Environmental Impact Report / Environmental Impact Statement, Bay Delta Conservation Plan. Sacramento, CA: December 2013.

ATTACHMENT A

Flow Science (2013). Review of availability of temperature model results for BDCP scenarios. Technical memorandum to Jason Lofton, SRCSD, from Al Preston and Susan Paulsen. November 14. FSI 098116.

BDCP1651

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TECHNICAL MEMORANDUM

To: Jason Lofton, SRCSD

From: Al Preston and Susan Paulsen

Date: November 14, 2013

Subject: Review of availability of temperature model results for BDCP scenarios
FSI 098116

Summary

SRCSD requested that Flow Science review model results received to date as part of the Bay-Delta Conservation Plan (BDCP) process to determine if sufficient information is available to evaluate changes in the temperature of the Sacramento River at Freeport that may result from the implementation of the BDCP proposed project. As detailed below, Flow Science's review indicates that models have been run to evaluate river temperature changes, but temperature results from these models have not been made available yet. Although Flow Science could run the models internally to evaluate river temperature changes, we recommend instead that any evaluation of river temperature be based upon DWR's model results, which should becom available when the Draft EIR is released; the current target date for release is mid-December.

Hard Drives from DWR

Flow Science received hard drives from the Department of Water Resources (DWR) on 2/24/2012 and 4/5/2013, and a flash drive on 5/5/2013. These drives include CALSIM II and DSM2 model results for the existing condition, a future no-action alternative, and a range of project alternatives. Flow Science has reviewed the information on these drives and could not find temperature information in the DSM2 results provided by DWR. Flow and stage are computed by DSM2-HYDRO, while EC and temperature are computed by DSM2-QUAL[1]. The drives do contain EC results, which indicates that DSM2-QUAL has been run and temperature results likely exist. In addition, the 2013 BDCP Draft Chapters (see below) refer to temperature results from

[1] http://www.waterplan.water.ca.gov/docs/tools/descriptions/DSM2-description.pdf

DSM2-QUAL simulations. Conversations with others working on BDCP review (e.g., CCWD) indicate that they likewise have not received DSM2-QUAL temperature results but believe that the modeling has been completed.

Flow Science emailed DWR on 9/25/2013 to inquire about the status of the DSM2-QUAL temperature results, and was informed via email on 9/26/2013 that DWR is still working on preparing the temperature data for public release. Flow Science requested to be informed via email when the temperature results become available.

Although DSM2-QUAL temperature results are not available, the hard-drives do include some temperature results from the Sacramento River Water Quality Model (SRWQM). However, these appear to be for a different model period (1921 – 2003), only for the Sacramento River, and available only as daily output. In addition, the furthest downstream location for which these temperature data are available is Knights Landing, which is located just upstream of the confluence of the Feather and Sacramento Rivers. Since the Feather River and American River provide significant inflow to the Sacramento River, model output from this location is not useful in evaluating temperature changes in the Sacramento River at Freeport.

It is noted that the SRWQM may have subsequently been extended to include Freeport[2], but results on the hard-drive do not reflect this.

Review of 2013 BDCP Draft Chapters[3]

There are several relevant sub-sections of Section 5, but none have explicit numeric temperature results that can be applied at Freeport.

1. "BDCP Chapter 5 - Effects Analysis 3-27-13.pdf"

Monthly temperature results are available for four locations (Keswick [near Redding] and Bend Bridge [near Red Bluff] in Sacramento River, and at the Fish Barrier and Honcut in the Feather River). These locations are well upstream of Freeport. Excerpts below:

[2] http://www.environmentguru.com/pages/elements/element.aspx?id=421762
[3] Released March 2013.

5.3.2.1 Water Temperature

Water temperature effects caused by the BDCP are limited to the upstream Sacramento and San Joaquin Rivers and their tributaries. With the exception of the Feather River, changes are minimal. Comparisons of water temperature differences between EBC and ESO scenarios were not conducted for the Plan Area. The reasoning behind this is provided in the USFWS (2008:194) BiOp.

> The [state and federal] water projects have little if any ability to affect water temperatures in the Estuary (Kimmerer 2004). Estuarine and Delta water temperatures are driven by air temperature. Water temperatures at Freeport can be cooled up to about 3°C by high Sacramento River flows, but only by very high river flows that cannot be sustained by the projects. Note also that the cooling effect of the Sacramento River is not visible in data from the west Delta at Antioch (Kimmerer 2004) so the area of influence is limited.

Appendix 5.C, Attachment 5.C.A, *CALSIM and DSM2 Modeling Results for the Evaluated Starting Operations Scenarios*, provides the DSM2-QUAL comparison of water temperatures under existing biological conditions with BDCP's preliminary proposal (Alternative 1.A as described in the environmental impact report/environmental impact statement [EIR/EIS] for the BDCP [ICF International 2012]). Although the preliminary proposal has been superseded by the ESO (Alternative 4 of the BDCP EIR/EIS, one potential outcome of the decision tree process), the comparison between EBC scenarios and preliminary proposal scenarios is provided to illustrate that there is very little difference in Plan Area water temperatures between these scenarios. Water temperature differences between scenarios are attributable to climate change, as discussed in Appendix 2.C, *Climate Change Implications and Assumptions*.

Water temperatures in rivers below the SWP and CVP reservoirs may be affected in the future by the combination of Delta operations and by climate change effects on air temperatures. The physical factors that control the seasonal water temperature patterns in upstream tributary streams and the potential biological effects of increased temperature on various fish life stages are discussed below. Climate change also will affect precipitation and runoff; these expected changes in reservoir inflows will interact with reservoir operations (flood control releases and water supply storage) to also change the release temperatures from the major SWP and CVP reservoirs.

Water temperature in the Sacramento River immediately downstream of Shasta and Keswick Dams is determined by a number of factors that include the availability of cold water stored in the upstream reservoirs, seasonal atmospheric conditions, and the level of instream flow released to the river. Table 5.3-5 summarizes differences in upstream temperatures. Table 5.3-6 shows the monthly and annual mean temperature changes at four key locations in the upper Sacramento River. There will be minimal changes in Sacramento River temperatures as a result of BDCP. As described above, the BDCP will not result in changes in San Joaquin River flows and therefore will not contribute to any changes in temperature.

2. "BDCP Effects Analysis - Appendix 5.C.1 through 5.C.4, 5.C.6 - Flow, Passage, Salinity, and Turbidity 3-27-13.pdf"

As noted at page 5C.4-101 of Appendix 5.C, Section 5C.4, the Draft documents state that "Water temperatures at Freeport can be cooled by up to about 3°C by high Sacramento River flows, but only by very high river flows that cannot be sustained by the projects." See excerpts below.

Methods Used — Appendix 5.C, Section 5C.4

5C.4.4.4 Water Temperature

Comparisons of water temperature differences between existing biological conditions and evaluated starting operations scenarios were not conducted for the Plan Area. The reasoning behind this is provided in the USFWS (2008:194) OCAP BiOp:

> The [state and federal] water projects have little if any ability to affect water temperatures in the Estuary (Kimmerer 2004). Estuarine and Delta water temperatures are driven by air temperature. Water temperatures at Freeport can be cooled up to about 3°C by high Sacramento River flows, but only by very high river flows that cannot be sustained by the projects. Note also that the cooling effect of the Sacramento River is not visible in data from the west Delta at Antioch (Kimmerer 2004) so the area of influence is limited.

Attachment 5C.C, *Water Temperature*, provides the DSM2-QUAL comparison of water temperatures under existing biological conditions with BDCP's ESO, i.e., Alternative 1A of the BDCP EIR/EIS. Although the preliminary proposal has been superceded by the evaluated starting operations (one potential outcome of the decision tree process, as encompassed by Alternative 4 of the BDCP EIR/EIS), the comparison between EBC scenarios and ESO scenarios is provided to illustrate that there is very little difference in Plan Area water temperatures between these scenarios. Water temperature differences between scenarios are attributable to climate change, as discussed in Appendix 2.C, *Climate Change Implications and Assumptions*.

3. "BDCP Effects Analysis - Appendix 5.C - Attachment C.C Water Temperature 3-27-13.pdf"

DSM2 QUAL model results were used to interpret effects on fish at numerous locations in the Delta. Results are presented in terms of frequency (or number of days) temperatures are within or outside certain limits (related to fish well-being). It would be difficult to use these results to infer the temperature changes that are expected to result at Freeport as a result of BDCP implementation.

Appendix D

Regional San Comments on BDCP and Associated Draft EIR/EIS

Flow Science Technical Memorandum on BDCP Temperature Related Impacts to SRWTP

REGIONALSAN
TAKING THE WASTE OUT OF WATER
Sacramento Regional County Sanitation District

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Treatment Plant
8521 Laguna Station Road
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September 6, 3012

John Laird, Secretary
California Natural Resources Agency
1416 Ninth Street, Suite 1311
Sacramento, CA 95814

Ms. Theresa Olson
Conservation and Conveyance Division Chief
Bay-Delta Office
Bureau of Reclamation
801 I Street, Suite 140

Sent via e-mail: *secretary@resources.ca.gov*, tolson@usbr.gov

Subject: Relevance of Ammonia Load Reductions in the Important Regional Actions section of the Conservation Strategies in the Bay Delta Conservation Plan

Dear Secretary Laird and Ms. Olson:

The Sacramento Regional County Sanitation District (SRCSD) appreciates the opportunity to review the Administrative Draft Bay Delta Conservation Plan (BDCP). We have previously commented on various versions of the document and continually requested that sound science be the basis for the BDCP and that all BDCP related impacts on SRCSD be fully mitigated.

The purpose of this letter is to inform you of SRCSD's objection to the inclusion, in the March 2013 draft BDCP's "Conservation Strategy," section 3.5.1., titled "Ammonia Load Reduction" as an "Important Regional Action" under the BDCP. This topic is not an appropriate part of BDCP conservation measures because it is not among the activities that the applicants for incidental take permits propose to undertake. It also perpetuates disputes that are now moot. We are also concerned about potential unknown and unforeseen consequences to SRCSD. We request the removal of this section for reasons discussed below.

The BDCP is being proposed by parties other than SRCSD who wish to acquire long-term incidental take permits under the Endangered Species Act (ESA) as a means to protect diversion of water from the Delta. Under section 10 of the ESA, a conservation plan must specify actions that the permit applicant or applicants will take to avoid, minimize, or mitigate impacts of their take. BDCP thus must and should focus on the applicants' activities that will support their request for a permit that authorizes their take. The March

2013 draft BDCP's inclusion, among its conservation measures, of actions that SRCSD, not the applicants, will take is out of place and not appropriate.

In addition, as you are probably aware, the role of ammonia in the estuary has been debated in the Delta scientific community for the past five years. This debate ultimately led to strict ammonia limits in SRCSD's 2010 National Pollutant Discharge Elimination System (NPDES) permit. While SRCSD does not agree that the science used to set the ammonia discharge limits is "settled", in April 2013, SRCSD agreed to drop its challenge to the NPDES permit provisions requiring significant reductions of ammonia and nitrate in its treated effluent. In fact, SRCSD has already spent millions of dollars towards upgrading its treatment plant and we expect to ultimately spend a total of over $800 million just on ammonia and nitrate removal by the time the treatment plant upgrade is completed.

Additionally, the description of scientific facts presented in Section 3.5.1 is not a fair representation of the current understanding of the effects of ammonia in the Delta and Suisun Bay. The text in this section overstates the magnitude and certainty of the effects of reduced ammonia loadings by relying on only a portion of the scientific literature on this topic.

For these reasons, SRCSD requests that the "Important Regional Action" of ammonia load reduction in chapter 3.5 be removed from the BDCP. The removal of this section will not change the fact that SRCSD has already begun the process of removing ammonia and nitrate from its treated effluent, nor will it affect the timetable for the construction of our treatment plant upgrades.

We will be contacting personnel in the Natural Resources Agency to discuss this issue in the near future. If you have any questions, please contact Terrie Mitchell, Manager of Legislative and Regulatory Affairs, at 916-876-6092 (mitchellt@sacsewer.com) or me at (916) 875-9116 (somavarapup@sacsewer.com).

Sincerely,

Prabhakar Somavarapu

Prabhakar Somavarapu
District Engineer

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