To protect and restore California Rivers by influencing public policy and inspiring citizen action.

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April 22, 2013

Cindy Messer
Delta Program Manager
Delta Stewardship Council
980 Ninth Street, Suite 1500
Sacramento, CA 95814

VIA Personal Delivery and Email

Re: Comments on Proposed Delta Plan Modified Rulemaking Documents to the Text of the Proposed Regulations

Dear Ms. Messer and Council Members:

This organization, Friends of the River (FOR), objects to approval of the Delta Plan (DP), Draft EIR, RDPEIR, and Regulations and to approval of the modified text of the Regulations made available for a 15 day written comment period commencing April 8, 2013. We adopt and incorporate by this reference our prior comment letters of January 11, 14, and 24, 2013, the Environmental Water Caucus comment letters of January 14, and April 22, 2013, and the CSPA, C-WIN, and AquAlliance Comment letter of January 14, 2013. As we did in writing and orally on January 24, 2013, we propose two deletions and two additional short paragraphs as amendments to the Proposed Regulations that we believe would resolve our objections and allow the Council's actions to comply with the California Environmental Quality Act (CEQA). Our position is that you need to neutralize the Regulations so that they do not call for improved, meaning new, conveyance meaning the Delta Water Tunnels.

Both by way of actual language and by universally understood "code", the Regulations call for new conveyance, meaning the Delta Water Tunnels. The Regulations use terms such as "improved Delta conveyance and operations," "optimize diversions in wet years when more water is available," and "decrease the vulnerability of Delta water supplies to disruption by natural disasters, such as, earthquakes, floods, and levee failures." Modified Regulations § 5001(h)(1)(A) and (C). The Delta Water Tunnels-- the proposed project set forth in the Bay Delta Conservation Plan (BDCP)—are the understood way of carrying out these activities

according to the California Department of Water Resources. Moreover, these terms are used in the Regulations' definitions of the achieving of the co-coequal goals established by the Delta Reform Act. That is an unlawful effort to make the new upstream conveyance—the Delta Water Tunnels—the ***only*** BDCP alternative that would be consistent with the Delta Reform Act, the Delta Plan, and the Delta Plan Regulations.

SUMMARY OF SEVERAL CEQA VIOLATIONS

The recommended modifications to the text of the Regulations have done absolutely nothing to cure any of the many extremely serious CEQA violations that were brought to the Council's attention in the above referenced comment letters. In a nutshell, the Delta Plan and Regulations are running interference for— serving as a blocking back for—the massive Delta Water Tunnels by calling for improved, meaning new upstream conveyance. That violates CEQA because he environmental documents prepared in the Delta Plan and Regulations process have failed to even disclose that the Delta Water Tunnels are the true project, let alone evaluate the environmental impacts of developing and operating the Tunnels. As we have said before, there is a difference between filling a water bottle in the Sacramento River and diverting 15,000 cubic feet per second (cfs) of water from it and away from the Delta and the endangered fish species.

Recent "Red Flag" issues raised by the National Marine Fisheries Service ((NMFS) and the U.S. Fish and Wildlife Service concerning the Delta Water Tunnels are many, and include as just one example "potential extirpation of mainstream Sacramento River populations of winter-run and spring-run Chinook salmon over the term of the permit. . . ." (NMFS Progress Assessment and Remaining Issues Regarding the Administrative Draft BDCP Document, p. 12, April 4, 2013). Those species of salmon are listed endangered species under the Endangered Species Act, 16 U.S.C. § 1531 et seq.

The potential impact of a project on endangered species is *per se* significant under CEQA. 14 Cal. Code Regs (CEQA Regulations) § 15065(a)(1). Recirculation of environmental documents is required when new information is provided showing substantial impacts on the environment including impacts on endangered species of salmon as a result of taking significant quantities of the water they live in. *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 447-449; CEQA Regulations § 15088.5(a).

A copy of the NMFS document setting forth these impacts is attached to the original of this comment letter personally delivered to the Council for consideration by the Council and inclusion in the Record. "Potential extirpation" of the salmon as a result of the Delta Water Tunnels is one of many significant environmental impacts that the Delta Plan Regulations CEQA process has failed to disclose let alone evaluate. Preparation and recirculation of a new Draft EIR are required here.

In fact, the Delta Plan, Regulations, and CEQA process violations of CEQA are now aggravated by the State's commencing on March 14, 2013 to actually release chapters of the proposed BDCP including the Delta Water Tunnels. The entire Delta Plan and Regulations CEQA process has failed to provide and disclose the CEQA required "accurate, stable and finite description" of the true project. (For details see EWC January 14, 2013 comment letter pp. 43-46). The true project has been and is the massive Delta Water Tunnels project as announced by the Resources Agency in June 2012 and the Governor in July 2012. The true project has become even more abundantly clear now that the State is releasing the BDCP Plan chapters including Chapter 4 describing the Delta Water Tunnels. A copy of Chapter 4 released March 14. 2013 is attached to the original of these comments personally delivered to the Council for the information of the Council and for the Record. It can be seen from Chapter 4 that there will be 3 intakes for the Tunnels between river miles 37 and 41 (near Clarksburg). (BDCP Ch. 4 p. 4-5). Construction of the intakes would take place December 2017 to August 2021 and each intake would have a capacity of 3,000 cfs. (Ch. 4, p. 4-6). The intakes, Tunnels and forebays would take up 2,700 acres and the Tunnels would be 45 miles long with a conveyance capacity of 9,000 cfs. (Ch. 4, p. 4-8)(Actually, the capacity of the dual Tunnels will be 15,000 cfs).

The failure to provide an accurate project description and evaluate the environmental impacts of the true project—the Delta Water Tunnels--also violates CEQA by unlawfully segmenting and postponing environmental review from the adoption of the Delta Plan and Regulations calling for improved, meaning new upstream conveyance. (For details see FOR comment letter, January 14, 2013).

The CEQA Guidelines (14 Cal. Code Regs 15,000 et seq.) define a "project" to mean "the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment. . . ." Guideline § 15378. "All phases of a project must be considered when evaluating its impact on the environment: planning, acquisition, development, ***and operation***." Guideline § 15126. (Emphasis added). Instead of doing what CEQA requires, the Delta Plan and Regulations unlawfully make the most fundamental planning decision ever to be made in the history of the Delta— calling for improved, meaning new, upstream conveyance— without any CEQA analysis of the impacts of that new, upstream conveyance in all phases of the project including ***operation***. "CEQA's informational purpose 'is not satisfied by simply stating information will be provided in the future.'" *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 441. *Accord, Environmental Protection Information Center v. California Dept. of Forestry and Fire Protection* (2008) 44 Cal.4th 459, 502-504 (not proper to defer portion of environmental analysis to approve a plan by a statutory deadline).

There has also been complete failure to identify and properly consider a reasonable range of alternatives to the Delta Water Tunnels, including the EWC alternative (alternative 2) calling

for reduced exports, no new upstream conveyance, and emphasis on water conservation and recycling to efficiently and effectively meet water supply needs. (For details see EWC January 14, 2013 comment letter pp. 39-67). No other alternative, including the EWC alternative has been compared to the true project— the Delta Water Tunnels. The RPDEIR concluded that alternative 2 is slightly environmentally inferior to the proposed project. The NMFS, however, finds that the proposed project involves the "potential extirpation" of two populations of Chinook salmon. Consequently, the EWC alternative is environmentally superior to the proposed project. The failure to disclose and evaluate this and other significant adverse impacts of the proposed project and the failure to conduct reasoned, unbiased analysis of alternatives constitutes failure to proceed in a manner required by law under CEQA.

The CEQA violations are so numerous and so extreme that they cannot be cured or evaded by responses to comments on the draft environmental documents. Unless our proposed or equivalent amendments are adopted, it will be necessary for the Council to require preparation and recirculation of a new Draft EIR. That is because: "The draft EIR [and RPDEIR] was so fundamentally and basically inadequate and conclusory in nature that meaningful public review and comment were precluded." CEQA Regulations § 15088. 5(a)(4).

PROPOSED AMENDMENTS

The following deletions and new Regulations Section are proposed to allow the Council to adopt a Delta Plan and Regulations without violating CEQA by calling for new conveyance— the Delta Water Tunnels. Our suggested language is as follows:

Delete from § 5001(h)(1)(A) the phrase "and improve Delta conveyance and operations."

Delete § 5001(h)(1)(C) in its entirety including "improving conveyance in the Delta" and "to optimize diversions in wet years when more water is available."

Add new Section where the Council thinks best:

§_____ Delta Plan and Regulations do not Call for New Conveyance

(a) In the absence of "comprehensive review and analysis" including "a reasonable range of Delta conveyance alternatives, including through-Delta", "the potential effects of climate change, possible sea level rise up to 55 inches,", "the potential effects on migratory fish and aquatic resources", and the "potential effects of each Delta conveyance alternative on Delta water quality" (Draft EIR 23-3, 4) supposedly to be provided in the future by the BDCP CEQA process; and in the absence of water supply availability analysis, quantification, and analysis of the environmental impacts of supplying specific quantities of water required by CEQA as determined by the California Supreme Court's decision in *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412; it is not possible at

this time for the Council to lawfully call for, plan for, encourage, recommend, or require development of new conveyance upstream from the Delta for the exporters.

(b) These Regulations and the Delta Plan do not call for, plan for, encourage, recommend, or require development of new conveyance, intakes, tunnels, canals and/or diversions upstream from the Delta for the exporters, improved Delta conveyance and operations, or optimizing diversions in wet years when more water is available. Nothing in these Regulations and the Delta Plan, or the draft EIR or RPDEIR establishes support for any future decision including but not limited to the BDCP process to favor selection of an alternative of development of new conveyance and diversions upstream from the Delta including the Delta Water Tunnels as opposed to other alternatives such as reducing exports and/or maintaining through-Delta conveyance. This provision is necessary to ensure that the Delta Plan and these Regulations do not violate CEQA and/or lead to development of or creation of momentum for a project or projects such as the Delta Water Tunnels prior to comprehensive CEQA analysis of the true project. This subsection and subsection (a) of this Section control over any provision or provisions in these Regulations, Delta Plan, Draft EIR and/or RPDEIR in actual or arguable conflict with this subsection and/or subsection (a) of this Section.

CONCLUSION

The most important and fundamental planning decision made in the history of the Delta will be whether or not to develop massive, new upstream conveyance from the Delta. That is a planning decision that cannot even be considered rationally, let alone made, until after comprehensive CEQA analysis of the true project—the Delta Water Tunnels— has been performed.

Please call if you have any questions about our comments.

Sincerely,

/s/ E. Robert Wright

E. Robert Wright

Senior Counsel

NMFS Progress Assessment and Remaining Issues Regarding the Administrative Draft BDCP Document[1]

4/4/13

In April 2012, the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) submitted our "red flag" comments regarding the previous draft of the Bay Delta Conservation Plan (BDCP). These comments were developed by agency staff to flag those issues that may require significant changes to the BDCP and would need to be resolved prior to final submittal of the plan. Since then, NMFS has worked closely with the State and its consultants on the details of the revised BDCP. The following is an assessment of the materials provided to NMFS in the December 2012 Administrative Draft BDCP document as well as Section 5.5, which was submitted to NMFS in February 2013. Additional draft materials were subsequently submitted to NMFS on March 1st. We have conducted a cursory review of the March 1st materials to confirm that all of the following comments are still applicable, but we have not had the opportunity to conduct a complete and thorough review of those newer materials.

We would like to acknowledge the very significant improvements and progress that have been made in the development of the effects analysis and the plan itself over the past year. DWR has substantially amended the proposed plan by reducing the number of planned intakes and overall capacity and including significant improvements to operational criteria, including the High Outflow Scenario and improvements to South Delta Old and Middle River (OMR) limits. These changes are in direct response to our previous red flags and are critically important to providing for species needs.

We have experienced excellent cooperation and coordination with the project consultants (ICF International) along with the other planning agencies. There has been significant improvement in the expanded analytical methodologies used in the effects analysis and many technical and policy issues have been resolved. Many other technical and plan component issues are currently in active discussion, and we are optimistic they can be resolved with additional time, technical resources, and independent peer review. We look forward to continuing our close collaboration with all of the involved parties to resolve remaining issues and complete this planning process.

The first section of this document is intended to provide an assessment of the progress that has been made in addressing NMFS' initial comments provided in April 2012, following our review of the previous draft BDCP document. The format below shows our previous comments from last April, followed by our updated assessment of these issues in **bold print.** We have categorized the comment headers to allow for quick viewing:

- Critical = Significant disagreement between NMFS and consultant team and/or no significant progress made to resolve issue.
- Important = Significant progress has been made or is in process of being made on methods. We have not yet seen the results, or there is disagreement on results, or interpretation of results that NMFS believes could be resolved with more time and effort.
- Resolved = Red flag is resolved.

[1] December 2012/February 2013 version

The second section of this document describes several new comments and issues resulting from our review of the current draft of the BDCP (the December 2012/February 2013 version of the document or AdminDraft). These new concerns highlight key areas of the BDCP that will need to be addressed between now and the time that the plan and accompanying materials are submitted to us as a complete application under section 10 of the ESA. We have provided, where possible, suggestions for addressing these comments and are committed to working closely with our State and Federal partners to find resolutions to these issues. We view these comments as critical to the completion of a successful planning effort and generally they should be viewed as very important for resolution, preferably prior to issuance of the public draft. In addition to these comments, NMFS has also submitted more detailed technical comments and edits in "track changes" format for each chapter of the BDCP directly to the State and its consultants.

In summary, we note very substantial progress has been made, and we look forward to continue to work collaboratively with all parties towards timely completion of this ambitious plan.

Section 1: Progress Assessment on Resolution of Previous Comments/Issues: NMFS List of Issues Unresolved in BDCP Administrative Draft (from 4/2/2012; 2013 updates in bold print)

1.1 Hood Diversion Bypass Flows (Critical)

Previous comment: The Effects Analysis of the Preliminary Proposal (PP) raises concerns over reduced flows downstream of the North Delta diversions, especially in winter and spring months. These flows relate to:

A. Increased frequency of reversed Sacramento River flows at the Georgiana Slough junction. The January 2010 PP rules included a provision that north Delta pumping would not increase these reverse flows. CALSIM II results provided by CH2M-Hill indicate that the PP will increase the percent of time Sacramento River flows are reversed, causing increased entrainment of juvenile salmonids into the Central Delta. If the frequency of reverse flows increases due to the PP, then the diversion amounts allotted under the PP could not be implemented. The DSM2 analysis of reverse flows in the DPM suggests that tidal marsh restoration in the Delta will nearly offset both the effects of sea-level rise and large water diversions from the Sacramento River, a conclusion which needs much more explanation in the EA (see comment on tidal marsh effects).

B. Long-term viability of sturgeon populations. There are concerns that Sacramento River flow reductions will impact the reproductive success of white and green sturgeon, which have been documented to produce strong year classes mostly in years with high flows in April and May (AFRP study). We do not know if this has been addressed in revised Appendix C.

1. Further explanation and analysis of the reverse flow issue.

2. Work with the Services to find a diversion operating scheme that is still likely to be permitable after adequate modeling and analysis has been conducted.

Update: The modeling analysis in the Admin Draft indicates that the Evaluated Starting Operations (ESO) will generally result in a reduction in flows below the north Delta diversions, but that those reductions will not result in increased duration or magnitude of reverse flows at the Georgiana Slough junction. This conclusion is relatively counter-intuitive and the concepts and mechanisms that support this conclusion, and the level of uncertainty around it, need to be very clearly explained in thorough detail. We also recommend independent peer

review of these methods and results. Regardless of the modeling results, the planning parties agreed that the north Delta diversions would be operated in a manner that would not result in increased frequency, duration or magnitude of reverse flows at the Georgiana Slough junction. Therefore, the description of Conservation Measure 1 (CM1) needs to very clearly explain that real-time operations will be managed to insure that diversions in the north Delta will not result in increased frequency, duration or magnitude of reverse flows at the Georgiana Slough junction. Such a description is currently missing from CM1.

With regard to the Delta flows needed for sturgeon reproductive success, the spring outflows provided under the High Outflow Scenario (HOS) appear to meet the 25,000 cfs outflow in 50% of years as recommended in NMFS' Combined Scenario 5 (CS5) criteria. The other decision tree scenarios do not provide these flow parameters and therefore would not be likely to provide the necessary benefits to contribute to the recovery of green sturgeon.

There are additional concerns with the modeled ESO bypass flows with regard to juvenile salmonid survival downstream of the new intakes. The effects analysis acknowledges that there are potential impacts from reduced flows downstream of the intakes, as seen in the results of the Newman (2003) analysis, which shows slightly reduced (though not statistically significant) survival rates through the Delta, and the Delta Passage Model, which shows a slight decrease in smolt survival prior to the addition of survival benefits from Yolo Bypass.

NMFS has conducted a simple analysis of survival using Newman's (2003) and Perry's (2010) flow-survival relationships showing average survival rates under different bypass criteria levels (provided under separate cover). This assessment indicates a significant reduction in salmonid survival under level 3 pumping criteria for the ESO as compared to Existing Biological Conditions (EBC2). This is a key finding and should be carried through into the net effects analysis.

In summary, our recommendations on this topic are to:

- Submit the reverse flow analysis and conclusions to independent peer review.
- Amend the HOS decision tree to include the green sturgeon criterion.
- Augment the effects analysis to include NMFS analysis and to highlight magnitude and certainty of effects associated with Level 3, as compared to Level 2 and Level 1 pumping/bypass criteria.
- Submit the NMFS and ICF analyses of survivals associated with varying pumping/bypass criteria to independent peer review.
- In light of steps above, seriously consider amending Level 3 pumping/bypass criteria prior to submitting the section 10 application.

1.2 **Salmonid Net Effects (Critical)**

Previous comment: All salmonid species are grouped together, with no separate evaluations for the separate ESUs of Chinook salmon or for steelhead. It is important for the net effects analysis to describe individual ESUs/species, and provide full consideration of the life-history diversity and timing exhibited by each ESU/species. We also need the Sacramento River populations and San Joaquin populations for Spring-run Chinook, Fall-run Chinook, and Central Valley steelhead summarized by river basin, prior to the roll-up by ESU/DPS. Steelhead life-history and ecology especially warrant a separate evaluation. "Net effects" is useful for comparing alternative

operations, but will not provide the robust effects analysis needed for ESA purposes (see comment on ESA baseline).

Separate all Chinook by ESU, by San Joaquin and Sacramento populations, and separate steelhead in all analyses and discussion.

Update: The initial issue has been addressed. Each species and Evolutionarily Significant Unit (ESU) has a separate analysis.

Now that the analysis has been separated out by species and ESU, we have been able to determine the following concerns with the net effects analysis:

The net effects section does not provide a well-integrated assessment of the overall population-level effects of the plan. It is primarily a reporting of disparate segments and a summary of the different analyses, without an analytical method or over-arching conceptual model to tie them all together (i.e., feed one into another). It is still a discussion of the application of different methods to different life stages. Results are based on "environmental attributes" that are scored for magnitude of effect and uncertainty; the agencies did not have an opportunity to assess these scores and there are no tables of these attribute magnitude/certainty scores provided for salmon and sturgeon.

During the effects analysis review workshops conducted in November/December 2012, ICF and the interagency technical team agreed that the environmental attributes analysis in the net effects section should be fundamentally re-worked to make flow a much more robust element of the stressor tables by including the "five attributes" of flow (magnitude, timing, frequency, duration, and rate of change), how the project would affect each of these attributes, and how these changes would affect fish. These agreements are not reflected in the framework of the current environmental attributes analysis and should be incorporated into the next draft.

There needs to be a systematic method for selecting the number of attributes that are summed in the net effects. For example, for steelhead, there are four categories of food in the summary figure, which doesn't seem appropriate for salmonids, especially the migrants. At the same time, no benefit is assigned to channel margin habitat restoration in the figure. A table showing the summed scores for all attributes would be more helpful than the figure.

The attributes themselves need to be better defined. E.g., how does "Sacramento River Flows" differ from "Sacramento River Habitat" differ from "channel margin" or "riparian"? A conceptual model would help with this. The assessment should be of the *change* in these factors attributable to the project.

There needs to be a second level of analysis to weight the results by the proportion of each life history type exposed to the effect (e.g., the 95% migrants to 5% foragers split for juvenile steelhead seems appropriate, but each segment is given equal emphasis in the summary figure).

Some QA/QC needs to be done to make sure the conclusions from the text match the summary figure (e.g., in steelhead, the figure shows a moderate benefit from Feather River flows, but there is no discussion of this in the text).

The changes in flows mentioned for some locations need to be translated to their effects on water temperature in order to fully understand their impact. For example, a 28% reduction in flow for the American River shown under ESO and HOS in the summer and fall months could potentially cause significant temperature issues for juvenile steelhead, as these are the months that the river can get very warm in lower-flow years.

There also needs to be a more systematic method for assigning level of benefit from a CM to a species. For example, in the steelhead net effects section, the sensitivity analysis for non-physical barriers showed a 0.00 (zero) survival increase in one year, and a 0.03 increase in a second year, yet the conclusion was a moderate positive change with moderate certainty. We recommend that a facilitated workgroup including biologists from all five agencies and ICF be charged with assigning specific magnitude and certainty scores and documenting the rationale and data sources for those determinations.

As part of the South Delta Research Collaborative, NOAA's Southwest Fisheries Science Center has developed a simple "top-down" conceptual model of south Delta operational effects on salmonids, which among other things links hydrodynamics to predation. We recommend that ICF coordinate with the agency staff involved in this collaborative process and exchange information on common issues being analyzed in both efforts.

In summary, our recommendations on this topic are to:

- **Conduct a facilitated workshop with the agencies to identify conceptual models of operational effects on salmonids and sturgeon and to agree on a model to guide the quantitative net effects analysis.**
- **Conduct a facilitated workshop with agencies to discuss and define environmental attributes and scores, the methodology of combining and weighting scores, and incorporation of the five attributes of flow.**
- **Complete a thorough cross-check of conclusions in text against those in figures.**
- **Explore flow-temperature relationships in upstream areas to provide a better inference of effects of reduced flow on temperature stress.**

1.3 ESA Baseline, Future Conditions, and Climate Change (Important)

Previous comment: In order to conduct the ESA jeopardy analysis on the PP, the baseline condition and projections of future baseline conditions, including effects of climate change, need to be re-written to be consistent with the 2009 Biological Opinion and current case law. ESA regulations define the environmental baseline as "the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process." Implicit in this definition is a need to anticipate the future baseline, which includes future changes due to natural processes and climate change. For the ESA jeopardy analysis we add the effects of the proposed action[2] to the

[2] Effects of the action refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline.

environmental baseline to determine if there will be an appreciable reduction in the likelihood of survival and recovery of the species (by reducing its reproduction, numbers or distribution).

Upstream effects associated with climate change need to be in the baseline and future conditions, with any effects of the project (in the Delta or associated with upstream operations) added to that future condition to determine jeopardy. A project proposed in this type of baseline conditions needs to more than offset its effects in order to alleviate a jeopardy finding.

Update: As a result of this comment, ICF is developing a scope to conduct a new "aggregate" analysis that meets the needs of FWS and NMFS. NMFS intends to continue to work with them and the other agencies to complete this analysis and incorporate it into the effects analysis of the proposed project prior to submitting the section 10 application.

1.4 Analysis of Water Temperature Impacts (Important)

Previous comment: Lethal and sub-lethal water temperature thresholds need to be examined at a finer scale. Currently the effects analysis relies heavily on a Reclamation water temperature model which can only estimate monthly values, which have limited value for predicting project effects on fish. In addition, the effects analysis has only presented frequencies of temperature threshold exceedances, while the magnitude and duration of exceedance is also very important. We do not know if this has been addressed in revised Appendix C.

1. Provide tables and probability plots of magnitude and duration of temperature exceedances at certain upstream locations, by water year type and month.
2. Technical discussion with Reclamation and CH2MHill about how to post-process data.
3. Investigate the use of SWFSC's Sacramento River temperature model to predict project effects and make hindcasts of empirical temperatures.
4. Investigate the use of the new American River temperature (and storage and flow?) model

Update: NMFS and ICF are working to develop temperature data presentation methods that provide a more useful representation of results. Daily data will be used when available to indicate the magnitude and duration of temperature exceedances at compliance locations. These new analytical methodologies have not yet been incorporated into the effects analysis.

1.5 Assumption of Habitat Restoration CM Success (Critical)

Previous comment: In several places, the EA assumes that adverse impacts of the PP will be offset by unsubstantiated benefits of habitat restoration. The EA assumes that all restoration will be successful and work as predicted, with little or no evidence to support this prediction and no attempt to analyze the potential outcomes of less than perfect success.

1. It is imperative to avoid language such as "This conservation measure will...", because the anticipated CM outcomes are based on conceptual thinking, not execution. To be able to comprehensively think through the adaptive management and monitoring plan, implementers need to try to anticipate a range of responses that must be managed in order to be prepared for the uncertainty of the response.
2. Alternative outcome scenarios should be evaluated to bracket the range of possible outcomes from proposed habitat restoration.

Update: Language has been altered to reflect uncertainty to an extent, but alternative outcome scenarios have not been evaluated; all analyses and results assume that restoration activities will be successful. Alternative outcome scenarios showing varied effectiveness of habitat restoration efforts have not been provided, and therefore it is not possible to assess the effects of CM1 without the assumed benefits of completely successful habitat restoration. The total success of habitat restoration efforts remains highly uncertain, and an appropriate analysis should include an evaluation of the biological effects of at least a partial failure of efforts that are expected to "improve" conditions.

ICF has indicated that a comprehensive list of previously restored areas and "lessons learned" is included in the description of CM3, but we were not able to find the summary of "lessons learned". The list in Table 3.4.3-5 shows several estuarine aquatic habitat restoration projects but the "Results" column does not provide any direct links to improved biological metrics such as growth, survival, or abundance of native fishes.

1.6 Overreliance on Real-time Operations and Adaptive Management (Important)

Previous comment: In several places, the EA assumes that adverse impacts of the PP will be fully resolved through the implementation of real-time operations and adaptive management. This may not always be possible. For example, long-term trends towards reduced carryover storage may not be able to be mitigated using real-time operations. How adaptive management might work in this situation has not been fully assessed. There are going to be limitations on what adaptive management and real time operations can accomplish.

> *Examine recent (five to ten years) real-time management of the cold water pool in Shasta Reservoir to determine both the effectiveness of real-time operations and a range of adaptive management options.*

Update: The majority of upstream issues have been addressed through major changes in the proposed project (not withstanding some remaining issues with egg mortality and juvenile survival discussed below). However, there remains a need to more clearly describe how real-time operational adjustments will be implemented to achieve some of the stated objectives of the water operations. Specific examples include the need to thoroughly describe how the new intakes will be operated to: 1) avoid reverse flows at Georgiana Slough; 2) implement pulse protection when monitoring indicates that winter-run Chinook are "riding" a flow pulse; and 3) determine when a sufficient percentage of winter-run Chinook have passed the intakes to end the pulse protection and initiate standard level 1 pumping procedures. While it is understandable that these real-time criteria have not been developed to date (because they have not been necessary to complete CALSIM modeling and run monthly average models of effects), we will need greater specificity on real-time operations in order to meet section 10 permit issuance criteria and complete the underlying Section 7 analysis. We recommend that an interagency technical team be formed immediately to work with ICF to start scoping these real-time criteria.

1.7 North Delta Diversion Effects (Resolved)

Previous comment: Mortality rates from predation and other screening effects are difficult to predict, as there is a high level of uncertainty associated with predation and other effects on

juvenile salmonids. The estimate of <1% loss at all 5 screens is not sufficient without giving additional consideration to higher estimates of mortality (GCID empirical studies showed a 5% per screen loss rate, much higher than the <1% used in the DPM).

1. Bracket the analysis of screen related mortality around a 5% per screen loss assumption.

2. Investigate the use of DWR's hydrodynamic model to assess local flow alterations at the proposed diversion structures, including the creation of predator holding areas. Specific questions are whether the model can simulate on-bank structures and the additional hydrodynamic effects of active pumping.

Update: This comment has been addressed through the inclusion of a more comprehensive analysis of potential screen related mortality including an assessment of a 5% per screen loss rate. The recommendation to conduct a detailed hydrodynamic analysis of the screen face area is being advanced by the Fish Facilities Studies Group. This analysis should be incorporated into the effects analysis when it is available.

1.8 **Predator Control Conservation Measure (Important)**

Previous comment: We agree that predation is a significant risk factor to the listed species, but the assumed positive results of this CM are questionable and unsupported (see F.5.4.1.4 in Appendix F). As an example, localized control of striped bass may not be feasible as this species exists throughout the Plan area and are highly mobile. Few specific details have been presented on how the CM will be implemented, and an aggressive predator removal program could result in significant incidental take of listed species. Due to the high level of uncertainty, we find it very unlikely that we could rely on this measure for any benefits during the permit process.

Remove this CM measure from the plan, and move it to an experimental research program and link to adaptive management. Reflect this appropriately in the EA.

Update: The authors have generally toned down the level and certainty of beneficial effects anticipated from CM15 (Predator Control). However, the measure still lacks an appropriate metric to measure the success (or lack thereof) of the predator control program and seems to assume phase 1 (the scoping stage) will show success and phase 2 will be implemented. There is no discussion of what happens if phase 1 shows no benefits from the program. The conservation measure needs to clearly explain how the success of this action will be measured (metrics and success criteria). The analysis of CM15 also needs to take the next step and describe the expected outcomes if the measure is less than fully successful. This is a very important element of any analysis of actions whose outcome is highly uncertain and should be considered a universal recommendation for all measures where the results of implementation have high uncertainty.

1.9 **Delta Passage Model (Important)**

Previous comment: The Delta Passage Model (DPM) is used as the sole predictor of smolt survival in baseline and PP scenarios. However, the assumptions, inputs, and results are still being validated and reviewed. The datasets used in this model are very limited and largely based on results from hatchery late-fall run Chinook, which are then being applied to other runs of Chinook.

Continue refinement and development of DPM. Weigh validity of results against those of other models and relationships. The use of Newman, 2003 may be another tool to use for assessing the survival of fall and spring run smolts through the Delta.

Update: DPM continues to be refined through discussions with Cramer Fish Sciences and NMFS. Survival analyses based on methods in Newman (2003) have been incorporated into the effects analysis, and results of both models showing similar trends for the modeled years are discussed in the net effects section. NMFS recommends that this model continue to be used as an informative tool but that the results be closely scrutinized to determine what is driving them and if they make sense based on the system as we know it. NMFS also recommends that additional peer review should be conducted – perhaps a reconvening of those who participated in the previous workshop in June 2011.

1.10 **Deficient Analysis of Fry Passage/Survival (Important)**

Previous comment: Because the DPM model is only for smolt sized fish, the salmonid analysis is insufficient as it provides no information on fry-sized salmonid passage/survival.

Add qualitative analysis of fry survival based on best available data. Perhaps add time/added mortality to a modified version of an updated DPM model.

Update: In this new draft, fry growth is analyzed relative to the Yolo Bypass and a fry Particle Tracking Model (PTM) analysis was included (See 5C.5.3.7; 5C.5.4.1.4). ICF has acknowledged these analyses need additional agency input for the public draft. The PTM analysis was discussed at recent species-specific meetings where it was determined that it may not be appropriate for this application. NMFS has requested (and ICF is working on) more detailed (3- and 7-day) PTM output to allow a closer look at travel time through key reaches, which may potentially be linked to fry survival rates through those reaches. It is generally agreed that neutral particle movement does not necessarily mimic the movement of living fish and the SWFSC/NMFS life cycle model will include a "smart PTM" component that attempts to add more "life-like" movement to the particles, which may provide a better way to analyze fry survival.

1.11 **PTM Runs Inadequately Capture Altered North Delta Hydrodynamics (Important)**

Previous comment: PTM model runs did not include conditions in which ND diversions would be at the upper limits of allowable pumping (high proportion of total river flow). The technical memo from NMFS and USFWS highlighted the issue and the resolution to the problem. We will need additional modeling runs to adequately assess ND diversion impacts on salmonid travel time and route entrainment.

Do additional PTM analysis following guidelines outlined in NMFS/USFWS memo.

Update: While it appears from Chapter 5 Appendix B.6 and Appendix C.4.3.2.4 that some of the suggested time periods were included, Attachment 5C.A.9 indicates that PTM was run for 24 representative months. These are the same months that were used in the previous (February 2012) effects analysis draft. The methods attachment needs to be updated to reflect the additional runs.

The time periods recommended by NMFS and USFWS were selected based on evaluation of impacts of a 15,000 cfs capacity project. It is possible that different time periods would be more appropriate to assess the effects of a 9,000 cfs capacity diversion. NMFS will continue to look into this and determine whether the modeled periods capture an appropriate range of effects from the updated project.

1.12 D1641 Export/Inflow Ratio (Important)

Previous comment: Combined north and south Delta exports under the PP exceed the current D-1641 Delta Export/Inflow standard. (The PP calculation method measures Sac River inflow below the North Delta diversions and does not include ND diversions as part of total exports).

1) *Provide summary analysis of differences between PP and EBC by month and water year type using alternate E/I calculations.*
2) *Show resulting flow data for both calculation methods.*

Update: The Export/Inflow (E/I) ratio has been applied two different ways in the three project scenarios (ESO, HOS, and LOS). The "Partial E/I", which measures Sacramento River inflow below the north Delta diversions and excludes north Delta diversions as part of total exports, has been applied to ESO and LOS. However, HOS has been modeled using the "Full E/I", which includes the full Sacramento River inflow upstream of the diversions as inflow and the north Delta diversion exports as exports. This is an inconsistency in approach that raises questions about the subsequent analyses. ICF has indicated that new analyses have been done but have not yet been fully incorporated into the effects analysis. There is placeholder language in CM1 showing both options but the actual operational criteria to be implemented upon project completion has yet to be decided. NMFS recommends that the "Full E/I" criteria be adopted and that this methodology be applied across all scenarios for consistency.

1.13 Yolo Bypass (Important)

Previous comment: Yolo Bypass has great potential for fisheries benefits, but the current EA may be overstating the benefits without adequate studies or data to support these conclusions. Without project specific plans to help quantify the effects, concerns remain about issues such as sturgeon passage, juvenile salmonid survival under lower flow regimes, ability to get juveniles into the floodplain through notch and reduction of flows in the mainstem Sacramento River to accommodate additional flooding in Yolo Bypass. Also, some races/runs of salmon may not have access to Yolo Bypass.

Provide project specific plans and consider the risks of managing the floodplain under lower flows related to issues above.

Update: ICF has indicated that these project specific plans are not yet available, but risks related to stranding, passage, etc., are acknowledged. See 5.C.5.4.1. This is another conservation measure where a lack of specific designs and operating criteria create significant uncertainty as to the efficacy of the measure and level of biological benefits that it will provide. However, the net effects analysis attributes broad success and significant benefits from the measure with no analysis of the consequences of less-than-complete success. We suggest that this is another area where an analysis of less than fully successful implementation should be conducted to determine the sensitivity of the overall plan to the success of this CM.

1.14 Channel Margin Habitat (Important)

Previous comment: Altered flows resulting from the North Delta diversions may result in reduced water levels affecting the percentage of time that current wetland and riparian benches are inundated.

Compare anticipated water levels under future scenarios with those in the design documents of restored wetlands and riparian benches to analyze potential dewatering of those features.

Update: NMFS and ICF are coordinating to develop and execute an effective analysis of the effects of proposed operations on inundation of existing wetland and riparian benches. We will need to assess the results of this analysis with respect to effects on covered fish once the analysis is completed. This analysis should also be submitted to independent peer review.

1.15 Construction and Maintenance Impacts (Important)

Previous comment: The EA does not adequately address the potential for adverse impacts on sturgeon, fall-run Chinook adults, and steelhead adults, which are generally present in the project area during the proposed in-river work windows described for construction and maintenance of North Delta facilities.

Discuss ways of minimizing impacts and implementing mitigation for species not protected by work windows.

Update: NMFS has been working with ICF to incorporate more detail into the construction and maintenance impacts analysis. This has resulted in significant improvements in the analysis. However, several elements, particularly regarding the long-term maintenance of the facilities, lack the detail and specificity to allow NMFS to conduct a thorough assessment of the amount and extent of take that will need to be included in the permit and the section 7 consultation analysis for the project. NMFS generally requires in-water construction projects to be at the 80% design stage for section 7 consultations, and we will likely need that level of design completion to conduct a thorough assessment of the amount and extent of take for this large construction project. We request information from ICF on when this level of design will be ready in order to understand the implications for the schedule, if any.

1.16 Tidal Marsh Impacts on Riverine Flow (Important)

Previous comment: The effect analysis assumes that restored tidal marsh will act to decrease flow reversals, which has not been well explained. It seems that tidal marsh restoration was modeled as a single configuration; there has been no description of that configuration to indicate how they were implemented in the hydrodynamic models. Therefore, there is a lot of uncertainty regarding model results.

Document changes to hydrodynamic models that were implemented to characterize tidal marsh restoration.

Update: ICF has communicated to NMFS that the data that can be provided is limited, and that ICF and the California Department of Water Resources (DWR) have provided as much specificity as they can. ICF met with NMFS and other agencies on March 5, 2013, to provide

additional information regarding the relationship between restoration and tidal dampening as they relate to riverine hydrodynamics, and more specifically to reverse flows near Georgiana Slough (See 5.C). We suggest that the document include a more comprehensive narrative of the tidal hydrodynamics and the effects of tidal habitat restoration, including a discussion of the RMA modeling conducted on this topic. Because of the importance of this analysis to determining potential project effects on covered fish, we recommend that these methods be independently peer reviewed and appropriately characterized for their uncertainty.

1.17 Cumulative Effects Show Long-Term Viability Concerns for Salmon (Critical)

Previous comment: The analysis indicates that the cumulative effects of climate change along with the impacts of the PP may result in the extirpation of mainstem Sacramento River populations of winter-run and spring-run Chinook salmon over the term of the permit.

1) Incorporate operational criteria into the PP that will protect and conserve suitable habitat conditions in the upper river for the species under the 50 year HCP (these operational criteria should be designed to meet the performance criteria in the NMFS BiOp RPA).

2) Convene a 5-agency team of experts specialized in Shasta operations and temperature management to develop the above described operational criteria.

Update: The current efforts to develop a fully "aggregated" effects analysis should address the analytical concerns related to this issue, but the fact that the cumulative effects of the project when combined with effects of climate change and other baseline conditions is showing the potential extirpation of mainstem Sacramento River populations of winter-run and spring-run Chinook salmon over the term of the permit remains as a serious concern.

The reported OBAN and IOS modeling results indicate a potential issue with either the modeling tools (OBAN and IOS), or the author's assertion that the upstream flows associated with EBC2 and ESO are "essentially identical". The conclusions in this section state that "The majority of the effects of both BDCP and climate change were driven by increases in upstream temperatures affecting egg survival, which, relative to the BDCP contribution, is a potential modeling artifact and not an actual predicted effect." However, ICF has determined that these are the best modeling tools available. The results cannot necessarily be discounted because they do not show what was "expected". Since these methods were deemed acceptable, the results need to be fully acknowledged.

The results of these models signal a need for further investigation to determine why they are not what are "expected". It seems that upstream releases between ESO and EBC2 do not match as well as thought, as seen in Table C.5.2 2 titled "Difference and Percent Difference in Flows in the Sacramento River at Keswick, Year-Round". Some summertime and fall months in drier years are very different, which may be what is causing the biological models to show a negative egg survival response. The table below shows the results of month-to-month comparisons of flows out of Keswick for LLT. It indicates that the ESO flows could be as much as 6500 cfs less than EBC2 flows (November) when months are evaluated individually, and not grouped by month and water year type.

Month	Maximum Difference (ESO_LLT - EBC2_LLT)
January	-7683
February	-1571
March	-4825
April	-1221
May	-830
June	-2979
July	-5916
August	-3712
September	-2691
October	-5510
November	-6504
December	-4594

We recommend that ICF work with the Shasta operations experts at Reclamation, and possibly a broader workgroup of biological and operations experts to resolve these issues and determine if/how the entire project can be operated to insure that BDCP does not cause impacts to upstream spawning and rearing habitat in the Sacramento River.

1.18 Holistic Estuarine Evaluation (Critical)

Previous comment: The effects analysis should examine synergistic and cumulative ecological impacts associated with reducing inflows to an estuary that is already severely degraded, and discuss the importance that water quantity, quality, and the natural hydrograph have to the ecosystem, as well as the direct impacts on native fish species. So far, the impacts to fish have mostly been examined in a piecemeal fashion (e.g., examining impacts of flow reduction on adult homing).

> *Incorporate a holistic evaluation of impacts on the estuarine ecosystem. Include discussion of the importance of water quantity, quality, and the natural hydrograph to the ecosystem, and the direct impact that changes to these conditions have on native fish species.*

Update: The holistic evaluation described above in our previous recommendation does not appear in the 2013 Admin Draft of BDCP. We suggest that ICF use Carlise et al. (2010) as a starting point for this discussion. Carlisle et al. found that in an analysis of over 200 stream systems, "biological assessments showed that, relative to eight chemical and physical covariates, diminished flow magnitudes were the primary predictors of biological integrity for fish and macroinvertebrate communities". In other words, the change in flow was a better predictor of whether the biotic communities were impaired than variables such as temperature, pH, total nitrogen, or urban land cover. It is also well recognized that streamflow reductions can impair the ecological function of downstream estuaries (Drinkwater and Frank 1994; Jassby et al. 1995; Loneragen 1999; Flannery et al. 2002; Winder et al. 2011).

1.19 **Burden of Proof (Important)**

Previous comment: Deference should be given to known population drivers and documented relationships (e.g., sturgeon recruitment relationship with flows is well documented, though the exact mechanism is not completely understood). Since flow is a key component of habitat for aquatic species, do not assume that it can be substituted for by other actions.

Do not assume that incremental benefits in a conservation measure will compensate for known population drivers related to flow.

Update: There has been significant improvement in the language used to describe the level of certainty of potential benefits attributed to those CMs that are less certain in their implementability or effectiveness for protecting covered fish. However there remain some instances of overstating/understating of beneficial/detrimental effects. For instance, the net effects analysis concludes that CM2 will "increase floodplain availability and usage and improve conditions for juvenile and adult winter-run Chinook salmon". However, the analytical methods for juveniles suggest only a low or moderate positive change. There are some stated conclusions that are based on analyses that are not yet complete (e.g., bench inundation). Some conclusions suggest that decreases in flows due to the project are "rare" because they only occur in some months of drier water years. But since dry and below normal water years can occur 40% of the time, this should not be considered a "rare" occurrence. There are numerous additional examples of these types of analytical discrepancies provided in the "track-changes" comments on the Admin Draft provided by NMFS.

1.20 **Incomplete Analyses and Documentation (Important)**

Previous comment: The full appendices were not released concurrently with Chapter 5 which makes review of the results problematic.

Provide all appendices/analysis simultaneously so Services can have all pertinent information used in Effects Analysis summaries without having to backtrack weeks later.

Update: While NMFS received the majority of the document on 12/21/12, this did not include Chapter 5.5 Effects on Covered Fish. Appendix 5.B Entrainment was provided on 1/2/13. Chapter 5.5 Effects on Covered Fish was provided on 2/7/13. This lag reduced the ability to simultaneously view results in appendices and assess how they were incorporated into Chapter 5.5.

The "complete" Admin Draft was delivered on March 4, 2013. This presumably includes all additional outstanding sections (Section 5.3 Ecosystem and Landscape Effects, Table 5.2-5 Biological Objectives for Covered Fish and Their Assessment in the Effects Analysis, Tables C.0-3 and C.0-4 Summary Tables, Appendix 5.I Critical Habitat and Essential Fish Habitat Analyses). NMFS has not had an opportunity to conduct a thorough review of this recent submittal.

Specific documentation for all analytical methods are not included or are outdated or incorrect (e.g., SacEFT documentation is outdated according to its developers; OBAN, MIKE21, SALMOD, Reclamation Mortality Model documentation is not included at all). This makes it impossible to fully understand how these models were configured or to determine the exact drivers of the reported results. It appears at times that the chapters/appendices were written by staff unfamiliar with the model operations and intricacies of results.

NMFS suggest that future drafts include updated and correct documentation (manuscripts, user's manuals, etc.) for all analytical methods. Documentation should include listings of all relevant input parameters and relationships. ICF should also draw on the expertise of the developers of specific models to interpret model results, identify uncertainties and limitations, and verify the stated conclusions.

1.21 Insufficient Biological Goals and Objectives (Important)

Previous comment: The conservation measures are sometimes defining the BDCP species objectives, which is insufficient. 30% juvenile through-Delta survival is not a suitable goal for a 50 year conservation plan.

The BDCP objectives should be biological, species-level outcomes.

Update: This issue has generally been resolved (for salmonid BGOs) through the incorporation of the recommendations provided in NMFS' technical memo on juvenile salmonid through-delta survival. However, the text that describes the BDCP's level of responsibility for achieving the through-delta survival objectives does not match what is described in the NMFS tech memo on salmonid BGOs. The tech memo calls for the BDCP to be responsible for 100% of the improvement in smolt survival through the Delta, not >50%. This is because it will be impossible to determine causation for any measured increase in through-delta survival rate. The specific objectives are interim and should be reevaluated over time. The actual tech memo should be included as an appendix to Chapter 3.

The biological objectives for sturgeon abundance and productivity (under GRST1) are vague and rely too much on "documenting the current distribution" and future studies. There needs to be greater emphasis on the objective to provide adequate adult attraction flows.

1.22 OMR Flows Unimproved in Drier Water Years (Important)

Previous comment: Improved OMR flows under the PP occur during wetter years when OMR is less of an issue for covered fish. PP OMR flows are often worse than, or similar to, EBC in drier years. Sacramento Basin fish are most vulnerable to entrainment into the central Delta in drier years when Sacramento River flows have the potential to reverse and OMR levels are below -2,500 cfs. San Joaquin basin fish are best protected by increased Vernalis flows and/or a HORB which the PP does not address.

1. Analyze the risk in different water year types and with different flow levels in the Sacramento River.

2. Implement Scenario-6 to help address the adverse impacts seen under the PP.

Update: This issue has generally been addressed by adopting "Scenario 6" into the proposed project and including the High Outflow Scenario into the decision tree. There were additional south Delta operational criteria included in the agency recommendations developed in the CS5 process. These included additional protections in the "shoulder" months of the juvenile salmonid migratory period (March and June), as well as summer OMR criteria intended to provide protections against sturgeon entrainment into the export facilities. The potential biological benefits of these CS5 criteria should be assessed in the effects analysis. ICF's participation in the South Delta Research Collaborative will provide an important linkage between BDCP and the conceptual models and hypotheses emerging from that effort. This

remains a key issue because of the importance of improving survival of emigrating salmonids from the San Joaquin River system, which is generally less than 10%. We recommend continued iterations on these operations prior to Plan completion, and between Plan completion and full implementation (during ELT).

1.23 Non-Physical Barriers (Important)

Previous comment: Assessment of non-physical barriers is inadequate, and the potential negative effects of predation associated with non-physical barriers haven't been assessed.

Include analysis of potential adverse effects of non-physical barriers.

Update: This is another instance where the certainty of beneficial effects from a CM is overstated in relation to the amount and quality of data on which those conclusions are based. The Georgiana Slough non-physical barrier (NPB) effectiveness is based on one year of data from high flow conditions. We have yet to see results from a lower-flow year when reverse flows at the Georgiana Slough junction may be more frequent. It should also be acknowledged that under the OCAP Reasonable and Prudent Alternatives (RPA) the development and implementation of NPBs would be required if they are found to be effective.

Also, the way in which the effects of NPBs are described is confusing and potentially misleading. According to Appendix 5C.5.4 Methods, there was a 67% reduction in the proportion of fish entering GS/DCC (from 22.1% to 7.4%). However, in the text it is often stated that the NPB provides a "67% deterrence", which implies that 67% of fish approaching the junction would be deterred, and therefore stay in the mainstem. That is not true. It would be better to describe this as a "67% decrease in proportional entry into GS."

1.23.1 Carry-over of OCAP RPA's on technological improvements to South Delta Facilities (Critical)

Previous comment: By not carrying forward technological fixes in the South Delta called for in the OCAP RPAs into the Conservation Measures, we would expect the effects analysis to specifically flag this and analyze it as a degradation to future conditions (as compared to the baseline which should include the RPA improvements).

Add south Delta technological improvement RPA's to Conservation Measures

Update: ICF states that "Many RPAs are assumed to be completed prior to the implementation of BDCP and/or CM1 and are therefore assumed in the baseline (This is clarified in Tables 3.2-1 and 5.2-2.)". However, all the comparisons in the effects analysis are to current levels of pre-screen loss and salvage, not to what they might be with these RPA elements implemented. Therefore, the results overstate the benefits of the project as compared to an appropriate baseline condition which should include these RPA required improvements.

This same issue is repeated by the fact that the analytical baseline (EBC) does not include potential beneficial effects of Yolo Bypass floodplain habitat restoration, and implementation of non-physical barriers, both of which are included in the OCAP RPA. This is a significant flaw in the net effects analysis. The analysis needs a clearly stated caveat of interpretation of results to reflect this limitation. The aggregate analysis should be helpful in addressing these beneficial effects in a different framework.

1.24 **Feasibility of 65K acres of Habitat Restoration (Critical)**
Previous comment: Recent evaluation of land available for habitat restoration indicates potential roadblocks to acquiring all the land proposed in the PP. DWR's own analysis suggests that 65K acres is very unlikely.

Analyze the potential effects of partial implementation of habitat restoration and incorporate alternative actions or measures to compensate for this possibility.

Update: The previous comment from 2012 was referring specifically to tidal wetland habitat. Since that time DWR has revised their habitat restoration feasibility analysis and expanded the definition of the "tidal natural communities" category to include all tidally influenced habitats to be restored under BDCP. DWR believes that it will be possible to fully achieve the plan's habitat restoration goals. However, there is no specific analysis of the feasibility of acquiring 65,000 acres of land appropriate for tidally influenced habitat restoration provided in the document. All related analyses proceed as if restoration will be wholly successful; there are no bounding analyses to show the effects of CM1 operations if restoration either cannot be completed to the full extent or is not fully successful. Therefore, our previous recommendation stands: Analyze the potential effects of partial implementation of habitat restoration and incorporate alternative actions or measures to compensate for this possibility.

Section 2: Additional Issues to be Resolved for Public Draft

Chapter 1

Introduction - Track changes comments submitted separately.

Chapter 2

Existing Ecological Conditions - Track changes comments submitted separately.

Chapter 3

2.1 **Decision Tree process needs to include consideration of flow needs for salmonids and sturgeon (Section 3.4)**

Modeling results of the HOS indicate that flow requirements intended to address the needs of smelt would also be likely to address some of the flow requirements for salmonids and sturgeon identified through the CS5 process. However, the description of the Decision Tree management process states that monitoring and research used to determine which "tree branch" would be implemented would only look at smelt issues and would not attempt to determine which flow scenario would be appropriate for salmonids and sturgeon. The monitoring and research should also investigate the flow needs of salmonids and sturgeon and the determination of which flow scenario will be implemented should be based on the needs of all covered species. There also needs to be a clear understanding that while the current Decision Tree would create four possible combinations of spring and fall outflow criteria that would be included in the range of potential options for initial study, prior to commencement of conveyance operations, there will be a new determination by the permitting agencies specifying what

the spring and fall outflow criteria will be at the time the new facility begins to operate. This determination will be based on all best available science, including that developed during the decision tree process.

2.2 Sensitivity analysis of likely effects of future increase in south-of-delta storage capabilities (Section 3.4)

There is a high likelihood that south-of-delta storage capabilities will be increased over the 50-year term of this permit. There is also the potential for such an increase in storage capacity to result in water operation parameters (pumping rates/timing, OMR flows, I/E ratios, etc.) that differ from those modeled in the current analysis. There needs to be a "sensitivity analysis" of the likely effects of future increase in south-of-delta storage capabilities on these operational parameters and the resulting biological effects on covered species.

2.3 No description of "operational phasing" of north Delta facilities (Section 3.4 and 3.6)

The document lacks any language describing the agreement to use "operational phasing" in lieu of construction phasing, as agreed to by the BDCP principals. The plan will need to include significant detail on the monitoring and metrics necessary to implement the operational phasing agreement and a detailed description of how all aspects of that agreement will be implemented. We have provided the document describing the details of the Principals' agreement last spring, and these need to be accurately reflected in the conservation measures and as a separate section of the adaptive management chapter.

2.4 The Role of Adaptive Management (Section 3.6)

Almost three years ago, the Federal Agencies issued a white paper on application of the Five Point Policy to the BDCP (document attached to this memorandum). It articulated the role of adaptive management in the BDCP, saying, in part, that

> "The BDCP is a complex, landscape scale, long-term HCP with a high degree of uncertainty as to how close the initial conservation measures will come to achieving the plan's biological goals and objectives. It falls into the category of plans that will be a mixture of the two strategies, with initial prescriptions associated with adaptive management, and specific biological outcomes defining the ultimate success of the plan. This type of plan will allow management flexibility so the permittee may institute actions necessary to achieve the plan's goals while providing boundaries for future expectations and commitments. In addition, a results-based plan will address uncertainty in the ecosystem and provide the conservation assurances required by the Act. The Services will be challenged to make the findings required for permit issuance if the plan does not include clearly defined and scientifically supported biological goals and objectives, an adaptive management plan that tests alternative strategies for meeting those biological goals and objectives, and a framework for adjusting future conservation actions, if necessary, based on what is learned." (4/29/2010 memo, page 1)

The adaptive management program created by the BDCP serves the essential functions of (1) assuring that alternative conservation measure designs that might more efficiently achieve objectives are studied and, where appropriate, implemented; (2) providing a workable framework for deliberating difficult management issues and proposing solutions; and (3) providing transparency in the management of the BDCP to ensure public confidence that the conservation measures and strategies implemented under

the plan are based on the best available science. We have concerns with the current draft on all three of these points.

2.5 Adaptive Limits (Section 3.6)

"Adaptive limits" in the BDCP refers to the most extreme sets of operational parameters that might be required or authorized to the permittee through the working of adaptive management over the life of the permit. Some discussion of what such parameter-by-parameter limits might be has already occurred, but neither the concept of adaptive limits nor a draft example of them is included in the current BDCP draft. This leaves open the question of what commitment of resources might be required of the permittee.

As is clear in both the HCP Handbook and the Five Point Policy, the permittee in an HCP is protected by the inclusion of adaptive limits that "clearly state the range of possible operating conservation program adjustments due to significant new information, risk or uncertainty. This range defines the limits of what recourse commitments may be required of the permittee. This process will enable the applicant to assess the potential economic impacts of adjustments before agreeing to the HCP." 65 Fed. Reg. 35253; see also HCP Planning Handbook at 3-24 – 3-25.

In the BDCP, adaptive limits would provide an important assurance that would protect the permittee from an open-ended obligation to commit resources irrespective of circumstances. They would also provide an important level of transparency to the permittee and the public regarding the commitments represented in the plan. The range of adaptations to reflect evolving scientific understanding and improved information on the effectiveness of the various conservation measures are usually described as changed circumstances within an HCP that has high scientific uncertainty, such as this one, and therefore do not trigger a formal plan amendment. Thus, the adaptive limits serve as an important guide regarding the boundaries of the anticipated changed circumstances.

2.6 Role of BGOs (Section 3.3)

Biological Goals and Objectives form the core of the BDCP. Biological goals represent the ultimate conservation outcomes toward which the plan is striving. In some cases, achievement of ultimate goals lies within the power of the BDCP; in others the achievement of goals depends in part on factors that are outside the control of the water projects. Objectives are lower-level outcomes within each goal that are essential to achieving the overarching goal. To be effective, objectives need to be SMART: specific, measurable, achievable, relevant to the goal, and time-bound. In addition to meeting the other SMART criteria, BDCP objectives are "achievable" because they are within the power of the water projects to achieve, and essential to BDCP success because they are "relevant to the goal[s]."
BDCP conservation measures are designed to achieve the biological objectives of the plan. Because of this, BDCP adaptive management will primarily focus on adjustment of the conservation measures to achieve the objectives as efficiently as possible.

The document generally makes it clear that the BGOs will be used to guide the implementation of conservation measures, but we have important concerns with the way objectives are used.

(1) The plan needs to clearly acknowledge and articulate that achieving the outcomes described in the Objectives is the actual basis of the entire conservation strategy and its constituent conservation measures. Continuing to achieve objectives is necessary for progress toward recovery of covered species and in many cases will be required for compliance with the terms of the BDCP permit.

(2) The plan needs to clearly articulate that the adaptive management program will focus on ensuring that plan objectives are being met. Indeed, looking at alternative management strategies to achieve program objectives is fundamentally what AM is designed to do. Failure of conservation measures to achieve objectives will, therefore, be a basis for the AMT to propose changes to conservation measures. There are several statements of the role of adaptive management in chapters 3, 6, and 7 that need to be edited to make this clear.

(3) The plan needs to make clear that objectives are themselves subject to adaptive management. Objectives are ultimately based on models describing the relationship of covered species to their environments, and changes to those models might occasion any of the following: changing an objective either up or down, adding an new objective to reflect improved understanding, removing an objective that is superseded or found not to be relevant to achieving its overarching goal. Deliberations on these issues is properly a subject for the AMT, with oversight by the AEG, POG, and ultimately the fish and wildlife agencies with final authority on adaptive management decisions. Though chapter 7 lays out a clear role for the AMT in these matters, section 3.6 is currently ambiguous and contradictory on the role of the AMT and how it makes decisions. Furthermore, section 3.6 does not adequately articulate how the AMT will exercise its responsibilities with respect to the nine enumerated steps of adaptive management, making it quite unclear whether the AMT is appropriately empowered to carry out its mission.

(4) Implementation of the conservation measures as initially described in the plan does not constitute the extent of the responsibilities of the Authorized Entities. Achieving the outcomes described in the objectives is the primary responsibility of those implementing the plan.

2.7 Effects of proposed operations on Coordinated Operations Agreement

There have been frequent discussions within various workgroups and meetings on the potential for some proposed operational scenarios to affect the Coordinated Operations Agreement (COA) agreement between Reclamation and DWR, but we were unable to find anything in the document describing this subject. If this is truly an issue, and certain operational scenarios intended to benefit covered species will require amendments to the COA agreement, this should be described somewhere in the document as part of the process necessary to implement the BDCP.

Chapter 4

Covered Activities and Federal Actions - Track changes comments submitted separately.

Chapter 5

2.8 Potential project related impacts on upstream egg and juvenile survival continue to be predicted in model results (Section 5.5 and Appendix 5.C)

OBAN, IOS and SacEFT model results continue to indicate that slight differences in Keswick release strategies between the ESO and EBC will result in increased egg mortality upstream. Lower flows in key summer and fall months increase egg mortality for winter-run and spring-run Chinook salmon and potentially other runs. SacEFT habitat results show significant impacts on spawning and rearing habitat for winter-run that are above and beyond effects of climate change.

Critical year egg mortality is very high by the LLT suggesting that a few dry/critical years in a row could potentially cause significant impacts to Sacramento River-dependent ESUs over the 50 year permit timeframe. The analysis shows that ESO criteria could result in riskier operations relating to stranding risk for juveniles (over two times more low risk years under EBC). The document should provide full SacEFT results – not just a summary of "good" year conditions. We are also interested in "poor" year conditions between the scenarios.

The analysis should provide a better examination of "worst case scenarios" for indicators like juvenile production, egg survival, escapement, etc. ESO appears to have riskier operations that result in half as many juveniles in minimum estimates of SALMOD. It may be useful to develop threshold juvenile production estimates (JPEs) of concern that can be compared between scenarios.

2.9 Additional Analysis of Feather River and Oroville Reoperations (Section 5.5 and Appendix 5.C)

Increased summertime temperatures in the Feather River may have effects on the reproductive success of sturgeon, especially for the high outflow scenario. While the high spring-time Feather River flows modeled in HOS could attract sturgeon into the Feather River from the Sacramento River, summertime releases are decreased compared to EBC2 to provide for end-of-September storage requirements. The decreased summertime river flows increase water temperatures in the high-flow channel; the resulting temperatures reported in the effects analysis would be lethal to sturgeon eggs and embryos. This is not discussed in the net effects section because lethal egg temperatures are not considered in the net effects conclusions. NMFS is also concerned with the low frequency with which the ESO and HOS meet the recommended minimum spring flows in above normal and below normal water years.

The forecasting method for Oroville releases is not clearly defined in any section. The effects of relying on Oroville to meet HOS spring-time Delta outflow requirements are reviewed in Chapter 5 (Appendix C Attachment A), and there are references to reduction of exports to also meet the outflow target. Chapter 5 Appendix C.2 presents NMFS' recommended Feather River flow schedule, but there are unexplained modifications and no description of the driving constraints or storage forecasting methodology. While these operations need to be described, the effects analysis should also address any influence of the potential temperature compliance point included in the Dec 2012 Settlement Agreement for Licensing of the Oroville Facilities. This would require compliance to 64° F from May-September in the high flow channel, and the Robinson Riffle criteria for protection of spring-run Chinook in the low flow channel, which could be affected as a result of changes in end of May storage and resulting diminishment of the cold water pool. Because of the potential biological importance of re-operation of Oroville, we recommend that the entire set of decisions and effects analysis be submitted for independent peer review to further assist in predicting these effects.

2.10 Turbidity Reduction Analysis (Chapter 5 and Appendix 5.F)

While Chapter 5 and Appendix 5.F contain discussion and evaluation of water clarity and the change in sediment delivery to the Delta due to the project, it does not specifically address the localized change in turbidity or sediment transport that may result due to reduced river velocity downstream of the north Delta diversion structures.

ICF could use DSM2 results to evaluate whether any reductions in flow velocity downstream of the intakes will reduce sediment transport capacity, causing deposition and reduced turbidity.

2.11 Poor linkage between net effects results and achievement of biological objectives (Section 5.5 and Section 3.3)

The net effects analysis needs to include a section(s) that specifically ties the results of the net effects to the achievement of the BGOs for each species. We need to be able to determine the likelihood of the various operational scenarios actually achieving the BGOs for each species. A rough examination of this issue in the current draft indicates that it may be difficult to meet the through-delta survival objectives for salmonids under the proposed operational criteria.

Chapter 6

2.12 Expansion of Changed Circumstances and adaptive responses to those Changed Circumstances (Section 6.4)

There are numerous problems with the latter sections of Chapter 6 (Sections 6.4 and 6.5). The list of foreseeable changed circumstances described in Section 6.4 needs to be significantly expanded and the range of adaptive responses available to address those changed circumstances is far too narrow and limiting. At a minimum, changed circumstances should consider all foreseeable changes in storage, conveyance and operations external to the BDCP conservation measures but that could substantially affect the CALSIM runs and therefore the effects analysis that supports the BDCP permit issuance criteria. These include: new North of Delta storage, new South of Delta storage, and new State Water Resources Control Board San Joaquin and Delta flow criteria. In general, we expect any one of these would trigger a new analysis of effects and the potential for changes to conservation measures. The Five Agencies will need to review this section and come to agreement on revising its contents prior to release of the public draft of the plan. More detailed comments on the issues with this section of Chapter 6 are provided in NMFS' "track-changes" submittal.

Chapter 7

2.13 Governance

While many of the important issues regarding the governance of plan implementation have been resolved over the last few years, one of the remaining significant issues is the lack of a clear tables and graphics describing how entities relate to each other (e.g. organization charts or flow charts) and which entities will retain final decision making power over each of the major categories of decisions to be made. We recommend that the "decision table" that was developed in the Principals workshop process be included in the document, with any necessary edits, to explain the decision-making process that was agreed to in the text.

There are also some issues regarding the role of the implementing office and its employees that remain to be resolved in Chapters 3, 6, and 7. The plan needs to be clear that adjustment of the conservation measures and other actions that are necessarily and appropriately part of adaptive management are to be managed and administered by the Adaptive Management Team, and not by the Implementation Office or any of its employees, including the Program Manager and the Science Manager.

Chapter 8

Implementation Cost and Funding Sources - Section is pending changes and was not reviewed at this time.

Chapter 9

Alternatives to Take - Track changes comments submitted separately. Intend additional review upon release of revised version.

Chapter 10

Integration of Independent Science - Track changes comments submitted separately. Intend additional review upon release of revised version.

Chapter 4
Covered Activities and Associated Federal Actions

Contents

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Figures

Figures appear at the end of the chapter.

Acronyms and Abbreviations

Banks	Harvey O. Banks
BDCP or Plan	Bay Delta Conservation Plan
BiOp	biological opinion
CCWD	Contra Costa Water District
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
cfs	cubic feet per second
CM	Conservation Measure
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DWR	California Department of Water Resources
ESA	federal Endangered Species Act
FEMA	Federal Emergency Management Agency
HCP	habitat conservation plan
HORB	Head of Old River Barrier
Jones	C. W. "Bill" Jones
JPOD	Joint Points of Diversion
kV	kilovolt
NCCP	natural community conservation plan
NCCPA	California Natural Community Conservation Planning Act
NPDES	National Pollutant Discharge Elimination System
NMFS	National Marine Fisheries Service
OMR	Old and Middle River
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RWQCB	Regional Water Quality Control Board
Skinner Fish Facility	John E. Skinner Delta Fish Protective Facility
SR	State Route
State Water Board	California State Water Resources Control Board
SWP	State Water Project
USFWS	U.S. Fish and Wildlife Service

Chapter 4
Covered Activities and Associated Federal Actions

4.1 Introduction

The Bay Delta Conservation Plan (BDCP or Plan) is intended to provide the basis for the issuance of regulatory authorizations under the federal Endangered Species Act (ESA) and the California Natural Community Conservation Planning Act (NCCPA) for a broad range of ongoing and anticipated activities that are associated with the operations of the State Water Project (SWP) in the Sacramento-San Joaquin River Delta (Figure 4-1). This chapter identifies and describes the activities that are addressed by the BDCP. The chapter further categorizes these activities on the basis of the party chiefly responsible for their implementation, characterizing activities as either *covered activities* for those actions undertaken by nonfederal parties or as *associated federal actions* for those actions that are authorized, funded, or carried out by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation) and *joint federal and non federal actions*, activities that will be carried out jointly by DWR and Reclamation. With regard to the associate federal actions, the BDCP is intended to provide the basis for the issuance of regulatory authorizations to Reclamation under Section 7 of the ESA.

The potential effects of all of these activities on covered species, their habitats, and natural communities have been evaluated as part of an overall assessment of the effects of the BDCP, as described in Chapter 5, *Effects Analysis*. All covered activities and associated federal actions will comply with the avoidance and minimization measures described in *CM22 Avoidance and Minimization Measures*, to minimize incidental take of covered species.

As a joint habitat conservation plan (HCP) and natural community conservation plan (NCCP), the BDCP has been designed to meet the requirements of both state and federal endangered species laws and provide the basis for nonfederal entities to obtain take authorizations from the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) pursuant to Section 10 of the ESA and from the California Department of Fish and Wildlife (CDFW) under Section 2835 of the NCCPA, and potentially under Section 2081 of the California Endangered Species Act (CESA).[1]

Specifically, the California Department of Water Resources (DWR) and certain SWP contractors are seeking regulatory coverage under the ESA and the NCCPA to ensure that many of their activities within the geographic scope of the BDCP, including conveyance, diversions, exports, use of water from the Delta associated with energy generation, and habitat restoration, comply with these laws. To meet these regulatory objectives, the BDCP sets out a comprehensive conservation strategy that addresses the effects of SWP, the Central Valley Project (CVP), and certain existing and future actions that may occur within the Plan Area on aquatic and terrestrial species, including those listed under the ESA or CESA as threatened, endangered, or candidates for listing, as well as on critical habitat, if any, that has been designated for these species (Chapter 3, *Conservation Strategy*).

[1] The BDCP has also been developed to meet the permit issuance standards of the CESA for the activities described in this chapter.

Those activities carried out by Reclamation that may affect federally proposed or listed threatened or endangered species, or their designated critical habitat, will be authorized under ESA Section 7. Additionally, water management activities associated with Delta diversions by Reclamation, DWR, and participating contractors are currently regulated under an existing Section 7 process and will continue to be regulated under that process until the new north Delta diversions become operational, approximately year 10 of the BDCP implementation (i.e., water operations in the near term are not covered by BDCP). Thereafter, DWR and SWP contractor activities related to diversions in the Delta will be regulated under the BDCP.

Under Reclamation's Section 7 compliance process, the biological assessment for federal actions in the Delta will incorporate the BDCP conservation strategy as it relates to those actions and will serve as a companion document to the BDCP. The BDCP does not attempt to distinguish precisely between the effects on covered species and their habitat attributable to the CVP-related federal actions and to covered activities associated with the SWP. Rather, the BDCP includes a comprehensive analysis of the effects related to both the SWP and the CVP within the Plan Area, and sets out a conservation strategy that adequately addresses the totality of those effects. On the basis of the BDCP and the companion biological assessment, it is expected that USFWS and NMFS will issue a new joint biological opinion (BiOp) that would supersede BiOps existing at that time as they relate to SWP and CVP actions addressed by the BDCP.

4.1.1 History and Overview of the State Water Project and Central Valley Project

This section provides an overview and a summary of the history of the SWP and the CVP. Additional detail is provided by DWR (2010).

4.1.1.1 State Water Project

The SWP is operated to provide water for agricultural, municipal, industrial, recreational, and environmental purposes, and to control flooding. As conditions of the water right permits and licenses, the California State Water Resources Control Board (State Water Board) requires that the SWP meet specific water quality, quantity, and operational criteria in the Delta. The development of the SWP was necessitated by the tremendous population growth that occurred in California after the Second World War. The State of California recognized at the time that local water supplies alone would not be sufficient to meet future regional demands, prompting the legislature in 1945 to commission an investigation of statewide water needs. That investigation resulted in recommendations for substantial new water infrastructure, including the development of various aqueducts and channels, a multipurpose dam and reservoir near Oroville on the Feather River, and an aqueduct to carry water from the Delta to the San Joaquin Valley and southern California (California Department of Water Resources 2010).

In 1960, California voters authorized the first phase of the SWP, which enabled water deliveries from watersheds of northern California to the cities of southern California and to farmers in the Tulare Basin that were beyond the reach of the CVP. After the SWP was passed by voters in 1960, the California Aqueduct, the main conveyance for the SWP, Clifton Court Forebay, and Harvey O. Banks (Banks) Pumping Plant west of Tracy were constructed (Figures 1-1 and 4-1 depict both CVP and SWP facilities).

Today, the SWP consists of 34 storage facilities (reservoirs and lakes), 20 pumping plants, 4 pumping-generating plants, 5 hydroelectric power plants, and about 701 miles of open canals and pipelines. It provides water that supplements local sources for approximately 25 million Californians and about 750,000 acres of irrigated farmland (California Department of Water Resources 2010).

The SWP distributes water to 29 urban and agricultural water suppliers in northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and southern California. These suppliers, known as the SWP contractors, receive specified annual amounts of water as provided by contracts with DWR.[2] These contracts are subject to renewal during the period 2035 through 2042. Of the total water supply under contract, 70% is allocated to urban users and 30% to agricultural users (California Department of Water Resources 2010).

4.1.1.2 Central Valley Project

Beginning in the late 1800s, the State of California recognized the potential to deliver water from the Sacramento River to the dry, but potentially productive, San Joaquin Valley (Alexander et al. 1874). In the 1930 State Water Plan (Department of Public Works 1930), the State of California identified that the development of upstream storage capacity along the Sacramento River could simultaneously resolve two major water problems: water shortages in the San Joaquin Valley, where pumping in excess of natural groundwater recharge was occurring; and salinity intrusion into the Delta, which could be addressed with a hydraulic salinity barrier created through controlled releases of water from upstream storage (Lund et al. 2007). This water plan served as a blueprint for the eventual CVP.

In 1933, the California State Legislature and the voters of California approved the CVP. Shortly thereafter, California ceded control of the project to the federal government to maximize federal financial contributions during the Great Depression. Construction of Shasta Dam, one of the primary components of the CVP, began in 1938. In the 1940s, federal agencies agreed on an approach to divert water from the Sacramento River, which relied on a small cross-channel to move water through the Delta. This channel, which was constructed by Reclamation in 1944, is known as the Delta Cross Channel.

Following the construction of the Friant Dam (1942) and the Friant-Kern Canal (1948), the CVP began diverting San Joaquin River water to supply irrigators on the east side of the San Joaquin Valley. Subsequent projects on the west side of the Sacramento Valley, notably the Tehama-Colusa Canal (1980), increased capacity for upstream diversions from the Sacramento River. The CVP's major water storage facilities are located at the Shasta, Trinity, Folsom, and New Melones Dams (Bureau of Reclamation 2008) (Figure 4-1). The primary water pumping facility for the CVP is the C. W. "Bill" Jones (Jones) Pumping Plant, which is located west of the City of Tracy.

The CVP presently consists of 20 dams and reservoirs, 11 power plants, and 500 miles of major canals, as well as conduits, tunnels, and related facilities. These facilities provide sufficient quantities of water to irrigate approximately one-third of the agricultural land of California and to provide for municipal and industrial use to support close to 1 million households for 1 year (Bureau of

[2] Under existing contract conditions, in 2010 DWR was obligated to make 4.167 million acre-feet per year of water available to its contractors, except under certain conditions specified in the contract, including shortage of supply availability, under which a lesser amount may be made available.

Reclamation 2011). Over 250 contractors in 29 out of 58 counties in California have entered into long-term contracts for CVP water (California Department of Water Resources 2008).

The Central Valley Project Improvement Act (CVPIA) of 1992 redefined the purposes of the CVP to include protection, restoration and enhancement of fish, wildlife and associated habitats, and protection of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. Overall, the CVPIA sought to "achieve a reasonable balance among competing demands for use of [CVP] water, including the requirements of fish and wildlife, agricultural, municipal and industrial and power contractors." The CVPIA provided for annual allocations of water to support fish and wildlife resources, a habitat restoration fund financed by water and power users, and a moratorium on new water contracts until such time as fish and wildlife goals are achieved (Bureau of Reclamation 2010). Implementation of the CVPIA is included in the project description of CVP operations for the purpose of consultation under Section 7 of the ESA.

4.2 Covered Activities

The SWP and CVP function as two interbasin water storage and delivery systems that divert and redivert water from the southern portion of the Delta. The SWP and CVP use reservoirs upstream of the Delta to store water, and use both natural watercourses and canal systems to transport water to areas south and west of the Delta. The CVP also includes facilities and operations on the Stanislaus and San Joaquin Rivers, such as the New Melones and Friant Dams.

The SWP and CVP are permitted by the State Water Board to store water during wet periods, divert water that is surplus to the Delta[3], and redivert water that has been stored in upstream reservoirs. Both SWP and CVP operate pursuant to water right permits and licenses issued by the State Water Board that allow for the appropriation of water by diverting to storage or by directly diverting to use and rediverting releases from storage later in the year. As conditions of their water right permits and licenses, the State Water Board requires that the CVP and SWP meet specific water quality, quantity, and operational criteria within the Delta.[4] Reclamation and DWR closely coordinate their management of the operations of the SWP and CVP to meet these conditions.

All covered activities described in this chapter will be covered for the duration of the 50-year permits. The BDCP does not seek coverage for current SWP and CVP operations, which will continue to be regulated under Section 7 of the ESA and the CESA. The BDCP covers SWP and CVP operations once the new north Delta intakes become operational, beginning in approximately year 10 of BDCP implementation. Therefore, references to SWP and CVP operations in the following discussion relate to operations that occur in conjunction with the new infrastructure.

The covered activities consist of activities in the Plan Area associated with the conveyance and export of water supplies from the SWP's Delta facilities and with the implementation of the conservation strategy (Chapter 3, *Conservation Strategy,* which sets out the conservation measures and the adaptive management and monitoring program). Each activity falls into one of six categories.

[3] *Water surplus to the Delta* refers to water that is excess to all other SWP contractual needs and is available for allocation after all these needs have been met.

[4] DWR has a separate contract to provide water to the North Delta Water Agency and that contract has separate water quality standards.

- New water facilities construction, operation, and maintenance.
- Operation and maintenance of SWP facilities.
- Nonproject diversions.[5]
- Habitat restoration, enhancement, and management.
- Monitoring activities.
- Research.

The BDCP-associated federal actions comprise those activities that are primarily the responsibility of Reclamation and relate to the operation of the CVP's Delta facilities to meet CVP purposes. These actions include the operation of existing CVP Delta facilities to convey and export water for project purposes, associated maintenance and monitoring activities, and the creation of habitat. The CVP is operated in coordination with the SWP under the Coordinated Operations Agreement. While the SWP and CVP are separate systems, they function in an integrated and coordinated manner.

Certain other actions associated with the SWP and CVP are not within the scope of the BDCP. These actions occur upstream of the Delta, outside of the Plan Area, and include the operations of certain reservoirs and the diversion and delivery of certain water supplies.

4.2.1 New Water Facilities Construction, Operations, and Maintenance

The development and operation of new water facilities are described in the sections that follow.

4.2.1.1 Tunnel/Pipeline Facility Construction and Operations

4.2.1.1.1 Background

DWR will construct new diversion and conveyance facilities that will be designed and operated to improve conditions for fish by bringing water from the Sacramento River in the north Delta to the existing water export pumping plants in the south Delta (Figures 4-2 and 4-3). This new tunnel/pipeline facility will allow for reductions in diversions at the existing SWP and CVP south Delta facilities, thereby minimizing reverse flows and reducing entrainment of covered fish species by the SWP and CVP in the south Delta. For a detailed description of the expected biological benefits of the tunnel/pipeline, see *CM1 Water Facilities and Operation.*

The new facility will entail three intake structures (Intakes 2, 3, and 5), located between river miles 37 and 41, fitted with state-of-the-art positive barrier fish screens (Table 4-1). A conceptual rendering of an on-bank intake facility is presented in Figure 4-4. Water will travel in pipelines from each intake bay to a sedimentation basin and solids lagoon and thence to the intake pumping plant. From the intake pumping plant, water will be pumped into another set of pipelines to an intermediate forebay (via a transition structure) or, in the case of Intake 2, to a tunnel (Tunnel 1) that will carry water to the intermediate forebay. From this forebay, water will be conveyed by a gravity bypass system through an outlet control structure into a dual-bore tunnel (Tunnel 2) that will run south to a new forebay near Byron Tract, adjacent to Clifton Court Forebay. This

[5] Nonproject diversions are those diversions not included as part of SWP and CVP operations. They are discussed and described in Section 4.1.5, *Nonproject Diversions.*

arrangement will enhance water supply operational flexibility, using forebay storage capacity to regulate flows from north Delta intakes to south Delta pumping plants.

Table 4-1. Specifications for North Delta Intakes and Associated Construction Footprints

North Delta Intake No.	Intake Construction Duration	Pile Driving Duration[a,b]	Location (River Mile)	Length of Screened Intake (feet)[c]	Total Intake and Transition Wall Length (feet)[c]	In-Water Area Temporarily Isolated Inside Cofferdam (acres)	In-Water Area Permanently Affected by Screened Intake Footprint (acres)	Dredging Area Outside of Cofferdams (acres)
2	December 2017 to August 2021	June to September 2019	41	1,800	2,400	3.1	2.1	4.5
3	September 2017 to July/August 2021	June to October 2019	40	970	1,560	1.6	1.1	2.7
5	October 2017 to July 2021	July to October 2019	37	1,650	2,400	2.8	1.9	4.9
Total				**4,420**	**6,360**	**7.5**	**5.1**	**12.1**

[a] It is anticipated that 16 feet of cofferdam could be built in a single day.
[b] It is anticipated the barge landing pile driving would occur during the same time period as the cofferdam pile driving.
[c] Estimates based on intake designs from GIS Revision 10.

Byron Tract Forebay will be designed to continuously provide water to Jones Pumping Plant 24 hours per day while minimizing on-peak pumping at north Delta intakes and allowing pumping criteria to limit diversions to two 6-hour ebb tide periods per day. The tunnel/pipeline system will improve protections for water supplies from flood, earthquake, and sea level rise. The Banks Pumping Plant will operate to minimize overall electrical power costs, by pumping at near maximum capacity during off-peak electrical demand periods, and at lower capacities during peak demand periods. The Byron Tract Forebay will alleviate some of the impacts of these operational constraints by providing additional storage to balance inflow with outflow.

New connections will be constructed between the new Byron Tract Forebay and the Banks and Jones Pumping Plants, along with control structures to regulate the relative quantities of water flowing from the north Delta and the south Delta.

The system will include the components listed below.

- Intakes
    - Three new on-bank water intake facilities on the east bank of the Sacramento River between about Clarksburg and Courtland, (river miles 37 to 41). Each facility will have a diversion capacity of 3,000 cubic feet per second (cfs) andwill rise approximately 55 feet from river bottom to top of structure, with lengths of between 1,560 to 2,400 feet, depending on location. Depending on the stage of the river at the intake location, the intake will rise above the river's surface by 20 to 30 feet. All intakes will be equipped with vertical, structurally reinforced wedge wire screen panels of stainless steel with 1/16-inch openings (fish

screens). The fish screen sizes would vary depending on location and would range from 10 to 22 feet in height and from 970 to 1,800 feet in length. These self-cleaning, positive-barrier fish screens will be designed to the established protection standards for salmonids and delta smelt, and will comply with CDFW, NMFS, and USFWS fish screening criteria as discussed in Appendix 5.B, *Entrainment.*

- New intake facilities will necessitate the replacement of existing levees with new setback levees along with dredging and channel modification activities. Each intake will require approximately 3.5 to 4.5 years to complete, with all three intakes constructed concurrently. Intakes will be constructed using a sheetpile cofferdam in the river to create a dewatered construction area that will encompass the intake site. These cofferdams will be constructed in the first in-water construction season. The cofferdam will extend approximately 10 to 35 feet from the face of the intake and will be installed from upstream to downstream, with the downstream end closed last. The distance between the face of the intake and the face of the cofferdam will depend on the foundation design and overall dimensions. The length of each cofferdam will vary by intake location, but will range from about 1,560 to 2,400 feet, which includes the length of the intake structure and the transition walls. While the cofferdam walls in front of the intake will be removed when the intake is completed, the sections upstream and downstream of the intake will remain in place and form the transition walls.
- Intake cofferdams will each temporarily occupy between about 1.6 to 3.1 acres of in-water habitat (7.5 acres total), while the permanent intake structures will occupy between about 1.1 and 2.1 acres of in-water habitat (5.1 acres total), and replace about 2.6 miles of relatively low-value steep-banked and riprapped shoreline habitat.
- After removing the cofferdams, the riverbed in front of the intakes will be dredged to provide smooth hydrologic conditions along the face of the intake screens. These dredged areas will range between about 2.7 and 4.9 acres, for an estimated total of about 12.1 acres, although the dredge volumes have not yet been determined.

- Pumping plants
  - Intake pumping plants, each with a capacity of 3,000 cfs provided by six individual 500-cfs pumps, will convey water from intake facilities into pipelines, eventually connecting to the rest of the conveyance structures (Table 4-2). Each plant and its associated facilities will encompass approximately 20 acres adjacent to the intake facility. At each intake pumping plant site, a new setback levee (ring levee) will be constructed. The space enclosed by the setback levee will be filled to the elevation of the top of the levee, creating a building pad for the pumping plant. The new levees will be designed to provide an adequate Sacramento River channel cross section and to provide the same level of flood protection as the existing levee. Cutoff walls will be constructed to avoid seepage, and the minimum slope of levee walls will be three units horizontal to one unit vertical. All levee construction will comply with applicable state and federal flood management engineering and permitting requirements. Transition levees will be constructed to connect the existing levees to the new setback levees.

Table 4-2. Summary of Tunnel/Pipeline Conveyance Physical Characteristics

Feature Description/Surface Area	Approximate Characteristics
Overall project (intakes, tunnels, forebays)/2,700 acres	
Conveyance capacity (cfs)	9,000
Overall length (miles)	45
Intake facilities/60 acres per site	
Number of on-bank screened intakes	3
Maximum diversion capacity at each intake (cfs)	3,000
Intake pumping plants/(included with intake facilities)	
Six pumps per intake plus one spare, capacity per pump (cfs)	500
Total dynamic head (feet)	30–57
Total electric load (MW)	39
Tunnels/370 acres (permanent subsurface easement = 1,860 acres)	
Tunnel 1 connecting Intake 2 to the Intermediate Forebay	
Tunnel length (feet)	20,000
Number of tunnel bores; number of shafts (total)	1; 2
Tunnel finished inside diameter (feet)	29
Tunnel 2 connecting Intermediate Forebay Pumping Plant to Byron Tract Forebay	
Tunnel length (feet)	183,000
Number of tunnel bores; number of shafts (total)	2; 13
Tunnel finished inside diameter (feet)	40
Intermediate Forebay/925 acres	
Water surface area (acres)	760
Active storage volume (acre-feet)	5,250
Emergency spillway inundation area (acres)	350
Byron Tract Forebay/840 acres	
Water surface area (acres)	600
Active storage volume (acre-feet)	4,300
Power requirements	
Total conveyance electric load (MW)	50
cfs = cubic feet per second; MW = megawatts	

- Pumping plant facilities will include sedimentation basins, solids handling facilities, transition structures, surge shafts or towers, one or two substations, a transformer, a mechanical room, an access road, and other associated facilities and utilities (Figure 4-4). Each intake will include six sedimentation basins, each approximately 120 feet long by 40 feet wide by 55 feet deep, with interior concrete walls to create separate sedimentation channels. The adjacent solids lagoons will be lined with concrete to prevent seepage to the groundwater or adjacent riverbed, will be approximately 10 feet deep, and will have sloped sides with a top width of 86 feet and a top length of 165 feet. Each intake pumping plant will be served by a 69-kilovolt (kV) substation with a footprint of about 150 by 150 feet.

- Pipelines
  - Intake pipelines will carry water between intakes and intake pumping plants. Each intake facility will convey water through six 12-foot-diameter pipelines to the adjacent pumping plant. Construction could involve microtunneling or open-cut trenching, depending on the depth at which the conduits are installed. If open-cut trenching is used and the native materials are generally of good quality in the area of conduit construction, excavated material from the trench will be used as embedment and backfill materials. Excess material will be exported off site. If the native soils are not suitable as foundation materials for the trench, those suitable materials will be imported to the site. Cut-and-cover construction will likely be used for landside pipe placement using long reach backhoes, scrapers, and excavators placed on levees or on the landside of the levees.
  - Conveyance pipelines will carry water between intake pumping plants and other conveyance facilities such as tunnels and forebays. Two or four 16-foot-diameter conduits will be used for conveyance pipelines.
- Tunnels
  - Tunnel 1, a single-bore 29-foot-inside-diameter tunnel will convey water approximately 3.8 miles from Intake 2 to a new intermediate forebay immediately south of Hood and immediately east of the confluence of Snodgrass Slough and the Sacramento River.
  - Tunnel 2, a dual-bore 40-foot-inside-diameter tunnel will convey water approximately 35 miles from the new intermediate forebay to a new Byron Tract Forebay, adjacent to Clifton Court Forebay.
  - The proposed tunnels will be constructed in soft, alluvial soils with high groundwater pressures. Because of this, the tunnels will be constructed using mechanized soft-ground tunnel-boring machines. Each tunnel will require appropriately sized launching and retrieval shafts to accommodate equipment. The main construction or launching shafts for each tunnel will be about 60 feet in diameter to accommodate construction and construction support operations. The tunnel-boring machine retrieval shafts will be approximately 45 feet in diameter, and 12-foot-diameter intermediate ventilation shafts will be located approximately every 3 miles. Because of the high groundwater level throughout the proposed tunnel alignment area, extensive dewatering (by means of dewatering wells at tunnel shaft sites) and groundwater control in the tunneling operation and shaft construction will likely be necessary.
  - Tunnel muck generated by the boring process is a plastic mix consisting of soil cuttings and soil conditioning agents (water, air, bentonite, foaming agents, and/or polymers/ biopolymers). Before the muck, or elements of the muck, can be reused or returned to the environment, the muck must be managed and, at a minimum, go through a drying/water-solids separation process and a possible physical or chemical treatment. The daily volume of muck withdrawn from the tunneling operations is estimated at approximately 7,000 cubic yards per day. It is assumed that transport of the muck will be continuous, without substantial muck storage at the tunnel work site, as long as tunneling is advancing. The muck will either be pumped through a pipeline or carried on a conveyor belt from the tunnel-boring machine to the base of the launching shaft. The muck will be withdrawn from the tunnel shaft and placed directly into the muck work area using the pipeline or a conveyor belt.

Tunnel muck will be deposited in designated muck storage areas, ranging in size from approximately 100 to 570 acres. In total, approximately 1,595 acres will be devoted to tunnel muck storage. A retaining dike—a berm of compacted imported soil—will be built around the perimeter of each muck area to ensure containment. The muck area will be subdivided by a grid of interior earthen berms into a system of muck ponds for dewatering. The dewatering process will consist of surface evaporation and leaching through a drainage blanket (2-foot-thick pea gravel or a similar material placed over an impervious liner) placed on the invert of the muck pond. The invert of the pond will be sloped a minimum of 1% toward a leachate collection system. The leachate will be pumped from the drainage system to leachate ponds for additional treatment, if needed. The depth of stored muck will be less than 25 feet, as measured from the lowest exterior ground level, and the maximum capacity of individual muck storage ponds will be less than 50 acre-feet.

To ensure that underlying groundwater is not contaminated, the invert of the muck pond will be a minimum of 5 feet above the seasonal high groundwater table, and an impervious liner will be placed on the invert of the muck pond and along the interior slopes of the berms to prevent any contact between the muck and groundwater. Because groundwater tables are high, it is anticipated that there will be minimal excavation for construction of the muck ponds.

- Forebays
  - A 925-acre intermediate forebay near Hood will store water between intake facilities and Tunnel 2. The intermediate forebay will provide storage of approximately 5,250 acre-feet with a surface area of 760 acres. The passage of water from the intermediate forebay will rely exclusively on gravity flow through an outlet control structure. This structure will include open channels, a point of access, and a series of gates to control the flow of water from the intermediate forebay into Tunnel 2. An emergency spillway will prevent the intermediate forebay from overtopping by spilling to an approximately 350-acre inundation area immediately south of the forebay. Approximately 6 million cubic yards of earth will be excavated to construct the intermediate forebay.
  - The 840-acre Byron Tract Forebay directly southeast of Clifton Court Forebay will store water between new conveyance structures and existing SWP and CVP south Delta export facilities. This forebay will provide storage of approximately 4,300 acre-feet with a surface area of 600 acres to balance variations in tunnel/pipeline inflow with outflow on a daily basis. Approximately 14 million cubic yards of earth will be excavated to construct the Byron Tract Forebay. A new forebay at Clifton Court is needed to ensure that water from the north Delta intakes that will be free of fish (screened at the diversions) is not mixed with water in Clifton Court Forebay that contains fish from the south Delta (fish that are collected, trucked, and released elsewhere in the Delta).
  - For both forebays, dewatering will be required for excavation operations. Much of the excavated material is expected to be high in organics and unsuitable for use in embankment construction; however, some of the excavated material below the peat layers may be suitable for use in constructing the embankments. To the extent possible, spoils to be used for the embankments will be stored onsite.

- Connections and control structures to the Banks and Jones Pumping Plants.
  - A 2,000-foot-long canal will carry water from the Byron Tract Forebay to existing approach canals to the Banks and Jones Pumping Plants.
  - A set of gates will be installed in the approach canal to the Banks Pumping Plant upstream of the connection to Byron Tract Forebay.
  - A set of gates will be installed at the outlet between the embankment of the Byron Tract Forebay and the approach canal to the Jones Pumping Plant.
  - A set of gates will be installed in the approach canal to the Jones Pumping Plant upstream of the connection to Byron Tract Forebay.
- Concrete batch plants and fuel stations. The volume of concrete needed for the conveyance facilities will require locating concrete batch plants at the project work sites rather than importing concrete from outside suppliers. A suitable source of clean water will be required for each batch plant. Batch plants and fuel stations will be constructed side by side and could range in size from approximately 2 acres to up to 40 acres. While it is anticipated that precast tunnel segments would be purchased and transported from existing plants, it is possible that one or more temporary plants will be constructed. If it is necessary to construct precast segment yards, they will be built adjacent to concrete batch plants.
- Temporary barge unloading facilities. These facilities will be constructed at locations along the alignment for the delivery of construction materials and will be sized to accommodate various deliveries (e.g., tunnel segments, batched concrete, major equipment). Access roads from these facilities to the construction work area will be necessary. The docks will be approximately 50 by 300 feet and typically supported on approximately 32 two-foot-diameter steel piles. However, floating barge landings may be used, where feasible, to minimize potential effects of underwater sound produced by pile driving on fish and other aquatic species. Piles will be driven within the allowable window for in-river construction, typically with a vibratory hammer, also to minimize underwater sound levels. However, up to about 30% of the piles are estimated to require an impact hammer. The barge unloading facilities will be removed following construction. These facilities will be constructed at the locations listed below.
  - State Route (SR) 160 west of Walnut Grove
  - Venice Island
  - Bacon Island
  - Woodward Island
  - Victoria Island
  - Tyler Island
- Transmission lines running from the existing electrical grid to project substations. Electric power will be required for intakes, pumping plants, operable barriers, and gate control structures. Temporary power will be required during construction of water conveyance facilities. Electrical power to operate the new north Delta pumping plants will be delivered through a single 230-kV transmission line, owned by either the utility or the Implementation Office (Chapter 7, *Implementation Structure*), that will interconnect with a local utility at a new utility substation. The line will extend south from the intermediate pumping plant and will generally follow the tunnel alignment, connecting to existing utility facilities at the Banks

Pumping Plant. The new substation will be constructed within or adjacent to the utility's existing transmission right-of-way. Some utility grid reinforcement and upgrade may be needed to accommodate this large new pumping load. The 230-kV transmission line will terminate at the BDCP's main 230-kV substation, which will be adjacent to one of the new pumping plants in a 268- by 267-foot enclosure. At the main 230-kV substation, the electrical power will be transformed from 230 kV to 69 kV and delivered to the adjacent main 69-kV substation to power the adjacent pumping plant. Additionally, the main 69-kV substation will deliver power on a new overhead 69-kV subtransmission line, looping into each of the other intake substations. Each 69-kV substation will have a footprint of approximately 150 by 150 feet.

Construction of 230-kV and 69-kV transmission lines will require a corridor width of 100 feet and, at each tower or pole, 100 feet on one side and 50 feet on the other side for construction laydown, trailers, and trucks. Construction will also require about 350 feet along the corridor (measured from the base of the tower or pole) at conductor pulling locations, which include any turns greater than 15 degrees and/or every 2 miles of line.

- Borrows, spoils, and tunnel muck storage/disposal areas. Spoils and tunnel muck will be stored in designated spoils and tunnel muck areas, respectively. To the extent possible, these areas will be located away from sensitive habitat areas, such as wetlands, vernal pools, alkali wetlands or grassland, native grasslands, riparian, or in floodplains identified by the Federal Emergency Management Agency (FEMA). Tunnel muck and muck decant liquid will undergo chemical characterization prior to reuse or discharge, respectively, to meet National Pollutant Discharge Elimination System (NPDES) and the Central Valley Regional Water Quality Control Board (RWQCB) requirements. Should muck or muck decant liquid constituents exceed discharge limits, these tunneling byproducts will be treated to comply with NPDES permit requirements. To ensure that underlying groundwater is not contaminated, the muck ponds will be lined with an impervious membrane.

  Dredged material will be handled in a similar manner or may be disposed in upland disposal sites, to help ensure that the material will not be in contact with surface water. Construction of sites requiring disposal of dredge material would likely be subject to the State Water Board General Permit (Order No. 2009-0009-DWQ). Hazardous materials excavated during construction will be segregated from other construction spoils and handled in accordance with applicable state and local regulations.

Other actions necessary to support the development and operation of a new tunnel/pipeline facility are covered activities under the BDCP. They include activities to improve local drainage systems affected by the new conveyance infrastructure, upgrade existing utilities and develop new utility infrastructure, establish temporary construction staging sites, install temporary and permanent roads, and dispose of spoils on certain sites. More detail on specific features of the tunnel/pipeline facility is provided in Appendix 5.H, *Aquatic Construction and Maintenance Effects* (Section 5.H.4.1.1).

CM1 Water Facilities and Operation includes a description of the long-term operations criteria for SWP and CVP with dual operations. These measures have been designed to minimize the potential effects of water conveyance and diversion actions associated with the new intakes and tunnel/pipeline facilities on covered fish species and their habitat.

4.2.1.1.2 Conveyance Facilities Maintenance Activities

Intakes and Screens

The intake facilities will require ongoing periodic maintenance, including cleaning and replacement of screens, trash racks, and associated machinery and dredging to maintain intake capacity. The facilities would require routine or periodic adjustment and tuning to ensure that operations are managed consistent with design intentions. Facility maintenance is part of long-term asset management and includes activities such as painting, cleaning, repairs, and other routine tasks to ensure the facilities are operated in accordance with design standards after construction and commissioning.

Routine visual inspection of the facilities would be conducted to monitor performance and prevent mechanical and structural failures of project elements. Maintenance activities associated with river intakes could include removal of sediments, debris, and biofouling materials. These maintenance actions could require suction dredging or mechanical excavation at or in the intake structures; dewatering; or use of underwater diving crews, boom trucks or rubber wheel cranes, and raft- or barge-mounted equipment. In-water maintenance activities would typically be accomplished during the approved in-water construction window.

It is expected that all intake panels would require annual removal (at a minimum) for pressure washing. Additionally, individual intake bays would require dewatering (one pair at a time) for inspection and assessment of biofoul growth rates. Dewatering would be accomplished by closing off portals with prefabricated bulkheads.

Two other maintenance activities, dredging and riprap placement, could contribute to incidental take in the areas adjacent to the intakes. Sediment deposition commonly plagues engineered infrastructure in natural waterways. It can bury intakes and reduce intake capability to divert or force shutdowns completely until working conditions are restored. The planned operation of proposed intakes would help mitigate sediment deposition within the intake bays and conveyance conduits.

Despite the design considerations, periodic maintenance dredging will be required in front of the intake facilities, and is assumed similar to the areas described above for the construction phase. However, the frequency of this dredging will likely vary by intake location and in response to high-flow events that redistribute sediment within the river channel. A dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities. This will include a predredge sampling and analysis plan to evaluate the potential presence of contaminants that may affect water quality, and appropriate plans to handle and dispose of dredged spoils similar to those described above for construction-related dredging. Riprap placement may also be occasionally needed to protect the intake or riverbank from erosion, and the frequency of such actions will also vary by location and over time.

The only systems associated with the intakes involving power-driven and routinely moving parts are the screen cleaning systems and gantry crane hoist systems. Lubrication of bearings, continuity checks of limit/torque switches, and periodic inspections of equipment in accordance with manufacturer recommendations will be the primary operations and maintenance tasks anticipated for these systems. Strip brushes for the screen cleaning systems will need replacement every several years.

Intake facilities will be designed such that all mechanical elements can be removable from the top surface for convenience of inspection, cleaning, and repairs as needed. The intakes will feature top-side gantry crane systems for removal and insertion of screen panels, louver assemblies, and bulkheads. It is expected that all panels will require annual removal (at a minimum) for pressure washing. Additionally, individual intake bays will require dewatering (one pair at a time) for inspection and assessment of biofoul[6] growth rates. Dewatering is accomplished by closing off portals with prefabricated bulkheads. Metalwork in intakes is expected to consist of plastics and austenitic steels (stainless); therefore, corrosion is not expected to be detrimental to the life of the facilities. Maintenance associated with these systems consists of replacing sacrificial (zinc) anodes at multiyear intervals.

Continuous general inspections will be important for monitoring and logging performance, recording the history of facility conditions and deterioration, and preventing mechanical and structural failures of project elements. Sediment removal will be carried out through suction dredging, mechanical excavation, and dewatering to remove sediment buildup. If large debris is found to have accumulated around intakes, removal will require underwater diving crews, boom trucks or rubber wheel cranes, and possibly a small barge and crew to rig the leads to the debris. While the screens will require cleaning at a frequency commensurate with debris load conditions in the river, the continuous traveling brush mechanisms or other screen cleaning technologies are expected to maintain a relatively clean screen face and adequate open area. Nevertheless, biofouling can occlude the screens and jeopardize function over time.

Damage incurred by the intake facilities (e.g., boat collisions, debris impact, stone and sediment abrasion) may require repairs.

Maintenance will be needed for the intake pumping plants, sedimentation basins, and solids lagoons. This includes service based on a schedule recommended by the manufacturers, mussel and solids removal, and checking and replacing worn parts. Major equipment repairs and overhauls will be conducted at a centralized maintenance shop. Routine site maintenance will include landscape maintenance, trash collection, and outdoor lighting repair or replacement.

Tunnel/Pipeline

Among the important steps involved in the maintenance of the tunnel/pipeline will be the evaluation and determination of an inspection schedule, including the frequency that the facility will need to be taken out of service to allow for such inspections. Typically, new water conveyance pipelines are inspected at least every 10 years for the first 50 years and more frequently thereafter. Dewatering of the tunnel/pipeline facility for maintenance purposes is expected to be conducted but it is assumed that only one of the tunnel/pipelines at a time will be dewatered, allowing continued north Delta diversions to the intermediate forebay. Depending on the monthly demands, diversion needs could be met or may be temporarily reduced. The entire dewatering and nonroutine maintenance process will likely be completed in a month and could be timed for low-diversion periods. Dewatering for maintenance will be conducted approximately once every 5, 10, or 20 years. This type of periodic maintenance will require an additional set of pumps, temporarily located at either the Byron Tract Forebay or at one of the shafts along the tunnel/pipeline route. While these pumps will have some noise associated with them, their operation will last less than a month per use and will occur at 5-, 10-, or 20-year intervals. A crane at the shaft site will launch and retrieve remotely operated vehicles for inspection of the interior of the tunnel/pipeline; a portable generator

[6] Biofouling is the attachment of an organism or organisms to a surface in contact with water for a period of time.

to supply power may also be necessary at the site. All work will be within the right-of-way at the shaft.

Forebays

Forebay maintenance considerations include regular harvesting of pond weed to maintain flow and forebay capacity, the installation of automatic trash raking equipment and disposal facilities, and potential sediment dredging approximately every 50 years. Maintenance requirements for the forebay embankments include control of vegetation and rodents, embankment repairs in the event of island flooding and wind wave action, and monitoring of seepage flows. Maintenance requirements for the spillway include the removal and disposal of any debris blocking the outlet culverts. Debris in the stilling basin will require removal to ensure normal water flow through outlet culverts.

Other Maintenance Activities

Additional activities that could be necessary are listed below.

- Powerline and substation maintenance; e.g., insulator washing, routine tower and pole maintenance and replacement.
- Road and fence repairs.
- Excavation to access pipelines.
- Testing or replacement of backup power supplies.

In summary, all construction, operations and maintenance of the new intakes, screens, pumps, conveyance facilities and forebays described in this section are covered activities and the effects of those activities are addressed by the BDCP (Chapter 3, *Conservation Strategy* and Chapter 5, *Effects Analysis*). DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for maintenance of these new facilities not otherwise restricted by the BDCP conservation strategy.

4.2.1.2 Fremont Weir and Yolo Bypass Improvements and Maintenance

4.2.1.2.1 Background

The purpose of this activity is to modify the Fremont Weir and Yolo Bypass and operate the Fremont Weir to increase the availability of floodplain habitat for spawning and rearing for covered fish species, enhance aquatic food production within and downstream of the Yolo Bypass, and improve fish passage within and nearby the Yolo Bypass (for details, see *CM2 Yolo Bypass Fisheries Enhancement* in Chapter 3, *Conservation Strategy*). Specifically, the Fremont Weir and Yolo Bypass modifications and operations will accomplish the following benefits.

- Improve rearing and spawning habitat for several but not all covered fish species.
- Provide for a higher frequency and duration of inundation of the targeted portion of the Yolo Bypass.
- Improve fish passage into, through and out of the Yolo Bypass, Putah Creek, and past the Fremont and Sacramento weirs.

Ten physical modifications to the Fremont Weir, Yolo Bypass and the Sacramento Weir and their resulting effects are proposed as covered activities and are listed below (additional details are

presented in Chapter 3, *Conservation Strategy*). While not all of these actions will occur, some combination of the actions will be implemented, so all are proposed as covered activities.

- **Replace the Fremont Weir fish ladder.** The covered activities include removing and replacing the existing Fremont Weir Denil fish ladder with new fish passage facilities designed to allow for the effective passage of covered fish species, including adult sturgeon and salmonids.
- **Install experimental sturgeon ramps.** The covered activities include constructing experimental ramps at the Fremont Weir to allow for the effective passage of adult sturgeon and lamprey.
- **Construct deep fish passage gates and channel.** The covered activities include removing a section of the Fremont Weir, excavating soil, fitting the remaining notch with operable fish passage gates that allow controlled flow into the Yolo Bypass, and excavating a deeper fish passage channel. This channel will convey water from the Sacramento River to the new fish passage gates, and from the fish passage gates to the Tule Canal to convey water from the Sacramento River, through the gates, and to the Tule Canal.
- **Modify the existing Fremont Weir stilling basin.** The covered activities include modifications to the existing Fremont Weir stilling basin to ensure that the basin drains sufficiently into the deep fish passage channel.
- **Improve the Sacramento Weir.** The covered activities include excavation of a channel to convey water from the Sacramento River to the Sacramento Weir and from the Sacramento Weir to the Tule Canal/Toe Drain, construction of new gates at a portion of the weir, and minor modifications to the stilling basin of the weir to ensure proper basin drainage.
- **Improve the Tule Canal/Toe Drain and Lisbon Weir.** The covered activities include physical modifications to passage impediments in the Tule Canal/Toe Drain (e.g., road crossings and agricultural impoundments) and redesigning Lisbon Weir to improve fish passage while maintaining or improving water capture efficiency for irrigation.
- **Realign Lower Putah Creek.** The covered activities include a realignment of Lower Putah Creek to improve upstream and downstream passage of Chinook salmon and steelhead in Putah Creek, and restoring floodplain habitat to provide benefits of seasonal floodplain habitat.
- **Create a notch in the Fremont Weir and a connecting channel.** The covered activities include the addition of new operable gates on the weir that allow for the control of the timing, duration, magnitude and frequency of inundation of the Yolo Bypass during nonflood stage periods of the Sacramento River.
- **Modify the Yolo Bypass.** The covered activities include grading; removal of existing berms, levees, and water control structures; construction of berms or levees; reworking of agricultural delivery channels; and earthwork or construction of structures to reduce Tule Canal/Toe Drain channel capacities.
- **Create a gated westside channel.** The covered activities include creation of a gated channel to provide flows into Yolo Bypass along the west side, and potential modification of the existing configuration of the discontinuous channels along the western edge of the Yolo Bypass to reduce diversion of Delta water for Yolo Bypass irrigation while maintaining or improving fish passage for all covered fish species.

Maintenance of Fremont Weir and Yolo Bypass Improvements

Routine maintenance of the Fremont Weir and Yolo Bypass are covered activities. Vegetation maintenance activities may include mowing, discing, livestock grazing, dozing, spraying, and/or hand-cutting of young willow groves, cottonwoods, arundo, brush, debris, and young selected oak trees. Trees with a trunk diameter of 4 inches or greater may be pruned up 6 feet from the ground. Clearing will be done in stripes to open areas for water flow and to avoid islands and established growth.

On a nonroutine but periodic basis, sediment will be removed from the Fremont Weir area using graders, bulldozers, excavators, dump trucks, or other machinery. Outside of the new channel, sediment removal of approximately 1 million cubic yards within 1 mile of the weir can be reasonably expected to occur on an average of approximately every 5 years based on recent maintenance history. Primarily inside the new channel, an additional 1 million cubic yards every other year of sediment removal is anticipated as a conservative estimate of sediment management. Where feasible, work will be conducted under dry conditions; if necessary some dredging may be required to maintain connection along the deepest part of the channel for fish passage. Where agreements can be made with landowners, sediment may be disposed of on properties in the immediate vicinity of the Fremont Weir area. It may also be used as source material for levee or restoration projects, or otherwise beneficially reused.

Maintenance activities will extend from the Sacramento River to the Fremont Weir, the Fremont Weir to the southern end of the Yolo Bypass, and between the associated levees.

In summary, all activities related to the construction, maintenance, replacement, and operations of the facilities described in this section, as well as access road improvements, are covered by the BDCP. The construction of facilities necessary to provide electrical power to these facilities will also be covered by the BDCP. The operations of the new Fremont Weir gates under the near- and long-term criteria and adaptive range as described in Chapter 3, *Conservation Strategy*, are also covered by the BDCP. Potential environmental effects of these activities will be minimized through implementation of *CM22 Avoidance and Minimization Measures* and the environmental commitments described in Appendix 3.C, *Avoidance and Minimization Measures*, as well as requirements of the permits necessary to construct these facilities.

4.2.1.3 North Bay Aqueduct Alternative Intake Project

4.2.1.3.1 Background

The BDCP will cover operation of the North Bay Aqueduct Alternative Intake Project. The project includes an additional intake on the Sacramento River that will operate in conjunction with the existing North Bay Aqueduct intake at Barker Slough (Section 4.2.2, *Operations and Maintenance of SWP Facilities*). The project will accommodate projected future peak demand of up to 240 cfs. DWR is the lead agency for the North Bay Aqueduct Alternative Intake Project, partnering with the Solano County Water Agency and the Napa County Flood Control and Water Conservation District. Both are state water contractors. The construction of any new facilities (any intakes, pipelines, and supporting facilities) associated with the North Bay Aqueduct Alternative Intake Project is not covered under the BDCP. Consequently, any such state and/or federal regulatory compliance requirements that will be applicable to the development of the project will be addressed through processes separate and apart from the BDCP.

Combined operations of a new intake on the Sacramento River and the existing intake at Barker Slough will be included under covered activities for future peak demand of up to 240 cfs. Operations of the North Bay Aqueduct Sacramento River intake will adhere, in combination with the new intake facilities on the Sacramento River, to the water operations criteria and adaptive range as described in Chapter 3, *Conservation Strategy*. The North Bay Aqueduct Alternative Intake Project may also consider an alternative that will involve the export of water from the Sacramento River through the new north Delta facilities.

4.2.2 Operations and Maintenance of State Water Project Facilities

This section describes covered activities that will be carried out by DWR to operate and maintain SWP facilities in the Delta after the north Delta intakes become operational. These activities involve the daily operation of water diversion, conveyance, and delivery systems and appurtenant facilities within the Plan Area. The flow diversions associated with these operations will be constrained as described under *CM1 Water Facilities and Operations.*

SWP facilities in the Plan Area consist of the Clifton Court Forebay; Banks Pumping Plant; Skinner Fish Facility; installation, operation, and removal of temporary barriers in the south Delta; the northern portion of the California Aqueduct; Barker Slough Pumping Plant; and eastern portions of the North Bay Aqueduct (Figures 1-1 and 4-1). Additional facilities that will be built during construction of the new north Delta intakes include the intakes, sedimentation basins and solids handling facilities, intake pumping plants, new setback levees, pipelines and a tunnel to convey water from the intake pumping plants to the new intermediate forebay, the intermediate forebay, tunnels to convey water under the Delta to Byron Tract Forebay, and the Byron Tract Forebay. These SWP facilities will be used to export water from the south Delta (Banks Pumping Plant) and from the north Delta (Barker Slough Pumping Plant) into canals and pipelines that carry it to municipal, industrial, and agricultural water contractors in the San Francisco Bay Area and southern California. These facilities are integral components of the SWP and contribute to the functional capacity of the overall system. This section describes these facilities, their operational requirements, and the actions necessary to maintain their viability. The manner in which these facilities are operated and maintained is not only integral to the proper functioning of the water supply system, but integrated with the actions in the conservation strategy to provide for the conservation of the aquatic ecosystem and for several but not all covered fish species.

The following descriptions of SWP-related covered activities are intended to be sufficiently broad to cover all aspects of the operation and maintenance of identified SWP facilities that may potentially affect resources covered by this Plan, including covered species and their habitats. The measures to address the effects of these covered activities on covered resources are set out in the conservation strategy (Chapter 3, *Conservation Strategy*). Potential environmental effects of these activities will be minimized through implementation of *CM22 Avoidance and Minimization Measures* and the environmental commitments described in Appendix 3.C, *Avoidance and Minimization Measures*, as well as requirements of the permits necessary to construct these facilities.

4.2.2.1 Clifton Court Forebay

Water for the SWP is diverted into Clifton Court Forebay and pumped at Banks Pumping Plant. Clifton Court Forebay is a 31,000-acre-foot regulatory reservoir located in the southwestern edge of

the Delta, about 10 miles northwest of the City of Tracy. Inflows to Clifton Court Forebay from surrounding channels are controlled by radial gates, which are generally operated based on the tidal cycle to reduce approach velocities, prevent scour in adjacent channels, and minimize water level fluctuation in the south Delta by taking water in through the gates at times other than low tide. When a large head differential (difference in water surface elevation) exists between the outside and the inside of the gates, theoretical inflow can be as high as 15,000 cfs for a short time, although actual inflow will be constrained on an average basis and in accordance with the conservation strategy. Thus, the instantaneous peak diversion may still occur when the gates are opened, but they would generally be opened less frequently for shorter periods.

Withdrawals to Clifton Court Forebay will be performed in accordance with *CM1 Water Facilities and Operations.* DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for operations and maintenance of Clifton Court Forebay from the time the proposed north Delta intakes become operational.

4.2.2.2 Harvey O. Banks Pumping Plant

The Banks Pumping Plant is in the south Delta, about 8 miles northwest of Tracy, and marks the beginning of the California Aqueduct. By means of 11 pumps, including two rated at 375-cfs capacity, five at 1,130-cfs capacity, and four at 1,067-cfs capacity, the Banks Pumping Plant provides the initial lift of water 244 feet into the aqueduct. The nominal capacity of the Banks Pumping Plant is 10,300 cfs. The pumps can be operated at full capacity to enable diversions to utilize power in off-peak periods.

CM1 Water Facilities and Operation includes a description of the operations criteria and adaptive limits for south Delta operations of the SWP and CVP. These measures have been designed to address the effect on covered fish species of water conveyance and diversion actions associated with the Banks Pumping Plant. Refer to Section 4.2.2.10, *Maintenance and Monitoring Activities,* for a description of the types of maintenance activities that may occur. DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all operations and maintenance of Banks Pumping Plant from the time the proposed north Delta intakes become operational.

4.2.2.3 John E. Skinner Delta Fish Protective Facility

The John E. Skinner Delta Fish Protective Facility (Skinner Fish Facility) is located at the head of the Intake Channel that connects Clifton Court Forebay to the Banks Pumping Plant. The Skinner Fish Facility screens some fish away from the pumps. Debris is directed away from the pumps by a 388-foot-long trash boom. Fish are diverted from the intake channel into bypasses by a series of metal louvers, while the main flow of water continues through the louvers and toward the pumps. These fish pass through a secondary system of screens and pipes into seven holding tanks, where they are later counted and recorded. The salvaged fish are then returned to the Delta in oxygenated tank trucks, at locations where they are unlikely to again be entrained.

DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all operations and maintenance of the Skinner Fish Facility from the time the proposed north Delta intakes become operational. Refer to the background description above with respect to operations of this facility, and to Section 4.2.2.10, *Maintenance and Monitoring Activities,* for a description of the types of maintenance activities that may occur.

4.2.2.4 Barker Slough Pumping Plant and North Bay Aqueduct

The Barker Slough Pumping Plant diverts water from Barker Slough into the North Bay Aqueduct for delivery in Napa and Solano Counties. The North Bay Aqueduct intake is located approximately 10 miles from the mainstem Sacramento River at the end of Barker Slough. The maximum pumping capacity is 175 cfs (pipeline capacity). During the last few years, daily pumping rates have ranged between 0 and 140 cfs. Each of the 10 North Bay Aqueduct pump bays is individually fitted with a positive barrier fish screen consisting of a series of flat, stainless steel, wedge-wire panels with a slot width of 3/32 inch. This configuration is designed to exclude fish 25 millimeters or larger from being entrained. The bays tied to the two smaller units have an approach velocity of about 0.2 foot per second. The larger units were designed for an approach velocity of 0.5 foot per second, but actual approach velocity is about 0.44 foot per second. The screens are routinely cleaned to prevent excessive head loss, thereby minimizing increased localized approach velocities.

DWR is seeking ESA Section 10 and NCCPA Section 2835 permits for all operations and maintenance of the Barker Slough Pumping Plant from the time the proposed north Delta intakes become operational. Operations will include authorization for a future peak withdrawal of up to 240 cfs at the Barker Slough Pumping Plant.

4.2.2.5 Proposed North Delta Intakes

A key element of the BDCP is the proposed intake facilities in the north Delta, which would allow for more effective screening of fish and less reliance on the south Delta facilities. The operation of the north Delta intakes will result in a reduction in the export of water through the south Delta SWP/CVP intake facilities, of up to 9,000 cfs. This component of the BDCP is intended to reduce fish entrainment and impingement through changes in Delta water management. Potential entrainment or impingement of fish may be associated with the state-of-the-art intake screens at the north Delta intakes and a reduced rate of entrainment or impingement at the south Delta diversions (see *Reduced Entrainment* sections for each species, in Chapter 5, *Effects Analysis*).

Operational scenarios would also result in changes in flow and potentially changes in water quality, habitat, and predation. Operational impacts on fish may include changes in spawning, migration, and rearing habitat associated with changes in reservoir operations, diversion of water, and the consequent changes in flow in the Sacramento River and water circulation and quality through the Delta. Placement and operation of intakes may also result in changes in the potential for predation (see *Impact of Take on Species* sections for each species, in Chapter 5, *Effects Analysis*).

Additional operational details and maintenance activities associated with north Delta intake facilities are provided above under Section 4.1.3, *New Water Facilities Construction, Operation, and Maintenance.*

4.2.2.6 Intermediate Forebay

The intermediate forebay will provide storage and a transition between the north Delta intakes and the tunnels leading to the new Byron Tract Forebay, adjacent to Clifton Court Forebay. This will provide a buffer to increase the flexibility within the system to regulate flows (pumping rates) at the north and south Delta intake facilities to minimize effects on covered species and reduce operational costs by reducing pumping during period of peak electricity rates. From the intermediate forebay, water will be conveyed by a gravity bypass and outlet control structure, into Tunnel 2, and then to the Byron Tract Forebay. Maintenance activities associated with the intermediate forebay are

described above under the construction discussion (Section 4.1.3, *New Water Facilities Construction, Operation, and Maintenance*).

4.2.2.7 Tunnels and Pipeline Conveyance

The primary covered activities associated with the operation of the proposed project conveyance facilities are the periodic maintenance activities. Maintenance of the conveyance systems (including tunnels, pipelines, and gates) is dependent on the materials of construction. For metal pipelines, maintenance will include inspection of current cathodic protection systems and internal inspections and repair of joints and welds. Concrete conduits would also require periodic inspections and repair of internal concrete surfaces and cement mortar lining at the joints. Regular inspections will occur along the conduit routes, looking for signs of leakage or erosion of soil cover. Radial gates will be inspected and operated periodically to ensure proper operations, and repaired, as needed. Additional details of these maintenance activities are provided in Section 4.2.1, *New Water Facilities Construction, Operations, and Maintenance*. These activities would typically occur in the closed portion of the system, where fish are excluded, thereby minimizing potential effects. This would including activities that require dewatering of portions of the system.

4.2.2.8 State Water Project Diversions

The amount of water delivered by the SWP in any year has been and will continue to be variable. In any given year, it is to the amount of water that is hydrologically available and that can be diverted under contractual rights consistent with the terms and conditions of the BDCP and other applicable permits and regulations. SWP *project water* is water made available for delivery to the contractors by the project conservation and transportation facilities included in the system. In 2010, DWR was obligated to make 4.167 million acre-feet per year of water available to its contractors, except under certain conditions specified in the contract, including shortage of supply availability, under which a lesser amount may be made available. The obligation incrementally increases to a maximum amount of 4.173 million acre-feet per year in 2021. This quantity may be exceeded if DWR determines surplus water is available above and beyond that needed to satisfy all regulations, permits, and operational requirements.

The California Water Code requires the state to allow the use of SWP facilities to convey nonproject water as long as the conveyance will not interfere with SWP operations. During drier years, conveyance capacity is available in SWP facilities for the transfer of water by other entities. Nonproject water for drought water banks, dry water purchase programs, and individual transfers has been conveyed through SWP facilities in the past and is expected to continue into the future. SWP facilities are also used to support groundwater banking programs, such as the Semitropic Water Banking and Exchange Program.

CM1 Water Facilities and Operations include a description of the operations criteria and adaptive limits for the SWP and CVP under the BDCP. This measure has been designed to address the effect on several covered fish species of water conveyance and diversion actions associated with the SWP and CVP. As such, the BDCP provides the basis for federal and state regulatory authorizations under the ESA and NCCPA for coverage of all diversion activities of the SWP and CVP in the Plan Area from the time the proposed north Delta intakes become operational.

4.2.2.9 Temporary Barriers in the South Delta

The South Delta Temporary Barriers Project consists of four barriers across south Delta channels for the purpose of benefitting southern Delta agricultural diverters by increasing water levels, improving circulation, and improving water quality, and for the purpose of benefitting San Joaquin River fall-run Chinook salmon by keeping them away from the export facilities. The existing South Delta Temporary Barriers Project consists of the annual installation, operation (full or partial) and removal of temporary barriers at the following locations.

- Middle River near Victoria Canal, about 0.5 mile south of the confluence of Middle River, Trapper Slough, and North Canal.
- Old River near Tracy, about 0.5 mile east of the Delta-Mendota Canal intake.
- Grant Line Canal near Tracy Boulevard Bridge, about 400 feet east of the Tracy Boulevard Bridge.
- Head of Old River (in Old River near its divergence from the San Joaquin River).

The barriers on Middle River, Old River near Tracy, and Grant Line Canal are tidal control facilities composed of rock and gated culverts designed to improve water levels and circulation for agricultural diversions and are in place during the growing season.

A fourth barrier, the Head of Old River Barrier (HORB), will also be installed to benefit San Joaquin River salmonids and their habitat. It can be installed in the spring and the fall. To date, the South Delta Temporary Barriers Project has installed temporary rock barriers and temporary nonphysical barriers at the head of Old River. It is also possible that a permanent barrier fitted with operable gates might be installed, but this option has been on hold pending further study of fish movement, survival, and predation in the vicinity of the temporary barriers. The final, long-term design of this barrier has also not been developed.

CM1 Water Facilities and Operation provides for installation and operation of temporary barriers in the South Delta. The Middle River, Old River, and Grant Line Canal barriers and the HORB will likely continue to be used in the near term in conjunction with the BDCP near-term conservation measures. The four barriers are generally installed beginning in mid-March to early April. The three tidal control barriers are partially operated and the HORB is fully operated through the end of May while salmon are migrating down the San Joaquin River and delta smelt are in south Delta channels. During June, once the risk to delta smelt and the salmon migration have passed, the HORB is removed and the tidal barriers are allowed to begin full operations and continue full operations through the remaining summer and fall. Removal of the barriers begins in early November and the barriers are completely removed by November 30.

Design and operation of the HORB will be intended to discourage salmonids migrating downstream in the San Joaquin River from entering Old River and being exposed to the effects of the export pumps. Pending further development of the proposal, an example operations scenario suitable for an operable gate is described here.

4.2.2.9.1 Example Operations Scenario

The HORB will be operated in conjunction with Old and Middle San Joaquin River (OMR) flow criteria enabled by dual conveyance. Draft criteria have been developed to align use of the HORB with the D-1641 fall pulse flow intended to cue immigrating adult Chinook salmon into the San

Joaquin River system. The proposal is to fully close the HORB and suspend south Delta diversion operations during the D-1641 flow pulse in October, and then operate it at 50% open for 2 weeks following the pulse flow. After that (beginning sometime in November), the HORB will likely remain open through December, but will return to 50% closed operations when San Joaquin River juvenile salmonids are moving out of the system (based on real time monitoring). Also, the HORB will be fully open whenever San Joaquin River flows are greater than 10,000 cfs at Vernalis.

During the spring months (April, May, and June), HORB operation will be conditioned upon flows of the San Joaquin River at Vernalis. These corresponding minimum OMR flow targets are focused on improving OMR flows in the Delta and flows in the San Joaquin River, downstream of the head of Old River, to improve survival and homing of salmonids. The proposed flows are intended to facilitate out-migration of San Joaquin River salmonids once they pass the Old River junction. These flows will also protect out-migrating steelhead from the Calaveras and Mokelumne basins. For the months of April and May, when Vernalis flows are below 5,000 cfs, an average net OMR target of -2,000 cfs or the USFWS reasonable prudent alternative (whichever provides more positive OMR flows) is proposed for evaluation via the monitoring and adaptive management program. Based on a review of particle tracking modeling and coded-wire-tag studies, operations consistent with a -2,000-cfs OMR target produce hydrodynamic conditions on the San Joaquin River that should benefit salmon and smelt compared to existing conditions. When Vernalis flows are above 6,000 cfs, positive average net OMR flows are proposed for evaluation. It is believed such flow conditions will further improve salmonid outmigration and reduce predation without significant water supply reductions. A review of various CALSIM II modeling output from the January 2010 Project Operations suggested that during wetter years, little or no south Delta pumping will occur. Long-term use of all barriers will be evaluated under the adaptive management program.

4.2.2.10 Maintenance and Monitoring Activities

From the time the proposed north Delta intakes become operational, maintenance activities are covered activities. Maintenance activities include actions necessary to maintain the capacity and operational features of the existing water diversion and conveyance facilities, as described in this chapter, including Banks Pumping Plant, Clifton Court Forebay, the Temporary Barriers Project, Barker Slough Pumping Plant, North Bay Aqueduct, the Skinner Fish Facility, and the new north Delta facilities described previously. Maintenance activities also include canal and levee maintenance, placement of riprap for bank protection and erosion control around diversion and conveyance facilities, vegetation management and weed control, and operation and maintenance of electrical power supply facilities. Maintenance activities also include repair and replacement as needed to ensure continued operations of facility or system components, including the operable HORB.

Monitoring activities for the operation of the SWP are also covered activities. These include activities to monitor water quality and water levels. For BDCP fish and other biological monitoring activities, see Section 3.6, *Adaptive Management and Monitoring Program.* DWR's Division of Operations and Maintenance monitors chemical, physical and biological parameters to evaluate conditions of concern for drinking water, recreation, and fish and wildlife. Fish monitoring may also be conducted by DWR for the Temporary Barriers Project.

All SWP maintenance and monitoring described in this section that could affect species or modify critical habitat protected under the ESA or CESA are covered activities from the time the proposed north Delta intakes become operational (Chapter 3, *Conservation Strategy*).

For the operable HORB, periodic maintenance of the gates, motors, compressors, and control systems would occur, as well as maintenance dredging around the gates to clear out sediment deposits. Dredging around the gates would be conducted using a sealed clamshell dredge every 3 to 5 years, depending on the rate of sedimentation. Because of constraints related to fish and other species of concern, the timing and duration of maintenance dredging would be limited. Spoils would be dried in the areas adjacent to the gate site. A formal dredging plan with further details on specific maintenance dredging activities will be developed prior to dredging activities.

Levee systems must be maintained to provide reasonable assurance of protection from the base flood (1% annual chance of exceedance or 100-year flood), and in accordance with an officially adopted maintenance plan. Maintenance activities include periodic addition of waterside armoring material, which may necessitate access and work either from the levee crest (e.g., using an excavator to place riprap)or from the water (e.g., using a barge and crane to place riprap). Levee maintenance may also include operations designed to prevent and repair damage from animal burrowing within the levee. Vegetation control measures will be performed as part of levee maintenance.

All levee maintenance activities must be under the jurisdiction of a federal or state agency, an agency created by the federal or state law, or an agency of a community participating in the National Flood Insurance Program that assumes ultimate responsibility for maintenance. The plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and system are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their performance, and the person, by name or by title, responsible for their performance.

4.2.3 Nonproject Diversions

For the purpose of the BDCP, nonproject diversions are defined as those diversions of surface waters that are carried out by parties other than the Authorized Entities (Chapter 7, *Implementation Structure*). The BDCP would remediate an estimated 100 cfs of nonproject diversions per year up to a maximum of 5,000 cfs over the permit term through a combination of removing diversion for restoration activities and remediation techniques detailed in *CM21 Nonproject Diversions.* Remediated diversions could be located anywhere in the plan area; diversions would be prioritized for remediation in the manner described in CM21.

Most of the nonproject diversions that occur in the Plan Area serve to support agriculture or waterfowl production. The BDCP covers those activities associated with capital projects that are undertaken to remediate nonproject diversions. The BDCP also covers the ongoing diversion that may occur after completion of a remediation project. Regulatory coverage for these remediated nonproject diversions will go into effect after the diversion operator has executed a certificate of inclusion that includes commitments to measures designed to minimize the effects of the diversion on covered species (see CM21). The specific diversions in the Plan Area that will be subject to removal or remediation will be determined on an annual basis by the Implementation Office. The rate and type of diversion removal are set out in *CM21 Nonproject Diversions.*

4.2.3.1 Background

Several thousand nonproject diversions currently exist in the Delta. Although remediation actions could occur at diversions anywhere in the Plan Area, Cache Slough provides an example of the type of removal and remediation actions that are addressed by this covered activity (Figure 4-5). The

area encompassing Cache Slough, including Barker Slough, Ulatis Channel, Lindsey Slough, Hass Slough, Shag Slough, the Sacramento Deep Water Ship Channel, Miner Slough, is approximately 29,000 acres. Within this area, there are approximately 55 intake pipes and 46 nonproject diversions, which are primarily used to support private agricultural activities[7]. Most of these diversions are currently active (Table 4-3).

Table 4-3. Summary of Intakes in Cache Slough Area

Slough/Waterway	No. of Intakes	No. of Active Intakes	No. of Inactive Intakes
Lindsey Slough	5	5	0
Hass Slough	9	9	0
Barker Slough	1	1	0
Shag Slough	4	3	1
Miner Slough	14	12	2
Cache Slough	20	19	1
Ulatis Channel	1	1	0
Sacramento Deep Water Ship Channel	1	1	0
Totals	**55**	**51**	**4**
Source: Solano County Water Agency 2011			

Roughly half of the intakes are gravity fed and the remainder are either dual power (gravity and pumped) or are pumped (power is drawn from the existing electrical grid). The pipes at these intakes are of various sizes: 23 intakes use pipes sized less than 15 inches in diameter, 22 intakes use pipes that fall between 15 to 30 inches in diameter, and 12 intakes are 30 inches in diameter (Solano County Water Agency 2011).

The capacities of the Cache Slough area diversions vary widely (Table 4-4). Over two-thirds of the intakes have a maximum capacity of between 1 and 50 cfs, while approximately nine of the intakes have a maximum capacity of greater than 50 cfs. The two largest diversions are the Area 66-inch Gate located on Lindsey Slough (maximum capacity of 200 cfs) and the RD2068 Pumping Plant (maximum pumping capacity of 325 cfs). Table 4-4 summarizes the intake capacity of the diversions.

[7] The area also includes one screened SWP diversion, the North Bay Aqueduct intake on Barker Slough, which provides the Solano County Water Agency with more than half of its urban water supply.

Table 4-4. Summary of Intake Capacity

Slough/Waterway	No. of Intakes	No. of Intakes 0 to 10 cfs	No. of Intakes 10 to 50 cfs	No. of Intakes 50 to 100 cfs	No. of Diversions over 100 cfs
Lindsey Slough	5	3	1	0	1
Hass Slough	9	2	6	0	1
Barker Slough	1	0	1	0	0
Shag Slough	4	0	2	2	0
Miner Slough	14	12	2	0	0
Cache Slough	20	6	9	5	0
Ulatis Channel	1	0	1	0	0
Sacramento Deep Water Ship Channel	1	0	1	0	0
Totals	**55**	**23**	**23**	**7**	**2**
Source: Solano County Water Agency 2011					

The maximum diversion capacity of all the intakes in the Cache Slough area is approximately 1,500 cfs (excluding the North Bay Aqueduct) (Solano County Water Agency 2011). The actual rates of diversion fluctuate throughout the year depending on the season and quantity of water needed to satisfy demands.

Cache Slough area diversions that are used for agricultural purposes generally occur during the irrigation period, between April and August, depending on the crop. These agricultural diversions account for an average of approximately 25%, or approximately 412 cfs, of the maximum diversion capacity (Rabidoux pers. comm.). These estimates are based on 7 years of pumping data gathered between April and October (Rabidoux pers. comm.). In practice, however, agricultural diversions tend to reach their highest flows during high-tide periods and during the summer months. These diversions rarely occur on a continuous 24-hour basis (Rabidoux pers. comm.).

The aquatic habitat conservation measures provide for restoration of 65,000 acres of tidal wetland and associated estuarine and upland habitats distributed across the Delta. At least 5,000 acres of this restoration will occur in the Cache Slough Complex. Pursuant to the habitat restoration actions, by year 10 an estimated nine diversions will be removed in the Cache Slough area in conjunction with the restoration, and an additional fifteen diversions will be removed by the end of the permit term. Accordingly, the habitat restoration action in Cache Slough will ultimately result in a reduction of the total number of existing diversions from 47 to 23.

The BDCP will provide incidental take coverage for the ongoing operation of nonproject diversions that have executed a certificate of inclusion that includes commitments to minimize the effects of the diversion on covered species, as prescribed in *CM21 Nonproject Diversions.* Among the requirements of the conservation measure is that diversion operators seeking coverage under the Plan execute a certificate of inclusion, which sets out certain commitments of the operator. These operators, for instance, may be required to allow their diversions to be screened. As set out in CM21, the Implementation Office will work with Reclamation and CDFW, which currently administers the Anadromous Fish Screen Program, to identify priorities and select the diversions that will be remediated under this program. The criteria currently used to identify priorities under the program will be modified, with regard the remediation actions that will be funded under the BDCP, to include

consideration of the impacts of these diversions on the covered fish species. CM21 will be applied throughout the Plan Area, but it is expected that, due to restoration activities in the area and the relative abundance of covered species, diversions in the Cache Slough area will represent a high priority for screening or other forms of remediation covered by the conservation measure.

4.2.4 Habitat Restoration, Enhancement, and Management Activities

The habitat restoration, enhancement, and management activities set out in the BDCP are also covered activities, including all actions that may be undertaken to implement the physical habitat conservation measures described in Chapter 3, *Conservation Strategy*. These activities will be designed and implemented as described in *CM3 Natural Communities Protection and Restoration* and *CM11 Natural Communities Enhancement and Management*, and will be performed in accordance with provisions of *CM22 Avoidance and Minimization Measures* and its supporting Appendix 3.C, *Avoidance and Minimization Measures*. Types of actions necessary to implement habitat restoration and enhancement conservation measures are anticipated to include, but are not limited to the following actions.

- Grading, excavating, and placement of fill material.
- Breaching, modifying, or removing existing levees and construction of new levees.
- Modifying, demolishing, and removing existing infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Constructing new infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure).
- Removing existing vegetation and planting or seeding of vegetation.
- Controlling the establishment of nonnative vegetation to encourage the establishment of target native plant species.
- Reducing nonnative predator and competitor species (e.g., feral cats, rats, and nonnative foxes).

Habitat management actions include all activities undertaken to maintain the intended functions of protected, restored, and enhanced habitats over the term of the BDCP. Habitat management actions are anticipated to include, but are not limited to the following activities.

- Minor grading, excavating, and filling to maintain infrastructure and habitat functions (e.g., levee maintenance, grading or placement of fill to eliminate fish stranding locations).
- Maintaining infrastructure (e.g., buildings, roads, fences, electric transmission and gas lines, irrigation infrastructure, fences).
- Maintaining vegetation and vegetation structure (e.g., grazing, mowing, burning, trimming).
- Controlling terrestrial and aquatic nonnative plant and wildlife species.

The extent of the proposed habitat and natural communities conservation actions is summarized in Table 4-5.

Table 4-5. Extent of Natural Communities and Habitat Types Conserved over the Term of the BDCP

Conserved Natural Community/ Habitat Type	Extent of Natural Community and Habitat Type Conserved[a]	
	Protected[b]	Restored[b]
Seasonally inundated floodplain	0	10,000[c]
Tidal wetlands of all types	0	65,000
Channel margin	0	20 linear miles
Riparian	750	5,000[d]
Grassland	8,000[e]	2,000[f]
Nontidal Marsh	50[d]	1,200
Alkali seasonal wetland complex	150	Up to 72 (no net loss)
Vernal pool complex	600	Up to 67 (no net loss)
Managed wetland	6,500[d]	320
Cultivated lands	45,405 (other than rice) 1,500 (rice)[g]	0
Total	**62,955**	**83,659**

[a] All values are in acres unless otherwise noted.

[b] Though not included in the *Restored* column, all protected natural communities/habitat types will also be managed to maintain or increase their habitat functions for covered species. Similarly, all restored natural community types will occur on protected lands, some of which will need to be acquired in fee title or easement from willing landowners.

[c] Enhancement of the existing Yolo Bypass floodplain will be provided with operation of a modified Fremont Weir to increase the duration and frequency of seasonally inundated floodplain habitat. The conditions under which this increased inflow will be provided are described in *CM2 Yolo Bypass Fisheries Enhancement.*

[d] Riparian habitat restoration will occur primarily in association with the restoration lands for seasonally inundated floodplain, channel margin, and freshwater nontidal areas.

[e] Managed wetland will be acquired to support salt marsh harvest mouse habitat (1,500 acres) and to enhance habitat for wintering waterfowl and shorebirds (5,000 acres).[f] Some of the restored grassland may be restored within the transitional component of restored tidal habitat and thus the total land base required for grassland restoration may be less than shown.

[g] 1,500 acres of rice, or "rice equivalent" will be protected to contribute to giant garter snake conservation. Rice equivalent is muted tidal or nontidal marsh restoration that meets the reserve design criteria described in *CM4 Tidal Natural Communities Restoration.*

4.2.4.1 Activities to Reduce Effects of Methylmercury Contamination

Activities to reduce methylmercury contamination, which could result in incidental take, are covered activities under the BDCP. These activities are fully detailed in *CM12 Methylmercury Management* in Chapter 3, *Conservation Strategy*. These include actions to minimize the methylation of inorganic mercury in habitat restoration areas. The Implementation Office will minimize, to the extent practicable, any increase in mercury methylation associated with habitat restoration conservation measures through the design and implementation of restoration projects. The Implementation Office will work with DWR and the Central Valley RWQCB to identify and implement methods for minimizing the methylation of mercury in restoration areas.

4.2.4.2 Activities to Reduce Predation and Other Sources of Mortality

Activities to reduce predation and other sources of mortality that could result in incidental take are covered activities under the BDCP. These conservation measures are fully detailed in Chapter 3, *Conservation Strategy*.

- *CM13 Nonnative Aquatic Vegetation Control.* The Implementation Office will control the growth of Brazilian waterweed (*Egeria densa*), water hyacinth (*Eichhornia crassipes*), and other nonnative submerged aquatic vegetation and floating aquatic vegetation in tidal habitat restoration areas and elsewhere in the Plan Area.
- *CM15 Localized Reduction of Predatory Fishes.* The Implementation Office will reduce the local effects of predators on covered fish species by conducting focused predator reduction using a variety of methods in locations in the Delta that are known to have high densities of predators (predator hotspots).
- *CM16 Nonphysical Fish Barriers.* The Implementation Office will install nonphysical barriers at the junction of channels with low survival of out-migrating juvenile salmonids, and test their effectiveness in deterring fish from entering these channels.

4.2.4.3 Adaptive Management and Monitoring Program

As described in Chapter 3, *Conservation Strategy*, various types of monitoring activities will be conducted during implementation, including species surveys, construction monitoring, compliance monitoring, effectiveness monitoring, and system monitoring. These activities are detailed in Section 3.6, *Adaptive Management and Monitoring Program*, and will be further detailed as necessary in monitoring protocols to be developed by the Adaptive Management Team (Chapter 7, *Implementation Structure*), in coordination with the Implementation Office. In addition, focused research will be undertaken to develop information that will help inform implementation. All such research actions will be managed by the Adaptive Management Team. Any take associated with the monitoring and research activities is covered under the BDCP.

4.2.4.4 Other Conservation Actions

All conservation actions set out in Chapter 3, *Conservation Strategy*, that may cause incidental take of covered species, not described in the foregoing list of activities, are covered under the BDCP. Incidental take as a result of these activities is are expected to be minimal, as detailed in Chapter 5, *Effects Analysis*. These conservation measures include the following.

- *CM14 Stockton Deep Water Ship Channel Dissolved Oxygen Levels.* The Implementation Office will continue to operate and maintain an existing oxygen aeration facility in the Stockton Deep Water Ship Channel, which serves to increase dissolved oxygen concentrations and thereby minimize a potential fish passage barrier.
- *CM18 Conservation Hatcheries.* The Implementation Office will support the development of a delta and longfin smelt conservation hatchery by the USFWS to house a delta smelt refugial population and provide a source of delta and longfin smelt for supplementation or reintroduction, if deemed necessary by federal and state fish and wildlife agencies. The Implementation Office will also support the expansion of the refugial population of delta smelt and establishment of a refugial population of longfin smelt at the University of California, Davis

Fish Conservation and Culture Laboratory to serve as a population safeguard in case of a catastrophic event in the wild.

4.3 Federal Actions Associated with the BDCP

The activities described in this section have been designated as federal actions associated with the BDCP. These actions consist of CVP-related activities in the Delta that are primarily carried out by Reclamation. These federal actions differ from covered activities set out above, which encompass those covered activities that are the responsibility of nonfederal entities. The associated federal actions described in the BDCP are subject to the ESA Section 7 consultation process; as such, Reclamation will consult with USFWS and NMFS regarding the effect of these actions on listed species and designated critical habitat. For the federal actions set out in this section, the BDCP is intended to provide the basis for a biological assessment to support Section 7 consultations with the federal fish and wildlife agencies. Reclamation's actions that are outside the scope of the BDCP will be addressed as part of a consultation that covers the totality of CVP-related operations.

The CVP's Delta Division[8] facilities in the Plan Area consist of the Delta Cross Channel, the eastern portion of the Contra Costa Canal, including the Contra Costa Water District (CCWD) diversion facility at Rock Slough; the Jones Pumping Plant (formerly Tracy Pumping Plant), the Tracy Fish Collection Facility, and the northern portion of the Delta Mendota Canal (Figures 1-1 and 4-1). These CVP facilities are used to convey water from the Sacramento River in the north Delta to the south Delta and to export that water from the Delta into canals and pipelines that carry it to agricultural and municipal and industrial contractors to the south and west of the Delta. These facilities are integral components of the CVP and contribute to the functional capacity of the overall system. This section describes these facilities, their operational requirements, and the actions necessary to maintain their viability. The operation and maintenance of these facilities are not only integral to the water supply system, but are also important to the conservation strategy and the protection and conservation of the aquatic ecosystem and covered fish species.

Once the new North Delta diversions become operational, the existing CVP facilities described in this section will be operated under the water operations criteria described in *CM1 Water Facilities and Operations*. All operations and maintenance of CVP facilities described in this section are federal actions associated with the BDCP and the effects of those actions are addressed by the conservation strategy (Chapter 3, *Conservation Strategy* and Chapter 5, *Effects Analysis*). Take authorizations, however, will be provided to Reclamation through the Section 7 consultation process.

4.3.1 Delta Cross Channel

The Delta Cross Channel is a gated diversion channel between the Sacramento River, near Walnut Grove, and Snodgrass Slough (Figure 1-1). Flows into the Delta Cross Channel from the Sacramento River are controlled by two 60-foot-by-30-foot radial gates. When the gates are open[9], water flows from the Sacramento River through the cross channel to Snodgrass Slough and from there to

[8] The Delta Division is one of several CVP divisions covering various geographical areas and facilities of the CVP including the American River, Friant, East Side, Sacramento River, San Felipe, West San Joaquin, and Shasta/Trinity River divisions. The CVP Delta Division includes facilities within the Plan Area (described in this chapter) and facilities outside the Plan Area (not included in this chapter).

[9] The Delta Cross Channel gates are open on holiday weekends (Memorial Day, Fourth of July, and Labor Day) to allow the passage of recreational boats.

channels of the lower Mokelumne River and into the central Delta. Once in the central Delta, the water is conveyed primarily via Old and Middle Rivers to the Jones Pumping Plant by the draw of the pumps. The Delta Cross Channel operation improves water quality in the interior Delta by improving circulation patterns of good quality water from the Sacramento River towards Delta diversion facilities.

Reclamation operates the Delta Cross Channel in the open position to achieve the following benefits.

- Increase the transfer of water from the Sacramento River to the export facilities at the Banks (SWP) and Jones (CVP) Pumping Plants.
- Improve water quality in the southern Delta by increasing deliveries of fresh water from the Sacramento River to the south Delta.
- Reduce saltwater intrusion rates in the western Delta.

During the late fall, winter, and spring, the gates are often periodically closed to protect out-migrating salmonids from entering the interior Delta experience lower rates of survival due to a longer less direct migration route with higher levels of predation and greater potential for entrainment at the CVP and SWP south Delta export facilities. When flows in the Sacramento River at Sacramento reach 20,000 to 25,000 cfs (on a sustained basis) the gates are closed to reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates.

See Chapter 3, *Conservation Strategy,* for a description of operations of the Delta Cross Channel gates under the BDCP to provide for protection of salmon in conjunction with water conveyance. Reclamation is seeking ESA Section 7 authorization for all operations and maintenance of the Delta Cross Channel consistent with conservation measures.

4.3.2 C. W. "Bill" Jones Pumping Plant

The CVP and SWP use the Sacramento River, San Joaquin River, and Delta channels to transport water to pumping plants located in the south Delta (Figures 1-1 and 4-1). The CVP's Jones Pumping Plant, about 5 miles northwest of Tracy, consists of six available pumps. The Jones Pumping Plant is located at the end of an earth-lined intake channel about 2.5 miles in length. The Jones Pumping Plant has a physical capacity of 5,100 cfs and the State Water Board-permitted diversion capacity of 4,600 cfs.

See Chapter 3, *Conservation Strategy,* for description of south Delta operations of SWP and CVP and SWP under the BDCP to provide for protection of covered fish species in conjunction with water conveyance and diversion. Reclamation's actions that are outside the scope of the BDCP will be addressed as part of their Section 7 consultation with the fish and wildlife services.

4.3.3 Tracy Fish Collection Facility

At the head of the intake channel leading to the Jones Pumping Plant, Tracy Fish Collection Facility louver screens intercept fish that are then collected, held, and transported by tanker truck to Delta release sites away from the south Delta facilities. The Tracy Fish Collection Facility uses behavioral barriers consisting of primary and secondary louvers to guide entrained fish into holding tanks. The primary louvers are located in the primary channel just downstream of the trash rack. The secondary louvers are located in the secondary channel just downstream of the traveling water

screen. The louvers allow water to pass through onto the Jones Pumping Plant but the openings between the slats are tight enough and angled against the flow of water in such a way as to prevent most fish from passing between them and instead enter one of four bypass entrances along the louver arrays. The holding tanks on hauling trucks used to transport salvaged fish to release sites are injected with oxygen and contain an eight parts per thousand salt solution to reduce stress on fish. The CVP uses two release sites, one on the Sacramento River near Horseshoe Bend and the other on the San Joaquin River immediately upstream of the Antioch Bridge.

Reclamation is seeking ESA Section 7 authorization for all operations and maintenance of the Tracy Fish Collection Facility consistent with the BDCP operating criteria.

4.3.4 Contra Costa Water District Diversion Facilities

CCWD diverts water from the Delta for irrigation and municipal and industrial uses under CVP contract and under its own water rights. CCWD diverts water at Rock Slough for direct use under its CVP contract. CCWD also diverts water for direct use or storage at its intake on Old River near SR 4 (designated CCWD's Old River intake) and its intake on Victoria Canal near Middle River (designated CCWD's Middle River intake). Under its own State Water Board permit and license, CCWD can divert water for direct use at Mallard Slough, and under its own Los Vaqueros water right permit, CCWD can divert water at its Old River and Middle River intakes for storage in Los Vaqueros Reservoir.

CCWD's water system includes intake facilities at Mallard Slough, Rock Slough, Old River, and Victoria Canal near Middle River (Middle River intake); the Contra Costa Canal and shortcut pipeline; Contra Loma Reservoir; the Martinez Terminal Reservoir; and the Los Vaqueros Reservoir. The Rock Slough intake facilities, the Contra Costa Canal, the shortcut pipeline, the Contra Loma Reservoir, and the Martinez Terminal Reservoir are owned by Reclamation, and operated and maintained by CCWD under contract with Reclamation. Mallard Slough Intake, Old River Intake, Middle River Intake (on Victoria Canal), and Los Vaqueros Reservoir are owned and operated by CCWD.

CCWD's operations are governed by BiOps issued to Reclamation under separate Section 7 consultations (hereafter, CCWD-specific BiOps). CCWD's operations are included in the project description and modeling for the long-term SWP/CVP operations biological assessment, which resulted in the current BiOps on SWP/CVP operations (U.S. Fish and Wildlife Service 2008; National Marine Fisheries Service 2009). CCWD also has CESA take authorization for all its operations under a 2081 permit issued in 2009 by CDFW, and amended by CDFW in 2012.

4.3.4.1 Planned Rock Slough and Los Vaqueros Modifications

Reclamation and CCWD are currently implementing two projects to modify facilities: addition of a fish screen to the Rock Slough Intake and expansion of the Los Vaqueros Reservoir. For each of these projects, Reclamation, in coordination with CCWD, consulted with USFWS and NMFS under Section 7, and CCWD, in coordination with Reclamation, has consulted with CDFW.[10]

4.3.4.1.1 Rock Slough Fish Screen

The Rock Slough Intake is located about four miles southeast of Oakley, where water flows into the earth-lined portion of the Contra Costa Canal. This section of the canal is open to tidal influence and

[10] For the Los Vaqueros project, consultation has been initiated but not completed.

continues for four miles to Pumping Plant 1, which has capacity to pump up to 350 cfs into the concrete-lined portion of the canal. Prior to completion of the Los Vaqueros Project in 1997, this was CCWD's primary diversion point. Consistent with the CVPIA and as required by the USFWS BiOp for the Los Vaqueros Project (U.S. Fish and Wildlife Service 1993), Reclamation, in collaboration with CCWD, recently (in 2011) constructed a fish screen at the Rock Slough intake. This project was covered by a separate ESA Section 7 consultation. With the completion of this project, all four of CCWD's Delta intakes (Rock Slough, Mallard Slough, Old River and the new Middle River intake on Victoria Canal) now have positive barrier fish screens.

4.3.4.1.2 Los Vaqueros Reservoir Expansion Project

CCWD is expanding the storage capacity of Los Vaqueros Reservoir from 100,000 to 160,000 acre-feet. Completion of the project is scheduled in 2012. The expansion will improve CCWD water quality, water supply reliability and emergency storage, and will have the effect of shifting CCWD diversions from drier periods to wetter periods. The expansion will not increase CCWD overall diversions from the Delta or modify any Delta facilities; operation of the expanded reservoir will continue to be governed by existing CCWD-specific BiOps. The expansion will impact terrestrial habitat and species within the Los Vaqueros watershed, which is outside of the Delta. Under consultation with CCWD and Reclamation, USFWS (under Section 7) issued a CCWD-specific BiOp covering the terrestrial impacts, mitigation, and adaptive management, separate and independent from the BDCP Section 7 consultation.

4.3.4.2 Covered Action

Reclamation will include CCWD's operations described above in the BDCP ESA Section 7 biological assessment as part of the existing operations. CCWD is not an ESA Section 10 permit applicant under BDCP, and operation of CCWD facilities is not covered under the BDCP. However, all operations and maintenance of CCWD facilities described in this section that could affect species or modify designated critical habitat protected under ESA will be included in the analysis of Delta operations in the BDCP Section 7 biological assessment. This will ensure that existing and ongoing operations in the Delta are accurately analyzed in the consultation on the effects of the BDCP and CVP operations. If, as a result of the BDCP ESA Section 7 consultation, any of the criteria for reinitiation of consultation set forth in the CCWD-specific BiOps are triggered, Reclamation and CCWD will reinitiate consultation under ESA Section 7.

4.3.5 Central Valley Project Diversions

The volume of water delivered by the CVP is and will continue to be variable, but in any year will be equal to the amount of water that is hydrologically available and that can be diverted under current contractual rights consistent with the terms and conditions of the conservation strategy and then-existing permits and regulations. Reclamation delivers water transported through facilities in the Delta to senior water rights contractors, long-term CVP water service contractors, refuges and waterfowl areas, and temporary water service contractors south of the Delta. The total volume under contract, including Level 2 refuge supplies, is approximately 3.3 million acre-feet. The CVP provides Level 4 refuge water totaling approximately 100,000 acre-feet. In addition, as part of the San Joaquin River Restoration Program, Reclamation anticipates submitting a petition to add a point of diversion to the State Water Board to allow rediversion of the restoration flows either upstream of or in the Delta. Moreover, in wet hydrologic conditions when CVP storage is not available and the

Delta is in excess conditions, water is made available under temporary contracts for direct delivery. The volume of water available for conveyance through the Delta is a result of hydrologic conditions, upstream reservoir operations, upstream demands, regulatory constraints on CVP operations, and from transfers of water from upstream water users to south of Delta water users.

See Chapter 3, *Conservation Strategy,* for description of near-term and long-term operations and adaptive range of CVP and SWP under the BDCP to provide for protection of covered fish species in conjunction with water conveyance and diversion. All CVP diversions described in this section are federal actions associated with the BDCP and will be covered in the BDCP Section 7 consultation. Water passing through the Delta associated with water transfers (e.g., Drought Water Bank and Dry Year Water Purchase Programs) is also a covered action. Reclamation is seeking ESA Section 7 authorization for all CVP diversions consistent with the BDCP operating criteria.

4.3.6 Associated Maintenance and Monitoring Activities

Maintenance and replacement means those activities that maintain the capacity and operational features of the existing CVP water diversion and conveyance facilities described above including the Delta Cross Channel, Jones Pumping Plant, Tracy Fish Collection Facility, and Contra Costa Diversion Facilities. Maintenance activities include maintenance of electrical power supply facilities; maintenance as needed to ensure continued operations and replacement of facility or system components when necessary to maintain system capacity and operational capabilities; and upgrades and technological improvements of facilities to maintain system capacity and operational capabilities. Levee systems must also be maintained to provide reasonable assurance of protection from floods, and in accordance with an officially adopted maintenance plan (Section 4.2.2, *Operations and Maintenance of State Water Project Facilities*).

Monitoring activities refer to those actions necessary for monitoring water quality and fish populations as conditioned by water rights permits and BiOps, those actions undertaken as a result of the CVPIA and agreements, and any additional monitoring under the BDCP as described in Chapter 3, *Conservation Strategy,* for which Reclamation is responsible. These actions include routine daily, annual or other periodic sampling of water quality constituents as well as trawl surveys for various fish species in the Delta (including actions associated with the Interagency Ecological Program). The Implementation Office will integrate its activities with the Interagency Ecological Program, Delta Science Program, and other entities involved in monitoring programs and will use data collected through these programs, as appropriate, to support evaluation of the effectiveness of the conservation strategy in achieving the biological goals and objectives of the BDCP (Appendix 3.E, *Monitoring and Research Actions*). These programs facilitate the coordination of Delta monitoring and research activities conducted by state and federal agencies and other science partners, to develop a better understanding of the estuary's ecology. Reclamation currently operates and maintains more than 20 monitoring stations in the Delta which provide near-real-time water quality data. As the conservation strategy is implemented, the nature of, and requirements for, monitoring will be expected to change.

All CVP maintenance and monitoring described in this section are federal actions associated with the BDCP and will be covered in the Section 7 consultation.

4.4 Joint Federal and Nonfederal Actions

This section describes activities that will be carried out jointly by DWR and Reclamation. These actions are categorized as covered activities under ESA Section 10 and NCCPA Section 2835 for DWR because of DWR's involvement in these joint actions. The activities identified in this section for federal actions by Reclamation are not covered activities for the purposes of the ESA Section 10(a)(1)(b) permit. These federal actions are actions that occur within the Delta that will be coordinated with DWR to support DWR's compliance with the ESA Section 10 permit. Reclamation's activities are subject to ESA Section 7, and Reclamation will consult under ESA Section 7 on those actions. The Section 7 consultation will also include other CVP operations that are not within the Plan Area.

4.4.1 Joint Point of Diversion Operations

Under State Water Board Decision 1641 (D-1641) (December 1999, revised March 2002), Reclamation and DWR are authorized to use/exchange diversion capacity between the SWP and CVP to enhance the beneficial uses of both projects. The use of one project's diversion facility by the other project is referred to as the Joint Points of Diversion (JPOD). There are a number of requirements in D1641 that restrict JPOD to protect water quality and fishery resources.

In general, JPOD capabilities are used to accomplish four basic SWP and CVP objectives.

- When wintertime excess pumping capacity becomes available during Delta excess conditions (all in-Delta conditions have been met) and total SWP/CVP San Luis storage is not projected to fill before the spring pulse flow period, the project with the deficit in San Luis storage may elect to use JPOD capabilities.
- When summertime pumping capacity is available at the Banks Pumping Plant and CVP reservoir conditions can support additional releases, the CVP may elect to use JPOD capabilities to enhance annual CVP south of Delta water supplies.
- When summertime pumping capacity is available at the Banks or Jones Pumping Plants to facilitate water transfers, JPOD may be used to further facilitate the water transfer.
- During certain coordinated SWP/CVP operation scenarios for fishery entrainment management, JPOD may be used to shift SWP/CVP exports to the facility with the least fish species entrainment effect while minimizing export at the facility with the most fish species entrainment effect.

All in-Delta JPOD operations are included as either covered activities or federal actions associated with the BDCP and the effects of those activities and actions are addressed by the BDCP (Chapter 3, *Conservation Strategy* and Chapter 5, *Effects Analysis*). Those actions associated with Reclamation will receive authorization through the ESA Section 7 consultation process and those actions associated with DWR will be covered under ESA Section 10 permits and Section 2835 permits issued pursuant to the NCCPA.

4.4.2 Operations of New Water Intake and Conveyance Facilities

DWR will own and operate the new intake and conveyance facilities and their operations will be covered activities as described in Section 4.2.1, *New Water Facilities Construction, Operations, and Maintenance.* Reclamation will likely enter into an agreement with DWR to wheel CVP water through the new conveyance facility, and this action by Reclamation will be an associated federal action. All operations of new intake and conveyance facilities are included as either covered activities or federal actions associated with the BDCP. Those actions associated with Reclamation will receive authorization through the ESA Section 7 consultation process and those actions associated with DWR will be covered under ESA Section 10 permits and Section 2835 permits issued pursuant to the NCCPA.

4.4.3 Transfers

State and federal laws governing water use in California promote the use of water transfers to manage water resources, particularly water shortages, provided that certain conditions of transfer are adopted to protect source areas and users. Transfers requiring export from the Delta are conducted at times when pumping and conveyance capacity at the SWP or CVP export facilities is available to move the water. Additionally, operations to accomplish these transfers must be carried out in coordination with SWP and CVP operations, such that the capabilities of the projects to exercise their own water rights or to meet their legal and regulatory requirements are not diminished or limited in any way.

SWP and CVP contractors have independently acquired water and arranged for its pumping and conveyance through SWP facilities. State Water Code provisions grant other parties access to unused conveyance capacity, although SWP contractors have priority access to capacity not being used by DWR to meet SWP contract amounts.

Water transfers by Authorized Entities are a covered activity if the transfers are consistent with the operational criteria described in *CM1 Water Facilities and Operation* and the effects analysis described in Chapter 5, *Effects Analysis.* However, the withdrawal of transfer waters from a source area is outside the scope of the covered activity. Consequently, separate take authorizations may need to be obtained that cover impacts to listed species or critical habitat that may result from the withdrawal of transfer water at the source. It is the responsibility of the water transfer provider or receiver to secure such take authorizations.

4.4.4 Suisun Marsh Facilities Operations and Maintenance

The existing Suisun Marsh facilities consist of the following elements.

- Suisun Marsh Salinity Control Gates
- Morrow Island Distribution System
- Roaring River Distribution System
- Goodyear Slough Outfall
- Various salinity monitoring and compliance stations throughout Suisun Marsh

Since the early 1970s, the California State Legislature, State Water Board, Reclamation, CDFW, Suisun Resource Conservation District, DWR, and other agencies have engaged in efforts to preserve beneficial uses of Suisun Marsh to mitigate for potential impacts on salinity regimes associated with reduced freshwater flows to the marsh. Initially, salinity standards for Suisun Marsh were set by the State Water Board's Decision 1485 to protect alkali bulrush production, a primary waterfowl plant food. Subsequent standards set under the State Water Board's Decision 1641 reflect the intention of the State Water Board to protect multiple beneficial uses. A contractual agreement between DWR, Reclamation, CDFW, and the Suisun Resource Conservation District includes provision for measures to mitigate the effects of SWP and CVP operations and other upstream diversions on Suisun Marsh channel water salinity. The Suisun Marsh Preservation Agreement requires DWR and Reclamation to meet specified salinity standards, sets a timeline for implementing the Plan of Protection, and delineates monitoring and mitigation requirements.

The existing operation of the Suisun Marsh facilities is covered for ESA and CESA compliance under the Operations Criteria and Plan BiOps and the related consistency determination. The Suisun Marsh facilities will be covered under the BDCP for existing operations criteria and for future criteria discussed below.

The BDCP includes conservation actions that will change land use and water operations in Suisun Marsh over time. These changes in land use and water operations are covered activities and are addressed by the BDCP. See Chapter 3, *Conservation Strategy,* for descriptions of tidal brackish marsh restoration (*CM4 Tidal Natural Communities Restoration*) and water operations (*CM1 Water Facilities and Operation*). The existing operation and maintenance of the Suisun Marsh Salinity Control Gates and other facilities will not change until covered activities require changes in their operation. Operations of the Suisun Marsh facilities under the existing operational criteria as well as changes to operation as described in CM1 will be covered by BDCP. Generally, as habitat restoration in Suisun Marsh is conducted with the implementation of conservation measures, and changes in land uses occur, the operation of the Suisun Marsh Salinity Control Gates will trend towards limiting the operation of the gates and increasing the period during which the gates allow tidal inflows into Montezuma Slough to provide for the conservation of covered fish species in conjunction with all other water operations under the BDCP.

The BDCP covers operations of the Suisun Marsh Salinity Control Gates and other Suisun Marsh facilities under the existing and future operational criteria and future construction and maintenance of tidal habitat in Suisun Marsh identified in CM1 and CM4 in Chapter 3, *Conservation Strategy.* These activities and actions are included as covered activities and associated federal actions. Those actions associated with Reclamation will receive authorization through the ESA Section 7 consultation process and those actions associated with DWR will be covered under the ESA Section 10 permit and NCCPA Section 2835 permit issued to the Authorized Entities.

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4.5.1 Literature Cited

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4.5.2 Personal Communications

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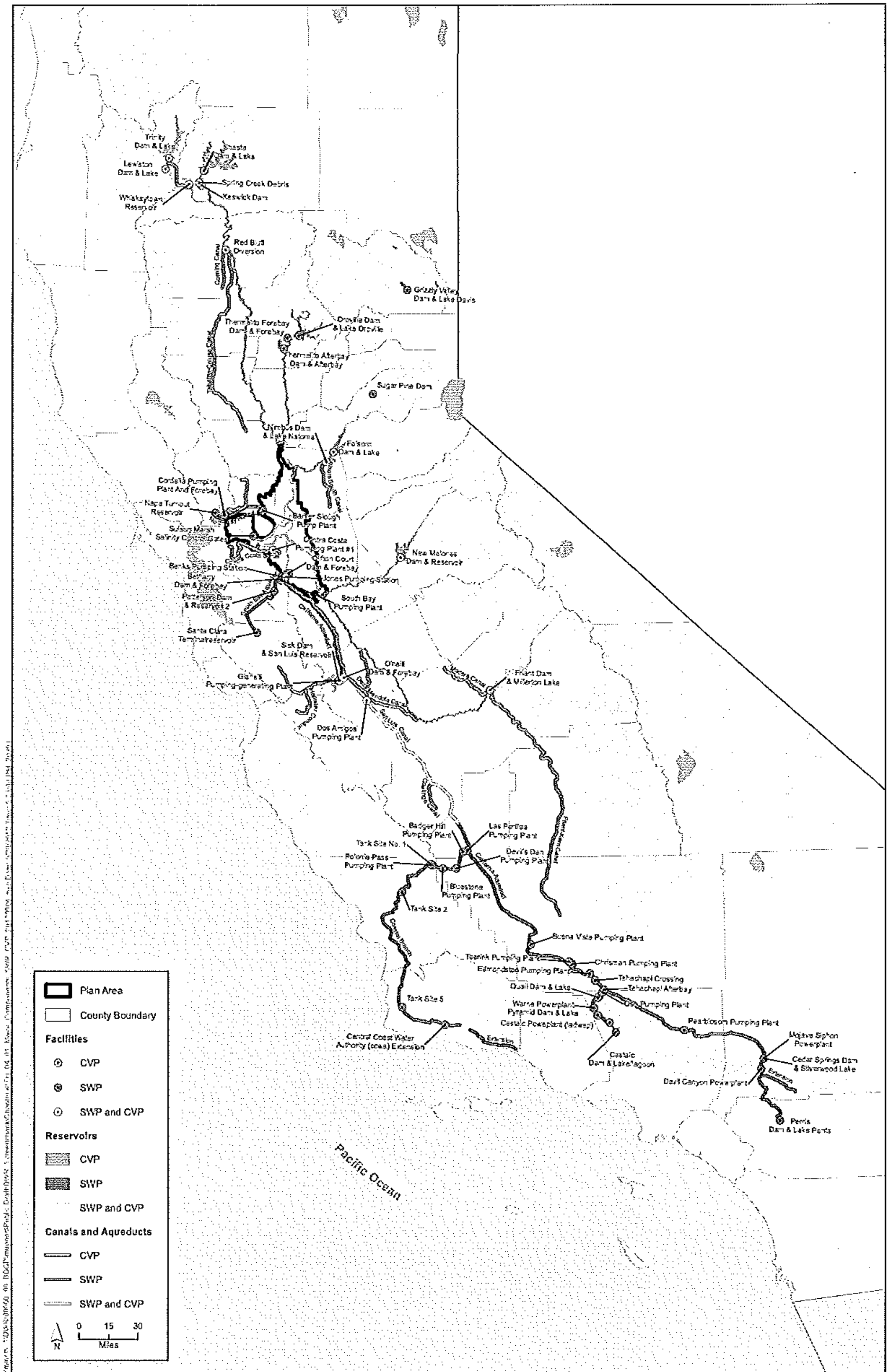
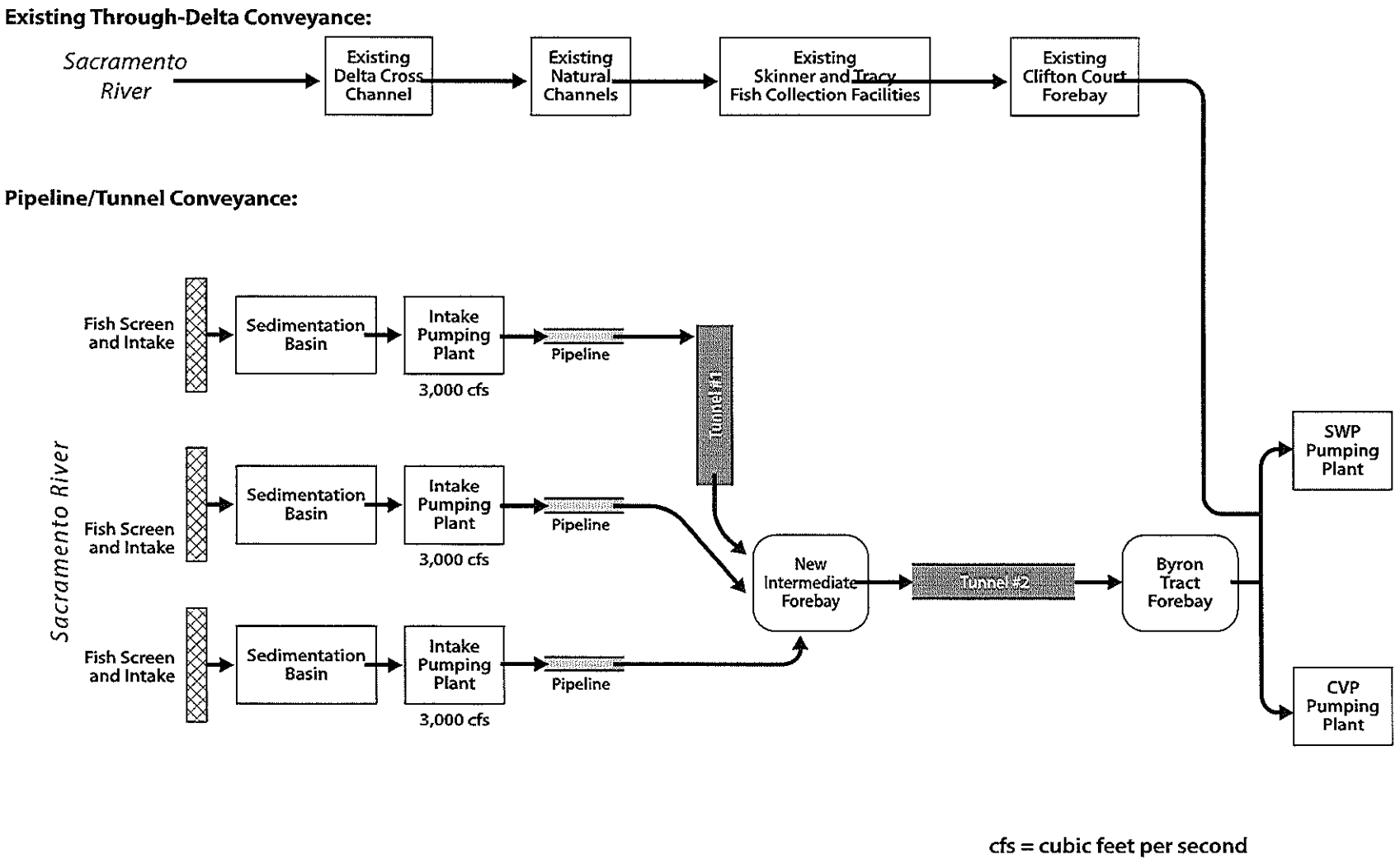


Figure 4-1
Major Components of the SWP and CVP



Source: Adapted from California Department of Water Resources Conceptual Engineering Reports, 2010.

Figure 4-2
Schematic Diagram of the Proposed North Delta Intake and Conveyance Facilities

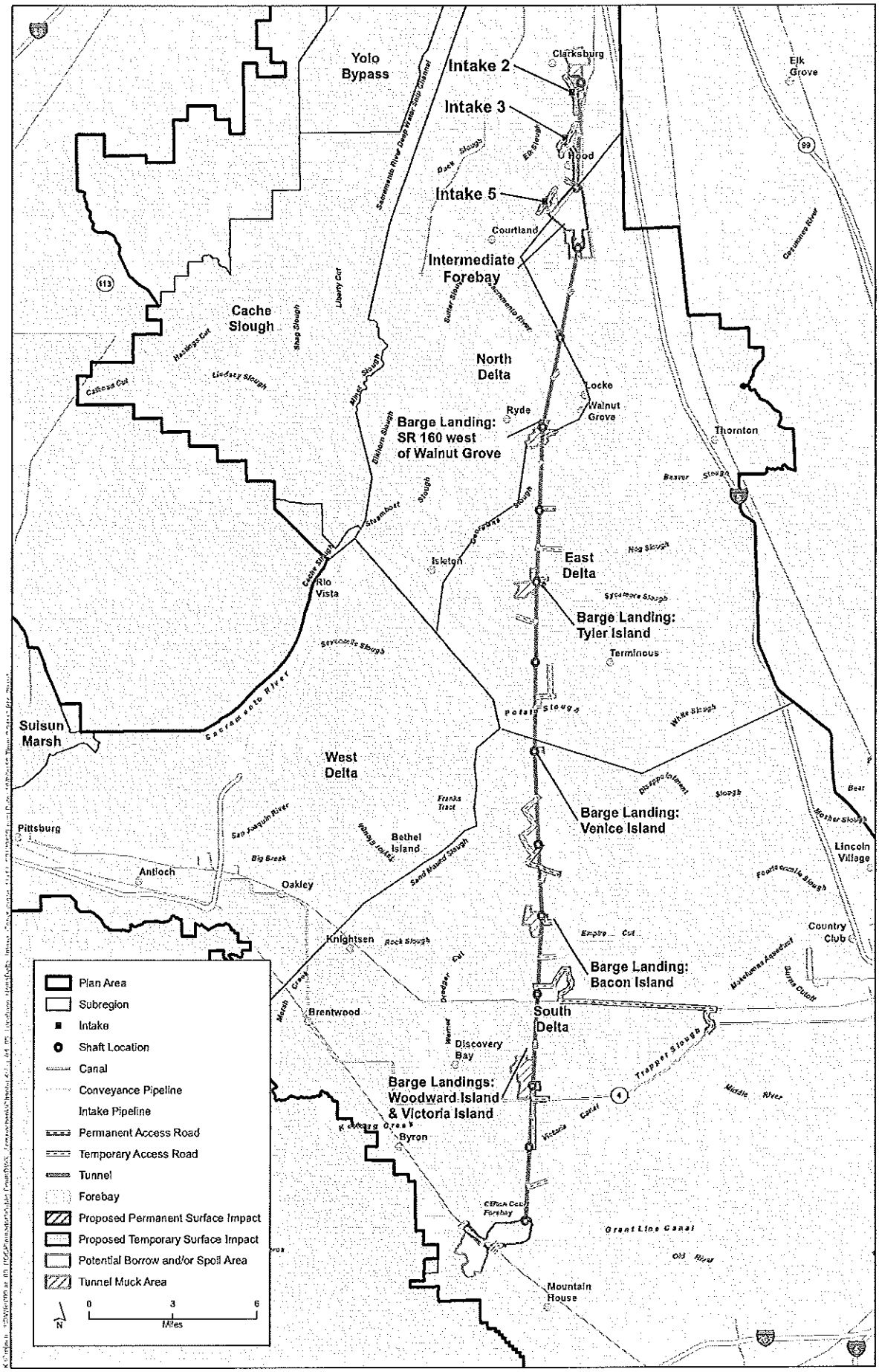
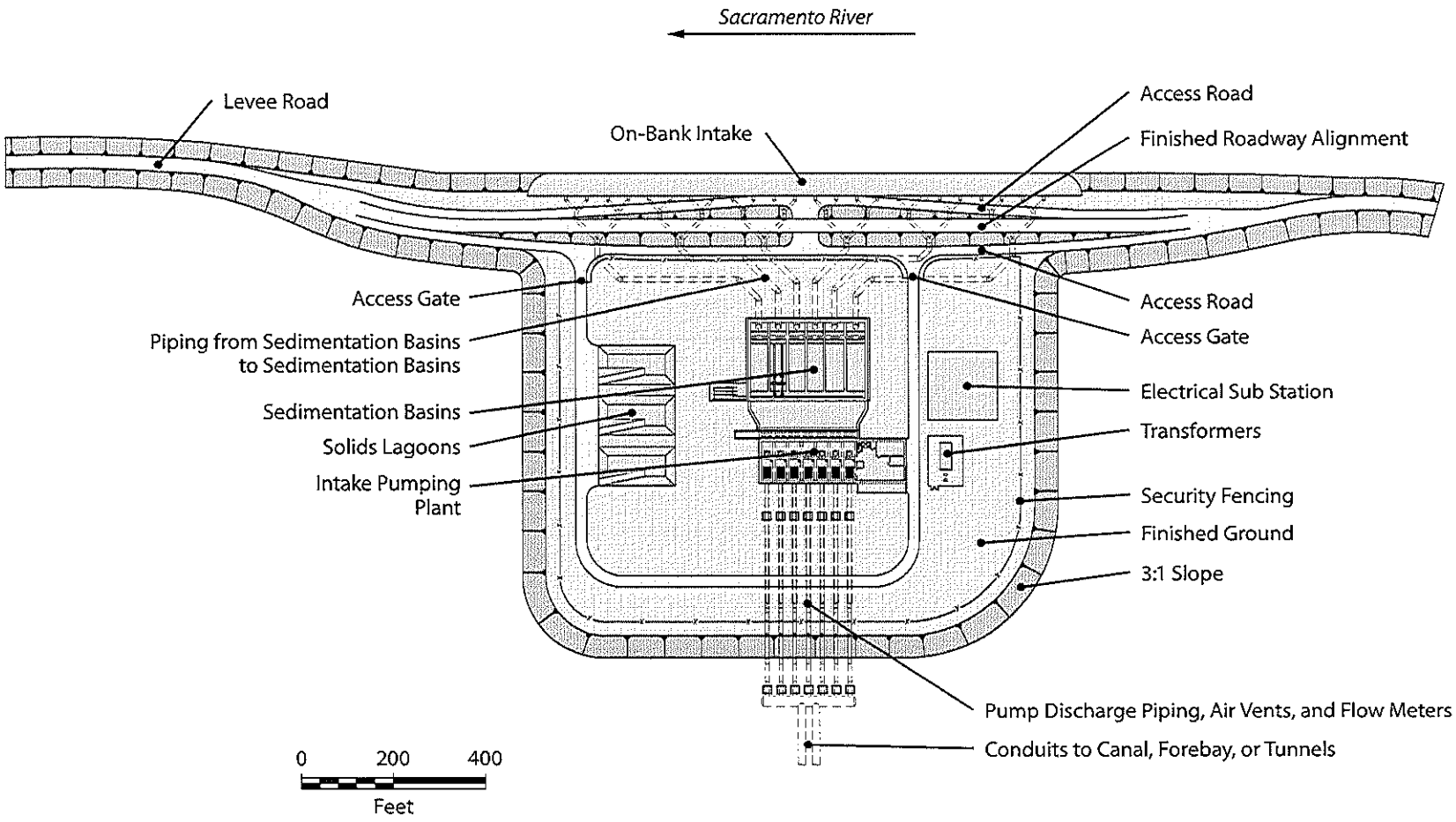


Figure 4-3
Locations of the Proposed North Delta Intake and Conveyance Facilities



Source: Adapted from TM 20-2 Rev 0 Proposed North Intake Facilities for the Draft EIRS, Figure O-5.

Figure 4-4
Conceptual Intake Structure

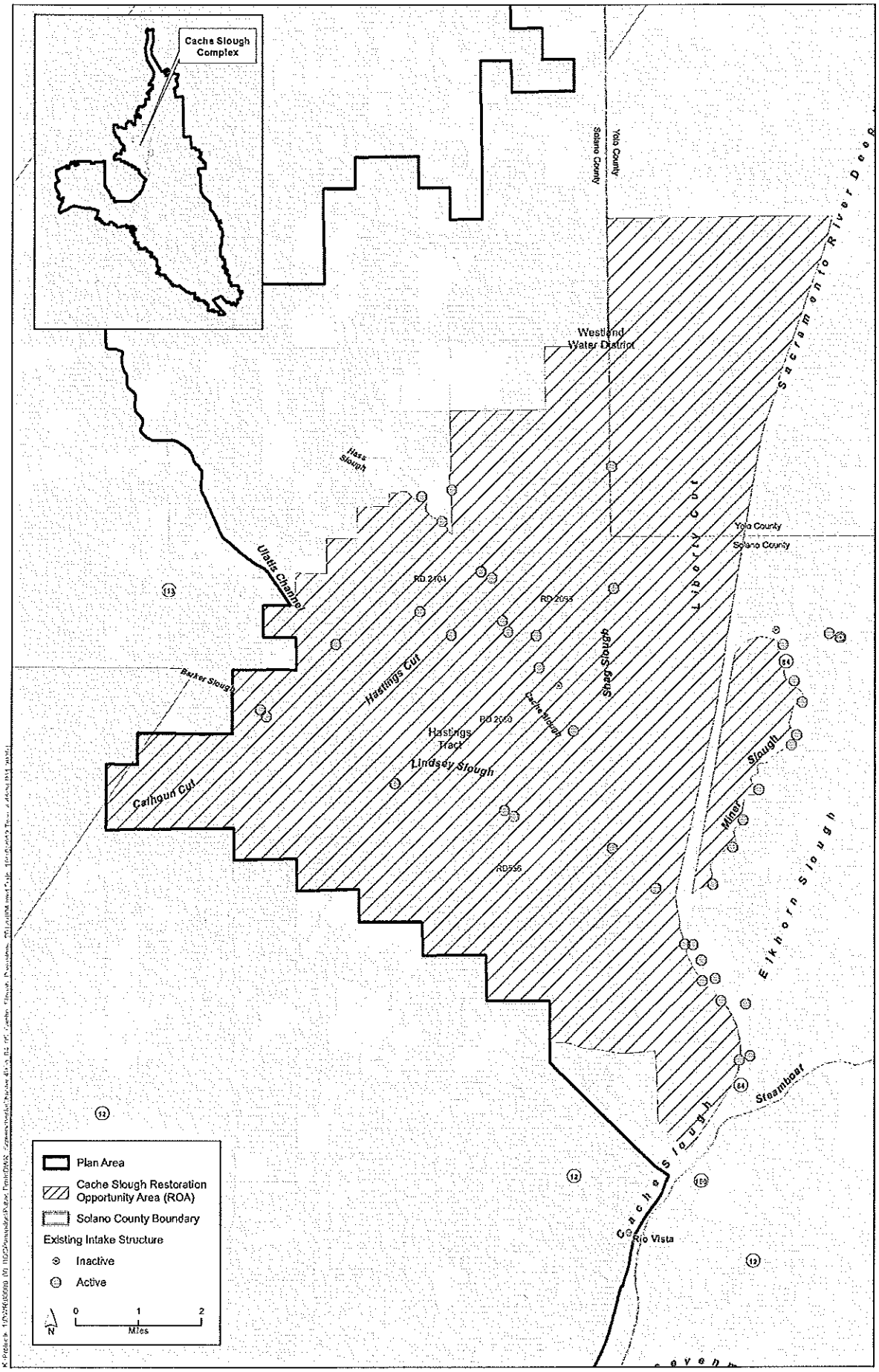


Figure 4-5
Cache Slough Restoration Opportunity Area with Intake Structures