coordinated operations of the SWP and CVP and the 2081b permit for the SWP facilities and operations, as well as for the new biological opinion and 2081b for this proposed project. Hypotheses will be tested using the following steps:

1. Clearly articulate the management objectives of the actions, along with the criteria that will be used to assess the efficacy of the actions.
2. Clearly articulate the scientific uncertainties and specific hypotheses designed to reduce that uncertainties regarding questions of management importance.
3. Develop and implement a science plan and data collection program to test the hypotheses and reduce the relevant uncertainties.
4. Based on the data collected and analysis of the data, the Collaborative Science process will prepare a written report that presents findings and synthesis of the analyses for submittal to an independent panel review process.

Table 4.1-2. New and Existing Water Operations Flow Criteria and Relationship to Assumptions in CALSIM Modeling

Parameter	Criteria	Summary of CALSIM Modeling[a]
	New Criteria Included in Alternative 4A	
North Delta bypass flows	• Initial Pulse Protection: o Low-level pumping of up to 6% of total Sacramento River flow such that bypass flow never falls below 5,000 cfs. No more than 300 cfs can be diverted at any one intake. o If the initial pulse begins and ends before Dec 1, post-pulse criteria for May go into effect after the pulse until Dec 1. On Dec 1, the Level 1 rules defined in Table 3-16 in the Draft EIR/EIS apply unless a second pulse occurs. If a second pulse occurs, the second pulse will have the same protective operation as the first pulse. • Post-pulse Criteria (specifies bypass flow required to remain downstream of the North Delta intakes): o October, November: bypass flows of 7,000 cfs before diverting at the North Delta intakes. o July, August, September: bypass flows of 5,000 cfs before diverting at the North Delta intakes. • December through June: post-pulse bypass flow operations will not exceed Level 1 pumping unless specific criteria have been met to increase to Level 2 or Level 3 as defined in the Section 3.6.4 of the Draft EIR/EIS. If those criteria are met, operations can proceed as defined in Table 3.4.1-2 in the BDCP Public draft. The specific criteria for transitioning between and among pulse protection, Level 1, Level 2, and/or Level 3 operations, will be developed and based on real-time fish monitoring and hydrologic/behavioral cues upstream of and in the Delta. During operations, adjustments are expected to be made to improve water supply and/or migratory conditions for fish by making real-time adjustments to the pumping levels at the north Delta diversions. These adjustments would be managed under Real Time Operations (RTO).	• Same as CM1 criteria, as proposed in the Draft BDCP (hereafter "CM1 criteria").

Parameter	Criteria	Summary of CALSIM Modeling[a]
South Delta operations	• October, November: No south Delta exports during the D-1641 San Joaquin River 2-week pulse, no Old and Middle River (OMR) flow restriction during 2 weeks prior to pulse, and a monthly average of −5,000 cfs in November after pulse. • December: OMR flows will not be more negative than an average of −5,000 cfs when the Sacramento River at Wilkins Slough pulse triggers, and no more negative than an average of −2,000 cfs when the delta smelt action 1 triggers. No OMR flow restriction prior to the Sacramento River pulse, or delta smelt action 1 triggers. • January, February[15]: OMR flows will not be more negative than an average of 0 cfs during wet years, −3,500 cfs during above-normal years, or −4,000 cfs during below-normal to critical years, except −5,000 in January of dry and critical years. • March[16]: OMR flows will not be more negative than an average of 0 cfs during wet or above- normal years or −3,500 cfs during below-normal and dry year and −3,000 cfs during critical years. • April, May: Allowable OMR flows depend on gaged flow measured at Vernalis, and will be determined by a linear relationship. If Vernalis flow is below 5,000 cfs, OMR flows will not be more negative than−2,000 cfs. If Vernalis is 6,000 cfs, OMR flows will not be less than +1,000 cfs. If Vernalis is 10,000 cfs, OMR flows will be at least 1,000 cfs. If Vernalis exceeds 10,000 cfs, OMR flows will be at least +2,000 cfs. If Vernalis is 15,000 cfs, OMR flows will be at least +3,000 cfs. If Vernalis is at or exceeds 30,000 cfs, OMR flows will be at least 6,000 cfs. • June: Similar to April, allowable flows depend on gaged flow measured at Vernalis. However, if Vernalis is less than 3,500 cfs, OMR flows will not be more negative than −3,500 cfs. If Vernalis exceeds 3,500 cfs and up to 10,000 cfs, OMR flows will be at least 0 cfs. If Vernalis exceeds 10,000 cfs and up to 15,000 cfs, OMR flows will be at least +1,000 cfs. If Vernalis exceeds 15,000 cfs, OMR flows will be at least +2,000 cfs. • July, August, September: No OMR flow constraints.	• October, November: Assumed no south Delta exports during the D-1641 San Joaquin River 2-week pulse, no OMR restriction during 2 weeks prior to pulse, and −5,000 cfs in November after pulse. • December: −5,000 cfs only when the Sacramento River pulse based on the Wilkins Slough flow (same as the pulse for the north Delta diversion) occurs, if no OMR requirement was applied. If the USFWS (2008) BiOp Action 1 is triggered, after which −2,000 cfs requirement is assumed. • April, May: OMR requirement for the Vernalis flows falling between the specified flows were determined by linear interpolation. When Vernalis flow is between 5,000 cfs and 6,000 cfs, OMR requirement is determined by linearly interpolating between −2,000 cfs and +1,000 cfs. • January–March and July–September: Same as CM1 criteria

[15] Sacramento River 40-30-30 index based water year types. For January and February, anticipated water year type based on the forecasted hydrology will be used. The frequency of exceedance of the forecasted hydrology will be consistent with current practices. CALSIM II modeling uses previous water year type for October through January, and the current water year type from February onwards.

[16] Sacramento River 40-30-30 index based water year types. For March, anticipated water year type based on the forecasted hydrology will be used. The frequency of exceedance of the forecasted hydrology will be consistent with current practices. CALSIM II modeling uses previous water year type for October through January, and the current water year type from February onwards.

Parameter	Criteria	Summary of CALSIM Modeling[a]
Head of Old River gate operations	• October 1–November 30th: RTO management in order to protect the D-1641 pulse flow designed to attract upstream migrating adult Fall-Run Chinook Salmon. HORB will be closed approximately 50% during the time immediately before and after the SJR pulse and that it will be fully closed during the pulse unless new information suggests alternative operations are better for fish. • January: When salmon fry are migrating, (determined based on real time monitoring), initial operating criterion will be to close the gate subject to RTO for purposes of water quality, stage, and flood control considerations. • February–June 15th: Initial operating criterion will be to close the gate subject to RTO for purposes of water quality, stage, and flood control considerations. The agencies will actively explore the implementation of reliable juvenile salmonid tracking technology which may enable shifting to a more flexible real time operating criterion based on the presence/absence of covered fishes. • June 16 to September 30, December: Operable gates will be open.	• Assumed 50% open from January 1 to June 15, and during days in October prior to the D-1641 San Joaquin River pulse. Closed during the pulse. 100% open in the remaining months.
Spring outflow	• March, April, May: To ensure maintenance of longfin smelt abundance, initial operations will provide a March–May average Delta outflow bounded by the requirements of Scenario H3, which are consistent with D-1641 standards, and Scenario H4, which would be scaled to Table 3-24 in Chapter 3, Section 3.6.4.2 of the Draft EIR/EIS. Over the course of the 2081(b) permit term the longfin smelt indices of annual recruitment based upon the 1980–2011 trend in recruitment relative to winter-spring flow conditions will be used to evaluate the effect of operations on longfin smelt (i.e., evaluate positive cohort over cohort population growth). Adjustments to the criteria above and these outflow targets may be made using the Adaptive Management Process and the best available scientific information available regarding all factors affecting longfin smelt abundance.[17]	• Same as CM1 criteria, assuming outflow from export reductions first, then Oroville releases
Rio Vista minimum flow standard	• January through August: flows will exceed 3,000 cfs • September through December: flows per D-1641	• Same as CM1 criteria
Key Existing Criteria Included in Modeling		
Fall outflow	• September, October, November implement the USFWS (2008) BiOp Fall X2 requirements. However, similar to spring Delta outflow and consistent with the existing RPA adaptive management process, adjustments to these outflow targets may be made using the Adaptive Management and Monitoring Program described below and the best available scientific information available regarding all factors affecting delta smelt abundance.	• Same as CM1 criteria.

[17] For example, if best available science resulting from collaborative scientific research program shows that Longfin Smelt abundance can be maintained in the absence of spring outflow, and DFW concurs, an alternative operation for spring outflow could be to follow flow constraints established under D-1641.

Parameter	Criteria	Summary of CALSIM Modeling[a]
Winter and summer outflow	• Flow constraints established under D-1641 will be followed if not superseded by criteria listed above.	• Same as CM1 criteria.
Delta Cross Channel Gates	• Operations as required by NMFS (2009) BiOp Action 4.1 and D-1641.	• Delta Cross Channel gates are closed for a certain number of days during October 1 through December 14 based on the Wilkins Slough flow, and the gates may be opened if the D-1641 Rock Slough salinity standard is violated because of the gate closure. Delta Cross Channel gates are assumed to be closed during December 15 through January 31. February 1 through June 15, Delta Cross Channel gates are operated based on D-1641 requirements.
Suisun Marsh Salinity Control Gates	• Gates would continue to be closed up to 20 days per year from October through May.	Not modeled in CALSIM II; only in DSM2.
Export to inflow ratio	• Operation criteria are the same as defined under D-1641. • The D-1641 export/inflow (E/I) ratio calculation was designed to protect fish from south Delta entrainment. For Alternative 4A, Reclamation and DWR propose that the North Delta Diversion (NDD) does not affect either Delta inflows or exports as they relate to the E/I ratio calculation. In other words, Sacramento River inflow is defined as flows downstream of the NDD and only south Delta exports are included for the export component of the criteria.	• Combined export rate is defined as the diversion rate of the Banks Pumping Plant and Jones Pumping Plant from the south Delta channels. • Delta inflow is defined as the sum of the Sacramento River flow downstream of the proposed north Delta diversion intakes, Yolo Bypass flow, Mokelumne River flow, Cosumnes River flow, Calaveras River flow, San Joaquin River flow at Vernalis, and other miscellaneous in-Delta flows.

[a] See Table C.A-1, CALSIM II Modeling Assumptions for Existing Conditions (EBC1), No Action Alternative (EBC2) and BDCP Operational Scenarios, in Section B.3.4, *Alternative 4 Decision Tree Scenarios H1, H2, H3 and H4*, in Appendix 5A, *Modeling Technical Appendix*, of the Draft EIR/EIS.