

Table 4: Key CalSim II CWF No Action Alternative, H3, H4, CPOD Boundary 1 and CPOD Boundary 2 Scenario Inputs and Assumptions

	No Action Alternative (NAA)	H3	H4	Boundary 1	Boundary 2
Planning horizon ^a	Year 2030	Same as NAA	Same as NAA	Same as NAA	Same as NAA
Inflows/ Supplies	Historical with modifications for operations upstream of rim reservoirs and with changed climate at Year 2030	Same as NAA	Same as NAA	Same as NAA	Same as NAA
Facilities					
North Delta Diversion Intakes	Not included	9,000 cfs north Delta diversion intake on the Sacramento River at Hood	Same as H3	Same as H3	Same as H3
Head of Old River Gate	Temporary Head of Old River Barrier installed in the fall months	Permanent Head of Old River Gate	Same as H3	Same as H3	Same as H3
North Delta Diversion Operations Criteria					
North Delta Diversion Bypass Flows	Not included	Sacramento River bypass flow requirements downstream of the proposed intakes as described in Table 2 below. In addition, a constraint on the potential diversion at the north Delta intakes, to account for the fish screen sweeping velocity criteria of 0.4 fps. The constraint was derived based on resulting diversions from the DSM2 modeling.	Same as H3	Same as H3	Same as H3
Minimum flow near Rio Vista	SWRCB D-1641	Same as NAA with additional minimum flow requirement of 3,000 cfs from January to August.	Same as H3	Same as H3	Same as H3

	No Action Alternative (NAA)	H3	H4	Boundary 1	Boundary 2
South Delta Export Restrictions					
South Delta exports (Jones PP and Banks PP)	SWRCB D-1641. Vernalis flow-based export limits Apr 1 – May 31 as required by NMFS BiOp (Jun, 2009) Action IV.2.1 (additional 500 cfs allowed for Jul – Sep for reducing impact on SWP)	SWRCB D-1641. Pumping at the south Delta intakes are preferred during the July through September months up to a total pumping of 3,000 cfs to minimize potential water quality degradation in the south Delta channels. No specific intake preference is assumed beyond 3,000 cfs.	Same as H3	Same as H3	Same as H3
Combined Flow in Old and Middle River (OMR)	FWS BiOp (Dec 2008) Actions 1 through 3 and NMFS BiOp (Jun 2009) Action IV.2.3	New OMR criteria in Table 3 below or same as the NAA, whichever results in less negative OMR flows	Same as H3	Same as NAA	New OMR criteria in Table 5 below or same as the NAA, whichever results in less negative OMR flows
Head of Old River Barrier/Gate	Head of Old River Barrier (HORB) is only installed in the fall months per FWS Delta Smelt BiOp Action 5; it is assumed to be not installed in April or May.	HOR gate operations assumptions (% OPEN) Oct 50%, Nov 100%, Dec 100%, Jan 50%, Feb - Jun 15th 50%, Jun 16-30 100%, Jul - Sep 100%; HOR gate will be open 100% whenever flows are greater than 10,000 cfs at Vernalis.; Oct-Nov: Before the D-1641 pulse = HOR gate open, During the D-1641 pulse = for 2 weeks HOR gate closed; After D-1641 pulse: HORB open 50% for 2 weeks	Same as H3	Same as NAA	HOR gate operations assumptions (% OPEN) Oct - Dec 100%, Jan - Feb 50%, Mar - Jun 0%, Jul - Sep 100%; HOR gate will be open 100% whenever flows are greater than 10,000 cfs at Vernalis.; Oct-Nov: Before the D-1641 pulse = HOR gate open, During the D-1641 pulse = for 2 weeks HOR gate closed; After D-1641 pulse: HORB open 50% for 2 weeks
Delta Outflow Requirements					
Delta Outflow Index (Flow and Salinity)	SWRCB D-1641 and USFWS BiOp (Dec 2008) Action 4 (Fall X2 Requirement)	Same as NAA	Same as NAA; In addition, enhanced spring Delta outflow required during the Mar-May period. Mar-May average outflow requirement is determined based on 90% forecast of Mar-May Eight River Index (8RI). For modeling purposes the Mar-May 8RI was forecasted based on a correlation between the Jan-Feb 8RI and Mar-May 8RI at ELT. Each year in March,	SWRCB D-1641	Same as NAA; In addition, year-round Delta outflow goals (see Table 8 below); outflow above existing requirements, attempted to achieve through Delta export curtailments by an amount needed to meet the outflow goal, such that minimum exports are greater of 1500 cfs or to meet CVP San

	No Action Alternative (NAA)	H3	H4	Boundary 1	Boundary 2
			<p>Delta outflow target for the Mar-May period is determined based on the forecasted Mar-May 8RI value and its exceedance probability, from the Table 7 below, linearly interpolating for values in-between. This additional spring outflow is not considered as an "in-basin use" for CVP-SWP Coordinated Operations. This outflow requirement is met first by curtailing Delta exports at Banks and Jones Pumping Plants by an amount needed to meet the outflow target, such that the minimum exports are at least 1,500 cfs. In wetter years (< 50% exceedance), if the outflow target is not achieved by export curtailments, then the additional flow needed to meet the outflow target is released from the Oroville reservoir as long as its projected end-of-May storage is at or above 2 MAF.</p>		<p>Joaquin River exchange contractor demands and CVP south-of-Delta refuge level 2 demands and conveyance losses are maintained. All other export restrictions are maintained. Outflow goals during Jul-Sep of non-Critical water year types, upstream reservoir releases are permitted to meet the additional outflow goals.</p>

Table 2: North Delta Diversion Bypass Flow Criteria

North Delta Diversion Bypass Flows								
These parameters are for modeling purposes. Actual operations will be based on real-time monitoring of hydrologic conditions and fish presence/movement								
<u>Low-Level Pumping (Dec-Jun)</u>								
Diversions 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.								
<u>Initial Pulse Protection</u>								
Low level pumping will be maintained through the initial pulse period. For modeling, the initiation of the pulse is defined by the following criteria: (1) Sacramento River flow at Wilkins Slough increasing by more than 45% within a five-day period and (2) flow on the fifth day greater than 12,000 cfs.								
The pulse (and low-level pumping) continues until either (1) Sacramento River flow at Wilkins Slough returns to pre-pulse flow level (flow on first day of pulse period), or (2) Sacramento River flow at Wilkins Slough decreases for 5 consecutive days, or (3) Sacramento River flow at Wilkins Slough is greater than 20,000 cfs for 10 consecutive days.								
After pulse period has ended, operations will return to the bypass flow table (Sub-Table A).								
If the initial pulse period begins and ends before Dec 1 st in the modeling, then any second pulse that may occur before the end of June will receive the same protection, i.e., low level pumping.								
<u>Post-Pulse Operations</u>								
After initial pulse(s), allowable diversion will go to Level I Post-Pulse Operations (see Sub-Table A) until 15 total days of bypass flows above 20,000 cfs occur. Then allowable diversion will go to the Level II Post-Pulse Operations until 30 total days of bypass flows above 20,000 cfs occur. Then allowable diversion will go to the Level III Post-Pulse Operations.								
Sub-Table A. Post-Pulse Operations for North Delta Diversion Bypass Flows								
Implement following bypass flow requirements sufficient to minimize any increase in the upstream tidal transport at two points of control: (1) Sacramento River upstream of Sutter Slough and (2) Sacramento River downstream of Georgiana Slough. These points are used to minimize any increase in upstream transport toward the proposed intakes or into Georgiana Slough. Allowable diversion will be greater of the low-level pumping or the diversion allowed by the following bypass flow rules.								
Level I Post-Pulse Operations			Level II Post-Pulse Operations			Level III Post Pulse Operations		
If Sacramento River flow is over...	But not over...	The bypass is...	If Sacramento River flow is over...	But not over...	The bypass is...	If Sacramento River flow is over...	But not over...	The bypass is...
Dec-Apr								
0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs
5,000 cfs	15,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	11,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	9,000 cfs	Flows remaining after constant low level pumping
15,000 cfs	17,000 cfs	15,000 cfs plus 80% of the amount over 15,000 cfs	11,000 cfs	15,000 cfs	11,000 cfs plus 60% of the amount over 11,000 cfs	9,000 cfs	15,000 cfs	9,000 cfs plus 50% of the amount over 9,000 cfs

17,000 cfs	20,000 cfs	16,600 cfs plus 60% of the amount over 17,000 cfs	15,000 cfs	20,000 cfs	13,400 cfs plus 50% of the amount over 15,000 cfs	15,000 cfs	20,000 cfs	12,000 cfs plus 20% of the amount over 15,000 cfs
20,000 cfs	no limit	18,400 cfs plus 30% of the amount over 20,000 cfs	20,000 cfs	no limit	15,900 cfs plus 20% of the amount over 20,000 cfs	20,000 cfs	no limit	13,000 cfs plus 0% of the amount over 20,000 cfs
May								
0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs
5,000 cfs	15,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	11,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	9,000 cfs	Flows remaining after constant low level pumping
15,000 cfs	17,000 cfs	15,000 cfs plus 70% of the amount over 15,000 cfs	11,000 cfs	15,000 cfs	11,000 cfs plus 50% of the amount over 11,000 cfs	9,000 cfs	15,000 cfs	9,000 cfs plus 40% of the amount over 9,000 cfs
17,000 cfs	20,000 cfs	16,400 cfs plus 50% of the amount over 17,000 cfs	15,000 cfs	20,000 cfs	13,000 cfs plus 35% of the amount over 15,000 cfs	15,000 cfs	20,000 cfs	11,400 cfs plus 20% of the amount over 15,000 cfs
20,000 cfs	no limit	17,900 cfs plus 20% of the amount over 20,000 cfs	20,000 cfs	no limit	14,750 cfs plus 20% of the amount over 20,000 cfs	20,000 cfs	no limit	12,400 cfs plus 0% of the amount over 20,000 cfs
Jun								
0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs	0 cfs	5,000 cfs	100% of the amount over 0 cfs
5,000 cfs	15,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	11,000 cfs	Flows remaining after constant low level pumping	5,000 cfs	9,000 cfs	Flows remaining after constant low level pumping
15,000 cfs	17,000 cfs	15,000 cfs plus 60% of the amount over 15,000 cfs	11,000 cfs	15,000 cfs	11,000 cfs plus 40% of the amount over 11,000 cfs	9,000 cfs	15,000 cfs	9,000 cfs plus 30% of the amount over 9,000 cfs
17,000 cfs	20,000 cfs	16,200 cfs plus 40% of the amount over 17,000 cfs	15,000 cfs	20,000 cfs	12,600 cfs plus 20% of the amount over 15,000 cfs	15,000 cfs	20,000 cfs	10,800 cfs plus 20% of the amount over 15,000 cfs
20,000 cfs	no limit	17,400 cfs plus 20% of the amount over 20,000 cfs	20,000 cfs	no limit	13,600 cfs plus 20% of the amount over 20,000 cfs	20,000 cfs	no limit	11,800 cfs plus 0% of the amount over 20,000 cfs

Bypass flow requirements in other months:		
If Sacramento River flow is over...	But not over...	The bypass is...
Jul-Sep		
0 cfs	5,000 cfs	100% of the amount over 0 cfs
5,000 cfs	No limit	A minimum of 5,000 cfs
Oct-Nov		
0 cfs	7,000 cfs	100% of the amount over 0 cfs
7,000 cfs	No limit	A minimum of 7,000 cfs

Table 3: Old and Middle River Flow Criteria under H3 and H4

Month	Combined Old and Middle River Flows to be No Less than Values Below^a (cfs)				
	Wet Water Year	Above Normal Water Year	Below Normal Water Year	Dry Water Year	Critical Dry Water Year
January	0	-3,500	-4,000	-5,000	-5,000
February	0	-3,500	-4,000	-4,000	-4,000
March	0	0	-3,500	-3,500	-3,000
April ^b	see Table 4	see Table 4	see Table 4	see Table 4	see Table 4
May ^b	see Table 4	see Table 4	see Table 4	see Table 4	see Table 4
June ^b	see Table 4	see Table 4	see Table 4	see Table 4	see Table 4
July	N/A	N/A	N/A	N/A	N/A
August	N/A	N/A	N/A	N/A	N/A
September	N/A	N/A	N/A	N/A	N/A
October ^c	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.
November ^c	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.	Based on State Water Board D-1641 pulse trigger.
December ^d	-5,000	-5,000	-5,000	-5,000	-5,000

- ^a Values are monthly average for use in modeling. The model compares these minimum allowable OMR values to 2008 USFWS BiOp RPA OMR requirements and uses the less negative flow requirement.
- ^b Based on San Joaquin inflow relationship to OMR provided Table 6.
- ^c Two weeks before the D-1641 pulse (assumed to occur October 16-31 in the modeling), No OMR restrictions (for modeling purposes an OMR requirement of -5,000 cfs was assumed during this 2 week period). Two weeks during the D-1641 pulse, no south Delta exports. Two weeks after the D-1641 pulse, -5,000 cfs OMR requirement (through November).
- ^d OMR restriction of -5,000 cfs for Sacramento River winter-run Chinook salmon when North Delta initial pulse flows are triggered or OMR restriction of -2,000 cfs for delta smelt when triggered. For modeling purposes (to compute a composite Dec allowable OMR), remaining days were assumed to have an allowable OMR of -8000 cfs.

Table 4: San Joaquin Inflow Relationship to Old and Middle River Flow Criteria under H3 and H4

April and May		June	
If San Joaquin River flow at Vernalis is (cfs):	Minimum Average OMR flows (interpolated linearly between values) (cfs)	If San Joaquin flow at Vernalis is the following (cfs):	Average OMR flows would be at least the following (no interpolation) (cfs):
≤ 5,000	-2,000	≤ 3,500	-3,500
6,000	+1000	3,501 to 10,000	0
10,000	+2000	10,001 to 15,000	+1000
15,000	+3000	>15,000	+2000
≥30,000	+6000		

Table 5: Old and Middle River Flow Criteria under Boundary 2

Month	Combined Old and Middle River Flows to be No Less than Values Below ^a (cfs)				
	Wet Water Year	Above Normal Water Year	Below Normal Water Year	Dry Water Year	Critical Dry Water Year
January	0	0	-2,500	-2,500	-2,500
February	0	0	-2,500	-2,500	-2,500
March ^b	Greater of 0 or Table 6	Greater of 0 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6
April ^b	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6
May ^b	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6
June ^b	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6	Greater of -2,000 or Table 6
July ^e	-5,000	-5,000	-5,000	-5,000	-5,000
August ^e	-5,000	-5,000	-5,000	-5,000	-5,000
September ^e	-5,000	-5,000	-5,000	-5,000	-5,000
October ^c	-3,500	-3,500	-5,000	-5,000	-5,000
November ^c	-3,500	-3,500	-5,000	-5,000	-5,000
December ^d	-3,500	-3,500	-5,000	-5,000	-5,000

^a Values are monthly average for use in modeling. The model compares these minimum allowable OMR values to 2008 USFWS BiOp RPA OMR requirements and uses the less negative flow requirement.

^b Based on San Joaquin inflow relationship to OMR provided Table 8.

^c Values for two weeks before the D-1641 pulse (assumed to occur October 16-31 in the modeling) and two weeks after the D-1641 pulse. Two weeks during the D-1641 pulse, no south Delta exports.

^d OMR restriction of -2,000 cfs for delta smelt when triggered.

^e -5,000 cfs for Wet years and years following Wet years.

Table 6: San Joaquin Inflow Relationship to Old and Middle River Flow Criteria under Boundary 2

April and May		March and June	
If San Joaquin River flow at Vernalis is (cfs):	Minimum Average OMR flows (interpolated linearly between values) (cfs)	If San Joaquin flow at Vernalis is the following (cfs):	Average OMR flows would be at least the following (no interpolation) (cfs):
≤ 5,000	-2,000	≤ 3,500	-2,500
6,000	+1000	3,501 to 10,000	0
10,000	+2000		
15,000	+3000	10,001 to 15,000	+1000
≥30,000	+6000	>15,000	+2000

Table 7: Enhanced Spring Delta Outflow Criteria under H4 (High Outflow Scenario criteria)

Percent Exceedance of Forecasted Mar-May 8RI:	10%	20%	30%	40%	50%	60%	70%	80%	90%
Proposed Mar-May Delta Outflow Target (cfs):	44,500	44,500	35,000	32,000	23,000	17,200	13,300	11,400	9,200

Table 8: Delta Outflow Goals under Boundary 2 (based on RDEIR/SDEIS App C SWRCB Scenario criteria) - greater of D-1641/BiOps or outflow goals specified below; Delta outflow goals above current regulatory requirements achieved through Delta export curtailments; upstream storage releases allowed in Jul – Sep months in all water year types, except Critical water year types

	W	AN	BN	D	C
Oct	11,400	11,400	7,100	7,,100	7,100
Nov	11,400	11,400	7,100	7,100	7,100
Dec	11,400	11,400	11,400	11,400	11,400
Jan	35,000	35,000	35,000	35,000	35,000
Feb	35,000	35,000	35,000	35,000	35,000
Mar	44,500	44,500	44,500	25,000	25,000

	W	AN	BN	D	C
Apr	44,500	44,500	44,500	25,000	25,000
May	44,500	44,500	44,500	25,000	25,000
Jun	11,400	11,400	7,100	7,100	7,100
Jul	7,100	7,100	7,100	7,100	7,100
Aug	7,100	7,100	7,100	7,100	7,100
Sep	11,400	11,400	7,100	7,100	7,100