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## Appendix A2

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**June 2017**

### **Description of the Proposed Action**

**EXHIBIT BKS-251**

south Delta export facilities

Head of Old River (HOR) gate operations

Additionally, the operation of the following facilities is included in the PA once the north Delta diversions are operational, but no changes to their operations are proposed.

Delta Cross Channel (DCC) gate operations

Suisun Marsh facilities

North Bay Aqueduct (NBA) Intake

The proposed operational criteria are described in the following sections and in Table 3.3-1. The longfin smelt is a species listed under the California Endangered Species Act (CESA). Therefore, it will be necessary for DWR to meet CESA permit issuance criteria for this species. To avoid a reduction in overall abundance for longfin smelt, the PA includes spring outflow criteria, which are intended to be provided by appropriate beneficiaries through the acquisition of water from willing sellers. If sufficient water cannot be acquired for this purpose, the spring outflow criteria will be accomplished through operations of the CVP/SWP to the extent an obligation is imposed on either the SWP or CVP under federal or applicable state law. Best available science, including that developed through a collaborative science program, will be used to analyze and make recommendations on the role of such flow in supporting longfin smelt abundance to CDFW, who will determine whether it is necessary to meet CESA permitting criteria.

Operations under the PA may result in substantial change in Delta flows compared to the expected flows under the existing Delta configuration, and in some instances real-time operations will be applied for water supply, water quality, flood control, and/or fish protection purposes. Two key drivers of CVP/SWP operations, Fall X2 and spring outflow, as well as many of the individual operational components described below, are designed to adapt to developing scientific information as a consequence of the level of uncertainty associated with those criteria. A Collaborative Science and Adaptive Management Program will be used to evaluate and consider changes in the operational criteria based on information gained before and after the new facilities become operational. Described in more detail in Section 3.4.6 *Collaborative Science and Adaptive Management Program* this program will be used to consider and address scientific uncertainty regarding the Delta ecosystem and to inform implementation of the operational criteria in the near term for existing BiOps for the coordinated operations of the CVP/SWP (U.S. Fish and Wildlife Service 2008, National Marine Fisheries Service 2009) and the 2081b permit for the SWP facilities and operations (California Department of Fish and Game 2009), as well as in the future for the new BiOp and 2081(b) for this PA.

### 3.3.2 Operational Criteria

Table 3.3-1 provides an overview of the proposed new criteria and other key criteria assumed for Delta operations when the proposed north Delta diversion intakes are operational. The proposed operational criteria were developed in coordination with NMFS, USFWS, and DFW to minimize project effects on listed species. Further descriptions, including the intent of the specific criteria for each facility are described below, except the spring outflow criterion which is not associated with any facility.

The purpose of the spring outflow criteria is to maintain spring outflows consistent with the current Biological Opinions (FWS 2008; NMFS 2009), as described above.

A brief description of the modeling assumptions for each criterion is included. Additional detail regarding modeling assumptions is included in Table 3.3-2. Actual operations will also rely on real-time operations as described in Section 3.3.3, *Real-Time Operational Decision-Making Process*. Criteria presented in Table 3.3-1, as annotated, for south Delta operations represent the maximum restrictions on exports. Even though this BA attempts to describe the temporal scale at which some of the operational criteria will be implemented (e.g. north Delta bypass flow requirements and OMR requirements), a detailed operations plan will be developed by Reclamation and DWR in coordination with DFW, NMFS and USFWS prior to the new facilities becoming operational.

Table 3.3-1. New and Existing Water Operations Flow Criteria and Relationship to Assumptions in CALSIM II Modeling<sup>27</sup>

Parameter	Criteria	Summary of CALSIM II Modeling Assumptions <sup>a</sup>
<b>New Criteria Included in the Proposed Action</b>		
North Delta bypass flows <sup>28</sup>	<ul style="list-style-type: none"> <li>● Bypass Flow Criteria (specifies bypass flow required to remain downstream of the North Delta intakes):                             <ul style="list-style-type: none"> <li>○ October, November: Minimum flow of 7,000 cfs required in river after diverting at the North Delta intakes.</li> <li>○ December through June: see below</li> <li>○ July, August, September: Minimum flow of 5,000 cfs required in river after diverting at the North Delta intakes.</li> </ul> </li> <li>● Pulse Protection:                             <ul style="list-style-type: none"> <li>○ Low-level pumping of up to 6% of total Sacramento River flow at Freeport such that bypass flow never falls below 5,000 cfs. No more than 300 cfs can be diverted at any one intake.</li> <li>○ Low level pumping maintained during the pulse protection period.</li> <li>○ Pulse is determined based on the real-time monitoring of juvenile fish movement as described in Section 3.3.3.1 <i>North Delta Diversion</i></li> <li>○ If the initial pulse begins and ends before Dec 1, the bypass flow criteria for</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Initial Pulse Protection:                             <ul style="list-style-type: none"> <li>○ 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.</li> <li>○ If the initial pulse begins and ends before Dec 1, criteria for the appropriate month (Oct–Nov) go into effect after the pulse until Dec 1. On Dec 1, the Level 1 rules defined in Table 3.3-2 apply until a second pulse, as defined in Table 3.3-3 occurs. The second pulse will have the same protective operation as the first pulse.</li> </ul> </li> </ul>

<sup>27</sup> In coordination with NMFS, USFWS, and CDFW, several updates to CWF operational criteria were made during the ESA and CESA consultation processes. An analysis was performed (model results submitted to USFWS on 5/5/17) to determine if the updated operational criteria would result in additional effects outside of those analyzed in this BA. The modeling results confirmed the effects of the operational updates are within the range analyzed in the BA. As a result, the PA effects analysis in Chapters 5 and 6 are representative of potential project effects and no additional analysis is necessary.

<sup>28</sup> Sacramento River flow upstream of the intakes to be measured flow at Freeport. Bypass flow is the Sacramento River flow quantified downstream of the Intake # 5. Sub-daily north Delta intakes' diversion operations will maintain fish screen approach and sweeping velocity criteria

Parameter	Criteria	Summary of CALSIM II Modeling Assumptions <sup>a</sup>
	<p>the month (Oct-Nov) when the pulse occurred would take effect. On Dec 1, the Level 1 rules defined below apply unless a second pulse occurs.</p> <ul style="list-style-type: none"> <li>• Post-pulse Criteria (specifies bypass flow required to remain downstream of the North Delta intakes):                             <ul style="list-style-type: none"> <li>○ December through June: once the pulse protection ends, 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. If those criteria are met, operations can proceed as defined in Table 3.3-2. Allowable diversion will be greater of the low-level pumping or the diversion allowed by the post-pulse bypass flow rules in Table 3.3-2. 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 as discussed in Section 3.3.3.1, <i>North Delta Diversion</i>. During operations, adjustments to the default allowable diversion level specified in Table 3.3-2 are expected to be made to improve water supply and/or migratory conditions for fish by making real-time adjustments to the diversion levels at the north Delta intakes. These adjustments are expected to fall within the operational bounds analyzed for the BA and will be managed</li> </ul> </li> </ul>	

South  
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ns<sup>29,30</sup>

- October, November: To be determined based on real time operations and protection of the D-1641 San Joaquin River 2-week pulse.
- December: OMR flows will not be more negative than an average of -5,000 cfs when the Sacramento River at Wilkins Slough pulse (same as north Delta diversion bypass flow pulse defined in Table 3.3-2) triggers<sup>31</sup>, and no more negative than an average of -2,000 cfs when the delta smelt USFWS (2008) BiOp action 1 triggers. No OMR flow restriction prior to the Sacramento River pulse or delta smelt action 1 triggers.
- October, November<sup>32</sup>: 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 the USFWS (2008) BiOp Action 1 is triggered, -2,000 cfs

<sup>29</sup> The criteria do not fully reflect the complexities of CVP/SWP operations, dynamic hydrology, or spatial and temporal variation in the distribution of aquatic species. As a result, the criteria will be achieved by operating within an initial range of real time operational criteria from January through March and in June. This initial range, including operational triggers, will be determined through future discussion, including a starting point of -1250 to -5000 cfs based on a 14-day running average, and will be informed by the Adaptive Management Program, including real time monitoring. Further, the 3-day averaging period may be modified through future discussion. Modifications to the 3-day average period and the range of operating criteria may be needed, in part, because: 1) the water year type is forecasted in February but not finalized until May and 2) 0 cfs, or positive, OMR in wet and above normal years may be attained coincident with unimpaired flows.

<sup>30</sup> OMR measured through the currently proposed index-method (Hutton 2008) with a 14-day averaging period consistent with the current operations (USBR 2014).

<sup>31</sup> December Sacramento River pulse determined by flow increases at Wilkins Slough of greater than 45% within 5- day period and exceeding 12,000 cfs at the end of 5-day period, and real-time monitoring of juvenile fish movement. Preliminary discussions with engineers indicates ramping down can begin within an hour of the trigger and full ramp down could be complete within approximately 12 hours. The Wilkins Slough trigger will be reviewed through future discussion, which will be informed by the Adaptive Management Program, including real time monitoring.

<sup>32</sup> As a result of formal consultation with USFWS and NMFS, and as a result of DFW's issuance of the Draft 2081(b) ITP, DWR and Reclamation have included clarifications to the CWF operations flow criteria contained in Table 3.3-1 table. Although the October/November south Delta operational criteria were updated for the PA (see criteria described in the left column), for CALSIM modeling purposes in the effects analysis for the BA, the operational criteria listed here were used in the PA scenario to compare against the NAA, which has no OMR flow restrictions in October or November. As described in footnote 27, an analysis (model results submitted to USFWS on 5/5/17) was performed which indicated that the effects of the updated operational criteria are consistent with the effects analyzed in this BA; therefore, it was determined no changes to the CALSIM II modeling assumptions or performance of additional analysis was necessary.

Parameter	Criteria	Summary of CALSIM II Modeling Assumptions <sup>a</sup>
	<ul style="list-style-type: none"> <li>• January, February<sup>33</sup>: OMR flows will not be more negative than a 3-day 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.</li> <li>• March<sup>34</sup>: OMR flows will not be more negative than a 3-day 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.</li> <li>• April, May<sup>35</sup>: 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 -2000 cfs. If Vernalis is 6,000 cfs, OMR flows will not be less than +1000 cfs. If Vernalis is 10,000 cfs, OMR flows will not be less than +2,000 cfs. If Vernalis is 15,000 cfs, OMR flows will not be less than +3,000 cfs. If Vernalis is at or exceeds 30,000 cfs, OMR flows will not be less than 6,000 cfs.</li> <li>• June: Similar to April and May, allowable flows depend on gaged flow measured at Vernalis (except without interpolation). 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 up to 10,000 cfs, OMR flows will not be less than 0 cfs. If Vernalis exceeds 10,000 cfs up to 15,000 cfs, OMR flows will not be less than +1,000 cfs. If Vernalis exceeds 15,000 cfs, OMR flows will not be less than +2,000 cfs.</li> <li>• July, August, September: No OMR flow constraints<sup>36</sup>.</li> <li>• OMR criteria under 2008 USFWS and 2009 NMFS BiOps or the above, whichever results in</li> </ul>	<p>requirement for 14 days is assumed. Remaining Dec days were assumed to have an allowable OMR of -8000 cfs to compute a composite monthly allowable OMR level.</p> <ul style="list-style-type: none"> <li>• April, May: OMR requirement for the Vernalis flows between 5000 cfs and 30000 cfs were determined by linear interpolation. For example, 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.</li> <li>• January–March and June–September: Same as the criteria</li> <li>• New OMR criteria modeled as monthly average values.</li> </ul>

<sup>33</sup> Water year type based on the Sacramento 40-30-30 index to be based on 50% forecast per current approaches; the first update of the water year type to occur in February. CALSIM II modeling uses previous water year type for October through January, and the current water year type from February onwards

<sup>34</sup> Water year type as described in the above footnote.

<sup>35</sup> When OMR target is based on Vernalis flow, will be a function of 5-day average measured flow.

<sup>36</sup> The PA operations include a preference for south Delta pumping in July through September months to provide limited flushing flows to manage water quality in the south Delta.

Parameter	Criteria	Summary of CALSIM II Modeling Assumptions <sup>a</sup>
	more positive, or less negative OMR flows, will be applicable <sup>37</sup> .	
HOR gate operations	<ul style="list-style-type: none"> <li>• October 1–November 30: RTO management – with the current expectation being that the HOR gate will be operated to protect the D- 1641 pulse flow.</li> <li>• January-March 31, and June 1-15: RTO will determine exact operations to protect salmon fry when migrating, During this migration, operation will be to close the gate subject to RTO for purposes of water quality, stage, and flood control considerations.</li> <li>• April-May: Initial operating criterion will be to close the gate 100% of time subject to RTO for purposes of water quality, stage, and flood control considerations (Section 3.3.3, <i>Real-Time Operational Decision-Making Process</i>). Reclamation, DWR, NMFS, USFWS, and DFW will actively explore the implementation of reliable juvenile salmonid tracking technology that may enable shifting to a more flexible real time operating criterion based on the presence/absence of listed fishes.</li> <li>• June 16 to September 30, December: Operable gates will be open.</li> </ul>	<ul style="list-style-type: none"> <li>• 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.</li> </ul>

<sup>37</sup> Change in CVP/SWP pumping from the south Delta will occur to comply with OMR targets and will be achieved to the extent exports can control the flow. The OMR targets would not be achieved through releases from CVP/SWP reservoirs. The combined CVP/SWP export rates from the proposed north Delta intakes and the existing south Delta intakes will not be required to drop below 1,500 cfs to provide water supply for health and safety needs, critical refuge supplies, and obligation to senior water rights holders.

Parameter	Criteria	Summary of CALSIM II Modeling Assumptions <sup>a</sup>
Delta Cross Channel Gates	<ul style="list-style-type: none"> <li>Operating criteria as required by NMFS (2009) BiOp Action IV.1 and D-1641, and DCC closure for downstream flood control will be based on Sacramento River flow at Freeport, upstream of the NDD facilities.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
Spring Outflow <sup>38</sup>	<p>March, April, May: Initial operations will maintain the March–May average delta outflow that would occur with existing facilities under the operational criteria described in the 2008 USFWS BiOp and 2009 NMFS BiOp (U.S. Fish and Wildlife Service 2008; National Marine Fisheries Service 2009).<sup>39</sup></p>	<ul style="list-style-type: none"> <li>2011 NMFS RPA for San Joaquin River i-e ratio constraint is the primary driver for the Apr-May Delta outflow under the No Action Alternative, this criterion was used to constrain Apr-May total Delta exports under the PA to meet Mar- May Delta outflow targets.</li> </ul>
<b>Key Existing Delta Criteria Included in Modeling<sup>40</sup></b>		
Fall Outflow	<ul style="list-style-type: none"> <li>No change. September, October, November: implement the USFWS 2008 BO Fall X2 requirements in wet (W) and above normal (AN) year types.</li> </ul>	<ul style="list-style-type: none"> <li>September, October, November: implement the 2008 USFWS BiOp “Action 4: Estuarine Habitat During Fall” (Fall X2) requirements (U.S. Fish and Wildlife Service 2008).</li> </ul>
Winter and summer outflow	<ul style="list-style-type: none"> <li>No change. Flow constraints established under D-1641 will be followed if not superseded by criteria listed above.</li> </ul>	<ul style="list-style-type: none"> <li>SWRCB D-1641 Delta outflow and February – June X2 criteria.</li> </ul>

Parameter	Criteria	Summary of CALSIM II Modeling Assumptions <sup>a</sup>
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<sup>38</sup> For modeling purposes, the criteria described in the CALSIM modeling assumptions column were used for the PA scenario. However, the 2081(b) ITP is expected to include final operations related to spring outflow. Although the expected spring outflow requirements from DFW are not components for the proposed action, DFW’s expected operational criteria related to spring outflow was modeled and included in the draft 2081(b) ITP and presented in the table below: **Spring Outflow Criteria** Upon initiation of the Test Period and throughout the CDFW permit term, average Delta outflow for LFS based on the 50% exceedance forecast for the current month’s ELT 8 River Index (8RI). (From DFW ITP)

<sup>39</sup> 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 developed to follow flow constraints established under D-1641. Any changes in the PA will be implemented consistent with the CWF AMP, including coordination with USFWS and NMFS

<sup>40</sup> All the CALSIM II modeling assumptions are described in Appendix 5.A, *CALSIM Methods and Results*.