Appendix B. Input Assumptions and Flow Parameter Values Used In CALSIM II and DMS2 Modeling

This appendix presents the input assumptions and flow parameters and values for the 4 Options, as well as the following tables and figures:

APPENDIX B. INPUT ASSUMPTIONS AND FLOW PARAMETER VALUES USED IN CALSIM II AND DMS2 MODELING

This appendix presents the modeling assumptions, flow parameters, and parameter values used to model the hydrodynamic performance of each of the Options under a range of possible operations. CALSIM II inputs and base condition assumptions are provided in Table B-1. Flow parameters and values are provided for each of the Options 1-4 in Tables B-2 through B5, respectively. These flow parameters were developed to allow for coarse modeling of the Options to provide information necessary to perform the evaluation of the Options. They are not designed nor intended to represent proposed operational flow parameter values for the system by either the SAIC team or any entity on the Steering Committee, nor should they be misconstrued as such. The range of operational flow parameters was defined in two operational scenarios developed by SAIC: "Scenario A" and "Scenario B." These scenarios were selected for the purpose of evaluating a range of operational conditions under each Option. It should be recognized that many different combinations of parameter settings could have been used as model inputs and that these two operational scenarios represent simplified and arbitrarily selected examples. Table B-6 presents a side-by-side summary of the flow parameter input values for all four Options.

In addition to the assumptions and input parameters presented in Tables B-1 through B-5, the following sections describe modeling assumptions for each Option.

Option 1 Assumptions

The following assumptions were used in modeling Option 1:

- Water conveyance and south of Delta storage are assumed to not limit pumping operations– model evaluation parameter.

- Upstream reservoir storage and releases will be made in accordance with current requirements to support salmon and steelhead habitat and maintain suitable water temperatures and compliance with existing agreements and regulatory requirements including FERC conditions and ESA requirements.

Option 2 Assumptions

The following assumptions were used in modeling Option 2:

- Water conveyance and south of Delta storage are assumed to not limit diversion operations– model evaluation parameter.

- Upstream reservoir storage and releases will be made in accordance with current requirements to support salmon and steelhead habitat and maintain suitable water temperatures and compliance with existing agreements and regulatory requirements including FERC conditions and ESA requirements.

- The barriers would be closed year-round, but may be periodically opened to promote flushing and improved water quality within the Old River region.

- A gravity siphon would be installed between Victoria Canal and Clifton Court Forebay to allow the San Joaquin River flows to follow Old River into the central Delta.

Option 3 Assumptions

The following assumptions were used in modeling Option 3:

- Water conveyance and south of Delta storage are assumed to not limit diversion operations– model evaluation parameter.

- Upstream reservoir storage and releases will be made in accordance with current requirements to support salmon and steelhead habitat and maintain suitable water temperatures and compliance with existing agreements and regulatory requirements including FERC conditions and ESA requirements.

- The barriers would be closed year-round, but may be periodically opened to promote flushing and improved water quality within the Old River region.

- A gravity siphon would be installed between Victoria Canal and Clifton Court Forebay to allow the San Joaquin River flows to follow Old River into the central Delta.

- Option 3 assumes that a dual conveyance system could be operated including:

    - Through-Delta conveyance in which SWP and CVP opportunistic export operations from the existing south Delta facilities.

    - A completely isolated conveyance that assumes SWP and CVP export operations could occur exclusively from a state-of-the-art positive barrier fish screen located on the Sacramento River in the general vicinity of Hood and isolated water conveyance canal with an intertie to both the SWP and CVP export facilities in the south Delta. The existing south Delta export facilities could be used in conjunction with the isolated facility for water diversions from the Delta.

    - Under the assumptions used to evaluate Option 3 it has been assumed that the isolated conveyance facility would be preferentially operated at all times. The dual conveyance would be operated only when one or more of the operational parameters are controlling exports at the isolated facility (e.g., Rio Vista flows) and opportunities exist to supplement water exports by also operating the south Delta export facilities. For purposes of this assessment it has been assumed that the dual facility would be operated in accordance with both the Option 2 and Option 4 criteria depending on the export operations of both the isolated facility and/or south Delta exports.

Option 4 Assumptions

The following assumptions were used in modeling Option 4:

- Water conveyance and south of Delta storage are assumed to not limit diversion operations– model evaluation parameter.

- Upstream reservoir storage and releases will be made in accordance with current requirements to support salmon and steelhead habitat and maintain suitable water temperatures and compliance with existing agreements and regulatory requirements including FERC conditions and ESA requirements.

- Option 4 assumes SWP and CVP pumping operations would occur exclusively from a state-of-the-art positive barrier fish screen located on the Sacramento River in the general vicinity of Hood and isolated water conveyance canal with an intertie to both the SWP and CVP diversion facilities in the south Delta. The existing south Delta diversion facilities would not be used for water diversions from the Delta.

Table B-1. Option Evaluation Report Base Condition Assumptions for CALSIM II Model

Table B-1
CALSIM II Inputs
Bay-Delta Conservation Plan – Evaluation Report Assumptions

	Base (=Existing) Condition Assumption
Planning horizon	2004[a]
Demarcation date	June 1, 2004[a]
Period of simulation	82 years (1922-2003)
HYDROLOGY	
Level of development	2005 level[b]
Sacramento Valley (excluding American River)	
CVP	Land-use based, limited by contract amounts[d]
SWP (FRSA)	Land-use based, limited by contract amounts[e]
Non-project	Land-use based
Federal refuges	Recent historical Level 2 deliveries[f]
American River	
Water rights	2004[g]
CVP	2004[g]
PCWA	No CVP contract water supply
San Joaquin River[i]	
Friant Unit	Limited by contract amounts, based on current allocation policy
Lower Basin	Land-use based, based on district level operations and constraints
Stanislaus River	Land-use based, based on New Melones Interim Operations Plan[j]
South of Delta (CVP/SWP project facilities)	
CVP	Demand based on contracts amounts[d]
CCWD	124 TAF CVP contract supply and water rights[k]
SWP	Demand varies based pattern used for 2004 OCAP Today studies; Table B transfers that occurred in 2005 and 2006 are not included
Article 56	Based on 2002-2006 contractor requests
Article 21	MWD demand up to 100 TAF/month from December to March, total of other demands up to 84 TAF/month in all months[e,l]
Federal refuges	Recent historical Level 2 deliveries[f]

Table B-1
CALSIM II Inputs
Bay-Delta Conservation Plan – Evaluation Report Assumptions

	Base (=Existing) Condition Assumption
FACILITIES	
Systemwide	Existing facilities[a]
Sacramento Valley	
Shasta Lake	Existing, 4,552 TAF capacity
Colusa Basin	Existing conveyance and storage facilities
Upper American River	PCWA American River pump station not included
Lower Sacramento River	Freeport Regional Water Project not included
Delta Region	
SWP Banks Pumping Plant	6,680 cfs capacity[a]
CVP C.W. Bill Jones Pumping Plant (Tracy PP)	4,200 cfs plus diversions upstream of DMC constriction
Los Vaqueros Reservoir	Existing storage capacity, 100 TAF, (Alternative Intake Project not included)
San Joaquin River	
Millerton Lake (Friant Dam)	Existing, 520 TAF capacity
South of Delta (CVP/SWP project facilities)	
South Bay Aqueduct Enlargement	None
California Aqueduct East Branch Enlargement	None
WATER MANAGEMENT ACTIONS (CALFED)	
Water Transfer Supplies (available long term program)	
Phase 8[n]	None
Lower Yuba River Accord	Not included
REGULATORY STANDARDS	
Trinity River	
Minimum flow below Lewiston Dam	Trinity EIS Preferred Alternative (369-815 TAF/yr)
Trinity Reservoir end-of-September minimum storage	Trinity EIS Preferred Alternative (600 TAF as able)
Clear Creek	
Minimum flow below Whiskeytown Dam	Downstream water rights, 1963 USBR Proposal to USFWS and NPS, and USFWS discretionary use of CVPIA 3406(b)(2)
Upper Sacramento River	
Shasta Lake end-of-September minimum storage	SWRCB WR 1993 Winter-run Biological Opinion (1900 TAF)

Table B-1
CALSIM II Inputs
Bay-Delta Conservation Plan – Evaluation Report Assumptions

	Base (=Existing) Condition Assumption
Minimum flow below Keswick Dam	Flows for SWRCB WR 90-5 and USFWS discretionary use of CVPIA 3406(b)(2)
Feather River	
Minimum flow below Thermalito Diversion Dam	1983 DWR, DFG Agreement (600 cfs)
Minimum flow below Thermalito Afterbay outlet	1983 DWR, DFG Agreement (750-1,700 cfs)
Yuba River	
Minimum flow below Daguerre Point Dam	Interim D-1644 Operations[q]
American River	
Minimum flow below Nimbus Dam	SWRCB D-893[r] (see accompanying Operations Criteria), and USFWS discretionary use of CVPIA 3406(b)(2)
Minimum Flow at H Street Bridge	SWRCB D-893
Lower Sacramento River	
Minimum flow near Rio Vista	SWRCB D-1641
Mokelumne River	
Minimum flow below Camanche Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (100-325 cfs)
Minimum flow below Woodbridge Div. Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (25-300 cfs)
Stanislaus River	
Minimum flow below Goodwin Dam	1987 USBR, DFG agreement, and USFWS discretionary use of CVPIA 3406(b)(2)
Minimum dissolved oxygen	SWRCB D-1422
Merced River	
Minimum flow below Crocker-Huffman Diversion Dam	Davis-Grunsky (180-220 cfs, Nov-Mar), Cowell Agreement, and FERC 2179 (25-100 cfs)
Tuolumne River	
Minimum flow at Lagrange Bridge	FERC 2299-024, 1995 (Settlement Agreement) (94-301 TAF/yr)
San Joaquin River	
San Joaquin River below Friant Dam/Mendota Pool	None
Maximum salinity near Vernalis	SWRCB D-1641

Table B-1
CALSIM II Inputs
Bay-Delta Conservation Plan – Evaluation Report Assumptions

	Base (=Existing) Condition Assumption
Minimum flow near Vernalis	SWRCB D-1641, and Vernalis Adaptive Management Plan per San Joaquin River Agreement
Sacramento River–San Joaquin River Delta	
Delta Outflow Index (Flow and Salinity)	SWRCB D-1641
Delta Cross Channel gate operation	SWRCB D-1641
Delta exports	SWRCB D-1641, USFWS discretionary use of CVPIA 3406(b)(2)
OPERATIONS CRITERIA: RIVER-SPECIFIC	
Upper Sacramento River	
Flow objective for navigation (Wilkins Slough)	3,500-5,000 cfs based on CVP water supply condition
American River	
Folsom Dam flood control	Variable 400/670 flood control diagram (without outlet modifications)
Flow below Nimbus Dam	Discretionary operations criteria corresponding to SWRCB D-893 required minimum flow
Sacramento Area Water Forum Mitigation Water	None
Feather River	
Flow at Mouth of Feather River (above Verona)	Maintain DFG/DWR flow target of 2,800 cfs for Apr-Sep dependent on Oroville inflow and FRSA allocation
Stanislaus River	
Flow below Goodwin Dam	1997 New Melones Interim Operations Plan
San Joaquin River	
Salinity at Vernalis	D1641
OPERATIONS CRITERIA: SYSTEMWIDE	
CVP water allocation	
CVP Settlement and Exchange	100% (75% in Shasta critical years)
CVP refuges	100% (75% in Shasta critical years)
CVP agriculture	100%-0% based on supply (South-of-Delta allocations are reduced due to D-1641 and 3406(b)(2) allocation-related export restrictions)
CVP municipal & industrial	100%-50% based on supply (South-of-Delta allocations are reduced due to D-1641 and 3406(b)(2) allocation-related export

Table B-1
CALSIM II Inputs
Bay-Delta Conservation Plan – Evaluation Report Assumptions

	Base (=Existing) Condition Assumption
	restrictions)
SWP water allocation	
North of Delta (FRSA)	Contract specific
South of Delta (including North Bay Aqueduct)	Based on supply; equal prioritization between Ag and M&I based on Monterey Agreement
CVP-SWP coordinated operations	
Sharing of responsibility for in-basin-use	1986 Coordinated Operations Agreement (2/3 of the North Bay Aqueduct diversions are considered as Delta Export, 1/3 of the North Bay Aqueduct diversion is considered as in-basin-use)
Sharing of surplus flows	1986 Coordinated Operations Agreement
Sharing of restricted export capacity for project-specific priority pumping	Equal sharing of export capacity under SWRCB D-1641; use of CVPIA 3406(b)(2) restricts only CVP exports
Dedicated CVP conveyance at Banks	None
North-of-Delta accounting adjustments	None
Sharing of export capacity for lesser priority and wheeling-related pumping	Cross Valley Canal wheeling (max of 128 TAF/yr), CALFED ROD defined Joint Point of Diversion (JPOD)
San Luis Low Point	San Luis Reservoir is allowed to operate to a minimum storage of 100 TAF
CVPIA 3406(b)(2)	
Policy Decision	Per May 2003 Dept. of Interior Decision:
Allocation	800 TAF, 700 TAF in 40-30-30 dry years, and 600 TAF in 40-30-30 critical years
CVPIA 3406(b)(2) (continued)	
Actions	1995 WQCP, Upstream fish flow objectives (Oct-Jan), VAMP (Apr 15-May 15) CVP export restriction, 3,000 cfs CVP export limit in May and June (D-1485 striped bass cont.), Post-VAMP (May 16-31) CVP export restriction, Ramping of CVP export (June), Upstream Releases (Feb-Sep)
Accounting adjustments	Per May 2003 Interior Decision, no limit on responsibility for non-discretionary D-1641 requirements with 500 TAF target, no reset with the storage metric and no offset with the release and export metrics, 200 TAF target on costs from Oct-Jan

Table B-2. Flow Parameters and Values for Option 1

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	Scenario B	
Delta Salinity Standards			
Year-round	Manage to meet D-1641 agricultural and M&I water quality	Meet D-1641 M&I standards – do not control for agricultural or Suisun Marsh standards	Meet water quality standards for CCWD
Sacramento River at Rio Vista			
Sept	3,000 cfs (All)	4,500cfs (All)	Adult Chinook salmon attraction and migration flows
Oct	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D) 4,000 cfs (C)	Adult Chinook salmon attraction and migration flows
Nov-Dec	4,500 cfs (W, AN, BN, D) 3,500 cfs (C)	4,500 cfs (W, AN, BN, D) 4,000 cfs (C)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others
Jan	No criterion	4,500 cfs (All)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others
Feb-Jun	No criterion	No criterion	Evaluation parameter
Jul-Aug	No criterion	4,000 cfs (All)	Steelhead and salmon rearing within the mainstem river; support resident fish habitat
San Joaquin River flow at Vernalis			
May	VAMP flow requirements	D-1641 flow requirements (higher objective)	The flow range was selected to reflect the current range of conditions intended to improve juvenile Chinook salmon emigration survival
Jul-Sep	No criterion	No criterion	Evaluation parameter
Oct	1,400 cfs (All)	2,000 cfs (All)	Attraction flows and improved water quality (DO and temperature) for adult salmon migration – equivalent to D-1641
Nov-Jan	D-1641 water quality requirements	1,500 cfs (All)	Salmon fry rearing and dispersal, nutrient transport to Delta, splittail spawning and larval rearing and dispersal
Feb-Apr and Jun	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)	D-1641 X2 contribution results in a range of San Joaquin River flows
X_2			
Feb-June	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C)	The range of X_2 locations during the late winter-spring is intended to (1) reflect the current regulatory requirements, and (2) an expansion of low-salinity habitat further downstream within Suisun Bay (66 km)
Jul-Jan	Model output	Model output	Evaluation parameter
Total Delta Outflow			
Feb-June	Model output	Model output	Evaluation parameter
Jul-Jan	3,000 cfs (All)	3,000 cfs (All)	Minimal outflow to prevent modeling from drawing unrealistic low outflows outside of the X2 period
Hydraulic Residence Time in Selected Delta Channels			
Year-round	Model output	Model output	Evaluation parameter

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	Scenario B	
Delta Cross Channel Gates			
Feb-Jun	Closed (All)	Open (All)	The range in DCC operations was intended to reflect (1) reduced movement of juvenile salmon and steelhead into the interior Delta; improved juvenile salmon survival, and (2), improved hydrodynamics for delta smelt within the central Delta and reduced vulnerability to SWP/CVP diversions
Jul-Jan	Open (All)	Open (All)	Improve hydrodynamics and water quality within the central Delta; reduce the potential barrier to fish movement into and out of the central delta
Head of Old River Barrier			
Mar-May	Closed (All)	Open (All)	The range in HORB operations was intended to reflect two alternative hypotheses that include (1) reduced movement of juvenile salmon and steelhead into the southern Delta; improved salmonid survival and reduced vulnerability to SWP/CVP diversions, and (2) improved hydrodynamics for delta smelt and reduced vulnerability to SWP/CVP diversions
Jun-Aug	Open (All)	Open (All)	Increase flows and flushing within the southern Delta to improve water quality
Sep-Nov	Closed (All)	Open (All)	The range of HORB gate operations was intended to reflect two alternative hypotheses that include (1) improved attraction flows and water quality for adult salmon within the lower San Joaquin River, and (2) improved hydrodynamics for delta smelt and reduced vulnerability to SWP/CVP diversions
Dec-Feb	Closed (All)	Open (All)	The range of HORB gate operations was intended to reflect two alternative hypotheses that include (1) reduced movement of salmon fry into the southern Delta; improved salmonid survival and reduced vulnerability to SWP/CVP diversions, and (2) improved hydrodynamics for delta smelt and reduced vulnerability to SWP/CVP diversions
Old and Middle River Flows (Combined)			
Mar-Jun	No criterion	>-1,000 cfs (All)	The range of reverse flows are intended to reflect two alternative hypotheses that include (1) reverse flows that have been hypothesized to reduce the movement of juvenile salmon and steelhead, delta smelt, longfin smelt, and splittail into Old and Middle River, improve survival; and (2) maintain a net westerly flow thought to benefit juvenile salmon migration rate and survival; reduce the vulnerability of planktonic fish eggs and larvae to diversion effects; non-SWP/CVP diversions contribute to reverse flows in Old and Middle River of approximately 1,000 cfs

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Jul-Sep	No criterion	>-5,000 cfs (All)	The range of values are intended to reflect alternative hypotheses regarding the effects of increased diversions and reverse flows during the summer on Delta habitat and vulnerability of delta smelt and other fish to SWP/CVP salvage; reduce vulnerability of resident fish to salvage; reduce entrainment of nutrients
Oct-Nov	No criterion	>-1,000 cfs (All)	The range of values are intended to reflect alternative hypotheses regarding the effects of increased diversions and reverse flows during the fall on Delta habitat and vulnerability of delta smelt and other fish to SWP/CVP salvage; non-SWP/CVP diversions contribute to reverse flows in Old and Middle River of approximately 1,000 cfs; a larger reduction in reverse flows is expected to contribute to a greater fall attraction flow for adult salmon returning to the San Joaquin River
Dec-Feb	No criterion	>-1,000 cfs (All)	The range of winter reverse flows is intended to reflect two alternative hypotheses that include (1) results of analyses by Pete Smith and Sheila Green that show an increase in delta smelt salvage as reversed flows increase, with a rapid increase in salvage as reverse flows exceed approximately 5,000 to 6,000 cfs, and (2) analyses show that delta smelt salvage increases as reverse flows increase and therefore a reduction in the magnitude of reverse flows is expected to contribute to a reduction in delta smelt losses; non-SWP/CVP diversions contribute to reverse flows in Old and Middle River of approximately 1,000 cfs; a larger reduction in reverse flows is intended to contribute to a greater reduction in salmon fry and steelhead salvage and a lower vulnerability of pre-spawning delta and longfin smelt to SWP/CVP salvage; a greater reduction in reverse flows is expected to result in a greater reduction in nutrient diversions from the Delta and San Joaquin River

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
QWEST			
Mar-May	No criterion	Net positive flows (no reverse flow) (All)	The range in QWEST during the spring is intended to reflect two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; and (2) net positive flows are expected to reduce movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increase transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increase the transport of zooplankton and nutrients downstream into Suisun Bay; reduce the vulnerability of fish to SWP/CVP salvage; reduce potential delays in downstream migration of juvenile salmon and other fish
Jun	No criterion	Net positive flows (no reverse flow) (All)	The range in QWEST during June is intended to reflect two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) densities of juvenile fish potentially affected by QWEST are reduced in the central Delta by June and therefore the potential benefit is reduced; reduce movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increase transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increase the transport of zooplankton and nutrients downstream into Suisun Bay; reduce the vulnerability of fish to SWP/CVP salvage; reduce potential delays in downstream migration of juvenile salmon and other fish
Jul-Nov	No criterion	Net positive flows (no reverse flow) (All)	The range of QWEST values is intended to reflect two alternative hypotheses including (1) delta smelt and other fish have reached a size where swimming performance allows volitional habitat selection; many fish are located downstream in Suisun Bay and are not in the area affected by QWEST, and (2) reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions
Dec-Feb	No criterion	Net positive flows (no reverse flow) (All)	Reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
SWP/CVP VAMP Operations			
April	Model output	VAMP	The range of SWP/CVP diversions is intended to reflect two alternative hypotheses that include (1) opportunistic diversions used as a model evaluation parameter, and (2) start of the peak period of San Joaquin juvenile salmon emigration through the Delta; larval stages of delta smelt, longfin smelt, splittail, and other fish are present in the Delta in relatively high densities and are vulnerable to diversion losses; VAMP diversion rates are intended to provide a higher level of protection from diversion related direct and indirect effects; extend the VAMP period to two months to increase the seasonal period of potential protection
May	VAMP	VAMP	Evaluation parameter; intended to provide increased protection for juvenile salmon emigrating from the San Joaquin, Mokelumne, Cosumnes, and other Central Valley rivers and other species; peak period of smolt migration occurs in May in many years; assumes for modeling that VAMP period is in May however the actual period may vary

Notes:

[1]Operational condition and seasonal time period used as a model input and/or output

[2]A range of values for a given operational condition intended to reflect alternative hypotheses or interpretations of available data. Water year type codes shown in parentheses are:

W = wet
AN = above normal
BN = below normal
D = dry
C = critical
All = value is applied to all water year types

[3]The rationales generally reflect the intended result of the parameter

Table B-3. Flow Parameters and Values for Option 2

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Salinity Standards			
Year-round	Manage to meet D-1641 agricultural water quality	Do not manage specifically to meet water quality standards – variable salinity	Meet water quality standards for CCWD (assumes CCWD diversions from Victoria Canal)
Sacramento River at Rio Vista			
Sept	3,000 cfs (All)	4,500 cfs (All)	Adult Chinook salmon attraction and migration flows
Oct	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D) 4,000 cfs (C)	Adult Chinook salmon attraction and migration flows
Nov-Dec	4,500 cfs (W, AN, BN, D) 3,500 cfs (C)	4,500 cfs (W, AN, BN, D) 4,000 cfs (C)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others
Jan	No criterion	4,500 cfs (All)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others
Feb-Jun	No criterion	No criterion	Evaluation parameter
Jul-Aug	No criterion	4,000 cfs (All)	Steelhead and salmon rearing within the mainstem river; support resident fish habitat
San Joaquin River flow at Vernalis			
May	VAMP flow requirements	D-1641 flow requirements (higher objective)	The flow range was selected to reflect the current range of conditions intended to improve juvenile Chinook salmon emigration survival
Jul-Sep	No criterion	No criterion	Evaluation parameter
Oct	1,400 cfs (All)	2,000 cfs (All)	Attraction flows and improved water quality (DO and temperature) for adult salmon migration – equivalent to D-1641
Nov-Jan	D-1641 water quality requirements	1,500 cfs (All)	Salmon fry rearing and dispersal, nutrient transport to Delta, splittail spawning and larval rearing and dispersal
Feb-Apr and Jun	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)	D-1641 X_2 contribution results in a range of San Joaquin River flows
X_2			
Feb-June	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C)	The range of X_2 locations during the late winter-spring is intended to reflect (1) the current regulatory requirements and (2) an expansion of low-salinity habitat further downstream within Suisun Bay (66 km)
Jul-Jan	No criterion	No criterion	Evaluation parameter
Total Delta Outflow			
Feb-June	No criterion	No criterion	Evaluation parameter
Jul-Jan	3,000 cfs (All)	3,000 cfs (All)	Minimal outflow to prevent modeling from drawing unrealistic low outflows outside of the X2 period
Hydraulic Residence Time in Selected Delta Channels			
Year-round	No criterion	No criterion	Evaluation parameter

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	Scenario B	
Delta Salinity Standards			
Delta Cross Channel Gates			
Feb-Jun	Closed (All)	Open (All)	The range in DCC operations was intended to reflect (1) reduced movement of juvenile salmon and steelhead into the interior Delta; improved juvenile salmon survival, and (2), improved hydrodynamics for delta smelt within the central Delta and reduced vulnerability to SWP/CVP diversions
Jul-Jan	Open (All)	Open (All)	Improve hydrodynamics and water quality within the central Delta; reduce the potential barrier to fish movement into and out of the central Delta
SJR Barrier – Installed in the San Joaquin River to direct fish and flows into Old River			
Mar-May	Closed (All)	Closed (All)	Reduce movement of juvenile salmon and steelhead into the southern Delta through the lower San Joaquin River and facilitate juvenile Chinook salmon passage into the central Delta through Old River; improve salmonid survival and reduce their vulnerability to SWP/CVP diversions
Jun-Aug	Closed (All)	Closed (All)	Increase flows and flushing within the southern and central Delta to improve water quality
Sep-Nov	Closed (All)	Closed (All)	Improve attraction flows and water quality for adult salmon within the lower San Joaquin River
Dec-Feb	Closed (All)	Closed (All)	Reduce movement of salmon fry into the southern Delta; improve salmonid survival and reduce their vulnerability to SWP/CVP diversions
Old River Flows			
Year-round	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	Reduce vulnerability of delta smelt and other species to SWP/CVP diversions by isolating Old River habitat from the hydraulic influence of the diversion facilities; increase hydraulic residence time in the Old River region to increase primary and secondary production and provide low velocity habitat for delta smelt and other fish species; operate the Old River siphon to allow salmon, other fish, nutrients, phytoplankton, and zooplankton produced in the San Joaquin River to flow into the central Delta
Middle River Flows			
Mar-May	No criterion	>-2,000 cfs (All)	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) larval and juvenile delta smelt, splittail, Chinook salmon, steelhead, and other fish produced in the Mokelumne and Cosumnes rivers and east-side channels and sloughs; reduced reverse flows are intended to reduce vulnerability to entrainment and SWP/CVP diversion effects

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Salinity Standards			
Jun	No criterion	>-6,000 cfs (All)	The range in Middle River flows reflects (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) most juvenile fish have grown to a size where swimming performance allows habitat selection or they have moved downstream into Suisun Bay and outside the area of influence; the majority of juvenile salmon and steelhead have emigrated from the Delta
Jul-Sep	No criterion	>-8,000 cfs (All)	Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths. Most of the sensitive covered fish species are not present in the central and southern Delta during the summer and therefore have reduced vulnerability to SWP/CVP diversions
Oct-Nov	No criterion	>-4,000 cfs (All)	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) adult Chinook salmon are migrating upstream into the Mokelumne and Cosumnes rivers; reduced reversed flows in Middle River are intended to reduce migration delays and improve hydrodynamic cues and attraction flows
Dec-Feb	No criterion	>-4,000 cfs (All)	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) Chinook salmon fry and steelhead smolts are emigrating through the Delta from the Mokelumne and Cosumnes rivers; reduced reverse flows are intended to reduce vulnerability to diversion effects; early spawning fish have planktonic larval and juveniles within the central Delta that could be vulnerable to hydraulic entrainment within Middle River
QWEST			
Mar-May	No criterion	Net positive flows (no reverse flow) (All)	The range in QWEST reflects two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) reduced QWEST is intended to result in reduced movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increased transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increased transport of zooplankton and nutrients downstream into Suisun Bay; reduced the vulnerability of fish to SWP/CVP diversions; reduced delays in downstream migration of juvenile salmon and other fish

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Salinity Standards			
Jun	No criterion	Net positive flows (no reverse flow) (All)	The range in QWEST reflects two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) the densities of juvenile fish potentially affected by QWEST are reduced in the central Delta by June and therefore the potential benefit is reduced; reduced movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increased transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increased transport of zooplankton and nutrients downstream into Suisun Bay; reduced vulnerability of fish to SWP/CVP diversions; reduce potential delays in downstream migration of juvenile salmon and other fish
Jul-Nov	No criterion	Net positive flows (no reverse flow) (All)	The range of QWEST values are intended to reflect two alternative hypotheses including (1) delta smelt and other fish have reached a size where swimming performance allows volitional habitat selection; many fish are located downstream in Suisun Bay and are not in the area affected by QWEST, and (2) reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions
Dec-Feb	No criterion	Net positive flows (no reverse flow) (All)	Reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions
SWP/CVP VAMP Diversions			
April	No criterion	VAMP	The range of SWP/CVP diversions is intended to reflect (1) opportunistic diversions used as a model evaluation parameter, and (2) start of the peak period of juvenile salmon emigration through the Delta; larval stages of delta smelt, longfin smelt, splittail, and other fish are present in the Delta in relatively high densities and are vulnerable to diversion losses, VAMP diversion rates are intended to provide a higher level of protection from diversion related direct and indirect effects; extend the VAMP period to two months is intended to increase the seasonal period of protection
May	VAMP	VAMP	VAMP diversion rate reductions are intended to provide increased protection for juvenile salmon emigrating from the Mokelumne and Consumes rivers and other species; peak period of smolt migration occurs in May in many years; assumes for modeling that VAMP period is in May however the actual period may vary

Notes:

[1]Operational condition and seasonal time period used as a model input and/or output
[2]A range of values for a given operational condition intended to reflect alternative hypotheses or interpretations of available data. Water year type codes shown in parentheses are:

W = wet
AN = above normal
BN = below normal
D = dry
C = critical
All = value is applied to all water year types

[3]The rationales generally reflect the intended result of the parameter

Table B-4. Flow Parameters and Values for Option 3

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Salinity Standards			
Year-round	Manage to meet D-1641 agricultural water quality	Do not manage specifically to meet water quality standards – variable salinity	Meet water quality standards for CCWD (assumes CCWD diversions from Victoria Canal)
Sacramento River at Rio Vista			
Sept-Oct	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D) 3,500 cfs (C)	Adult Chinook salmon attraction and migration flows – the range is based on
Nov-Dec	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D) 3,500 cfs (C)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others - the range is based on
Jan-Jun	5,000 cfs (W, AN, BN, D) 3500 cfs (C)	9,000 cfs (W, AN, BN) 5000 cfs (D) 3500 cfs (C)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others - the range is based on Rio Vista flows from CALSIM for below normal and above normal water years
Jul-Aug	2,000 cfs (All)	3,500 cfs (All)	Steelhead and salmon rearing within the mainstem river; support resident fish habitat - the range is based on
San Joaquin River flow at Vernalis			
May	VAMP flow requirements	D-1641 flow requirements (higher objective)	The flow range was selected to reflect the current range of conditions intended to improve juvenile Chinook salmon emigration survival
Jul-Sep	No criterion	No criterion	Evaluation parameter
Oct	1,400 cfs (All)	2,000 cfs (All)	Attraction flows and improved water quality (DO and temperature) for adult salmon migration – equivalent to D-1641
Nov-Jan	D-1641 water quality requirements	1,500 cfs (All)	Salmon fry rearing and dispersal, nutrient transport to Delta, splittail spawning and larval rearing and dispersal
Feb-Apr and Jun	D-1641 flow requirements of approximately 1,420 cfs (lower objective)	D-1641 flow requirements of approximately 2,280 cfs (higher objective)	D-1641 X_2 contribution results in a range of San Joaquin River flows
X_2			
Feb-June	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C)	The range of X_2 locations during the late winter-spring is intended to reflect (1) the current regulatory requirements and (2) an expansion of low-salinity habitat further downstream within Suisun Bay (66 km)
Jul-Jan	No criterion	No criterion	Evaluation parameter
Total Delta Outflow			
Feb-June	No criterion	No criterion	Evaluation parameter
Jul-Jan	3,000 cfs (All)	3,000 cfs (All)	Minimal outflow to prevent modeling from drawing unrealistic low outflows outside of the X2 period
Hydraulic Residence Time in Selected Delta Channels			
Year-round	No criterion	No criterion	Evaluation parameter

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Cross Channel Gates			
Feb-Jun	Closed (All)	Closed (All)	The range in DCC operations was intended to reflect (1) reduced movement of juvenile salmon and steelhead into the interior Delta; improved juvenile salmon survival, and (2), improved hydrodynamics for delta smelt within the central Delta and reduced vulnerability to SWP/CVP diversions
Jul-Jan	Closed (All)	Closed (All)	Improve hydrodynamics and water quality within the central Delta; reduce the potential barrier to fish movement into and out of the central Delta
SJR Barrier – Installed in the San Joaquin River to direct fish and flows into Old River			
Mar-May	Closed (All)	Closed (All)	Reduce movement of juvenile salmon and steelhead into the southern Delta through the lower San Joaquin River and facilitate juvenile Chinook salmon passage into the central Delta through Old River; improve salmonid survival and reduce their vulnerability to SWP/CVP diversions
Jun-Aug	Closed (All)	Closed (All)	Increase flows and flushing within the southern and central Delta to improve water quality
Sep-Nov	Closed (All)	Closed (All)	Improve attraction flows and water quality for adult salmon within the lower San Joaquin River
Dec-Feb	Closed (All)	Closed (All)	Reduce movement of salmon fry into the southern Delta; improve salmonid survival and reduce their vulnerability to SWP/CVP diversions
Old River Flows (only applies when operating South Delta facility)			
Year-round	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	Reduce vulnerability of delta smelt and other species to SWP/CVP diversions by isolating Old River habitat from the hydraulic influence of the diversion facilities; increase hydraulic residence time in the Old River region to increase primary and secondary production and provide low velocity habitat for delta smelt and other fish species; operate the Old River siphon to allow salmon, other fish, nutrients, phytoplankton, and zooplankton produced in the San Joaquin River to flow into the central Delta
Middle River Flows (only applies when operating South Delta facility)			
Mar-May	No criterion	>-2,000 cfs (All)	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) larval and juvenile delta smelt, splittail, Chinook salmon, steelhead, and other fish produced in the Mokelumne and Cosumnes rivers and east-side channels and sloughs; reduced reverse flows are intended to reduce vulnerability to entrainment and SWP/CVP diversion effects
Jun	No criterion	>-6,000 cfs (All)	The range in Middle River flows reflects (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) most juvenile fish have grown to a size where swimming performance allows habitat selection or they have moved downstream into Suisun Bay and outside the area of influence; the majority of juvenile salmon and steelhead have emigrated from the Delta

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Jul-Sep	No criterion	>-8,000 cfs (All)	Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths. Most of the sensitive covered fish species are not present in the central and southern Delta during the summer and therefore have reduced vulnerability to SWP/CVP diversions
Oct-Nov	No criterion	>-4,000 cfs (All)	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) adult Chinook salmon are migrating upstream into the Mokelumne and Cosumnes rivers; reduced reversed flows in Middle River are intended to reduce migration delays and improve hydrodynamic cues and attraction flows
Dec-Feb	No criterion	>-4,000 cfs (All)	The range in Middle River flows reflects two alternative hypotheses including (1) Middle River has been designated as the water conveyance route for SWP/CVP diversions; channel capacity may be limited by levee scour and water depths, and (2) Chinook salmon fry and steelhead smolts are emigrating through the Delta from the Mokelumne and Cosumnes rivers; reduced reverse flows are intended to reduce vulnerability to diversion effects; early spawning fish have planktonic larval and juveniles within the central Delta that could be vulnerable to hydraulic entrainment within Middle River
QWEST (o**nly applies when operating South Delta facility)**			
Mar-May	No criterion	Net positive flows (no reverse flow) (All)	The range in QWEST reflects two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) reduced QWEST is intended to result in reduced movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increased transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increased transport of zooplankton and nutrients downstream into Suisun Bay; reduced the vulnerability of fish to SWP/CVP diversions; reduced delays in downstream migration of juvenile salmon and other fish

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Jun	No criterion	Net positive flows (no reverse flow) (All)	The range in QWEST reflects two alternative hypotheses including (1) no data or analyses have been developed to demonstrate a relationship between the magnitude of QWEST and adverse impacts to delta smelt, salmon, or other fish species; evaluation criterion, and (2) the densities of juvenile fish potentially affected by QWEST are reduced in the central Delta by June and therefore the potential benefit is reduced; reduced movement of juvenile salmon, steelhead, larval and juvenile delta and longfin smelt, juvenile splittail, and other fish from the Sacramento River into the Delta; increased transport of plankton fish eggs, larvae, and juveniles downstream into Suisun Bay; increased transport of zooplankton and nutrients downstream into Suisun Bay; reduced vulnerability of fish to SWP/CVP diversions; reduce potential delays in downstream migration of juvenile salmon and other fish
Jul-Nov	No criterion	Net positive flows (no reverse flow) (All)	The range of QWEST values are intended to reflect two alternative hypotheses including (1) delta smelt and other fish have reached a size where swimming performance allows volitional habitat selection; many fish are located downstream in Suisun Bay and are not in the area affected by QWEST, and (2) reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions
Dec-Feb	No criterion	Net positive flows (no reverse flow) (All)	Reduce the movement of adult delta smelt from the Sacramento River into the interior Delta and thereby reduce their vulnerability to SWP/CVP diversions
SWP/CVP South Delta Diversion Operations			
April	No criterion	VAMP	The range of SWP/CVP diversions is intended to reflect (1) opportunistic diversions used as a model evaluation parameter, and (2) start of the peak period of juvenile salmon emigration through the Delta; larval stages of delta smelt, longfin smelt, splittail, and other fish are present in the Delta in relatively high densities and are vulnerable to diversion losses, VAMP diversion rates are intended to provide a higher level of protection from diversion related direct and indirect effects; extend the VAMP period to two months is intended to increase the seasonal period of protection
May	VAMP	VAMP	VAMP diversion rate reductions are intended to provide increased protection for juvenile salmon emigrating from the Mokelumne and Consumes rivers and other species; peak period of smolt migration occurs in May in many years; assumes for modeling that VAMP period is in May however the actual period may vary

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
SWP/CVP Isolated Facility Diversions			
Mar-May	Not to exceed 15,400 cfs	Model output not to exceed 6,000 cfs	The range in diversion rates reflects (1) the location of the point of diversion is upstream of the primary habitat of delta smelt and therefore the risk of entrainment is low; the positive barrier fish screen is expected to be effective in excluding juvenile salmon and other fish from the diversion, and (2) a number of fish species spawn upstream of the point of diversion during the spring and have planktonic eggs and larvae that could be vulnerable to entrainment, reduce the diversion of nutrients and food supply for the Delta during the key spring months
Jun-Feb	Not to exceed 15,400 cfs	No criterion	Evaluation parameter

Notes:

[1]Operational condition and seasonal time period used as a model input and/or output
[2]A range of values for a given operational condition intended to reflect alternative hypotheses or interpretations of available data. Water year type codes shown in parentheses are:
W = wet
AN = above normal
BN = below normal
D = dry
C = critical
All = value is applied to all water year types
[3]The rationales generally reflect the intended result of the parameter

Table B-5. Flow Parameters and Values for Option 4

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Salinity Standards			
Year-round	Manage to D-1641 agricultural (e.g., Jersey Point) standards	Do not manage specifically to meet water quality standards – variable salinity	Evaluation parameter to assess the range of variable salinity conditions that could occur and assess changes in aquatic habitat conditions as well as impacts on other Delta uses
Sacramento River at Rio Vista			
Sept-Oct	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4.500 cfs (W, AN, BN, D) 3,500 cfs (C)	Adult Chinook salmon attraction and migration flows – the range is based on
Nov-Dec	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D) 3,500 cfs (C)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others - the range is based on
Jan-Jun	5,000 cfs (W, AN, BN, D) 3500 cfs (C)	9,000 cfs (W, AN, BN) 5000 cfs (D) 3500 cfs (C)	Juvenile salmon and steelhead migration/survival, pre-spawning migration by delta smelt, splittail, and others - the range is based on Rio Vista flows from CALSIM for below normal and above normal water years
Jul-Aug	2,000 cfs (All)	3,500 cfs (All)	Steelhead and salmon rearing within the mainstem river; support resident fish habitat - the range is based on
San Joaquin River flow at Vernalis			
May	VAMP flow requirements	D-1641 flow requirements (higher objective)	The available relationships show a positive response with increasing spring flows; flows for salmon migration; nutrient transport to Delta; juvenile splittail rearing and dispersal
Jul-Sep	No criterion	No criterion	Evaluation parameter
Oct	1,400 cfs (All)	2,000 cfs (All)	Attraction flows and improved water quality (DO and temperature) for adult salmon migration – equivalent to D-1641
Nov-Jan	D-1641 water quality requirements (lower objective)	1,500 cfs (All)	Salmon fry rearing and dispersal, nutrient transport to Delta, Splittail spawning and larval rearing and dispersal
Feb-Apr and Jun	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)	D-1641 X_2 contribution results in a range of San Joaquin River flows
X2			
Feb-June (assumes improved habitat in central Delta)	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C) * 25,000 cfs cap on required flow	The range of X_2 locations during the late winter-spring is intended to reflect (1) the current regulatory requirements and (2) an expansion of low-salinity habitat further downstream within Suisun Bay (66 km)
Jul-Jan	No criterion	No criterion	Evaluation parameter
Total Delta Outflow			
Year-round	No criterion	No criterion	Evaluation parameter
Hydraulic Residence Time in Selected Delta Channels			
Year-round	No criterion	No criterion	Evaluation parameter

Parameter[1]	Range (Water Year Type)[2]		Rationale[3]
	Scenario A	**Scenario B**	
Delta Cross Channel Gates			
Feb-Jun	Closed (All)	Closed (All)	Reduce movement of juvenile salmon and steelhead into the interior Delta; improve juvenile salmon survival by reducing vulnerability to in-Delta diversions,
Jul-Jan	Closed (All)	Closed (All)	Open as needed for water quality enhancement within the central and southern Delta
Head of Old River Barrier			
Year-round	Open (All)	Open (All)	Increase flows and flushing within the southern Delta to improve water quality
Old River Flows			
Year-round	No criterion	No criterion	Evaluation criteria
Middle River Flows			
Year-round	No criterion	No criterion	Evaluation criteria
QWEST			
Year-round	No criterion	No criterion	Evaluation criteria
SWP/CVP Diversions			
Mar-May	Not to exceed 15,400 cfs	Not to exceed 6,000 cfs	The range in diversion rates reflects (1) the location of the point of diversion is upstream of the primary habitat of delta smelt and therefore the risk of entrainment is low; the positive barrier fish screen is expected to be effective in excluding juvenile salmon and other fish from the diversion, and (2) a number of fish species spawn upstream of the point of diversion during the spring and have planktonic eggs and larvae that could be vulnerable to entrainment, reduce the diversion of nutrients and food supply for the Delta during the key spring months
Jun-Feb	Not to exceed 15,400 cfs	No criterion	Evaluation parameter

Notes:

[1]Operational condition and seasonal time period used as a model input and/or output
[2]A range of values for a given operational condition intended to reflect alternative hypotheses or interpretations of available data. Water year type codes shown in parentheses are:

W = wet
AN = above normal
BN = below normal
D = dry
C = critical
All = value is applied to all water year types

[3]The rationales generally reflect the intended result of the parameter

Table B-6. Summary of model operational parameters for BDCP Conservation Strategy Options 1 - 4

Parameter	1A	1B	2A	2B	3A	3B	4A	4B
Delta Salinity Standards	Manage to meet D-1641 agricultural and M&I water quality	Meet D-1641 M&I standards – do not control for agricultural or Suisun Marsh standards	Manage to meet D-1641 agricultural water quality	Do not manage specifically to meet water quality standards – variable salinity	Manage to D-1641 agricultural (e.g., Jersey Point) standards	Do not manage specifically to meet water quality standards – variable salinity	Manage to D-1641 agricultural (e.g., Jersey Point) standards	Do not manage specifically to meet water quality standards – variable salinity
Sacramento River at Rio Vista								
Sep	3,000 cfs (All)	4,500cfs (All)	3,000 cfs (All)	4,500 cfs (All)	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 (C)	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 (C)
Oct	4,000 cfs (W, AN, BN, D), 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 4,000 cfs (C)	4,000 cfs (W, AN, BN, D), 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 4,000 cfs (C)	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 (C)	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 (C)
Nov-Dec	4,500 cfs (W, AN, BN, D), 3,500 cfs (C)	4,500 cfs (W, AN, BN, D), 4,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 cfs (C)	4,500 cfs (W, AN, BN, D), 4,000 cfs (C)	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 (C)	4,000 cfs (W, AN, BN, D) 3,000 cfs (C)	4,500 cfs (W, AN, BN, D), 3,500 (C)
Jan	No criterion	4,500 cfs (All)	No criterion	4,500 cfs (All)	5,000 cfs (W, AN, BN, D) 3,500 cfs (C)	9,000 cfs (W, AN, BN) 5,000 cfs (D) 3,500 cfs (C)	5,000 cfs (W, AN, BN, D) 3,500 cfs (C)	9,000 cfs (W, AN, BN) 5,000 cfs (D) 3,500 cfs (C)
Feb-Jun	No criterion	No criterion	No criterion	No criterion	5,000 cfs (W, AN, BN, D) 3,500 cfs (C)	9,000 cfs (W, AN, BN) 5,000 cfs (D) 3,500 cfs (C)	5,000 cfs (W, AN, BN, D) 3,500 cfs (C)	9,000 cfs (W, AN, BN) 5,000 cfs (D) 3,500 cfs (C)
Jul-Aug	No criterion	4,000 cfs (All)	No criterion	4,000 cfs (All)	2,000 cfs (All)	3,500 cfs (All)	2,000 cfs (All)	3,500 cfs (All)
San Joaquin River flow at Vernalis								
May	VAMP flow requirements	D-1641 flow requirements (higher objective)	VAMP flow requirements	D-1641 flow requirements (higher objective)	VAMP flow requirements	D-1641 flow requirements (higher objective)	VAMP flow requirements	D-1641 flow requirements (higher objective)
Jul-Sep	No criterion	No criterion	No criterion	No criterion	No criterion	No criterion	No criterion	No criterion
Oct	1,400 cfs (All)	2,000 cfs (All)	1,400 cfs (All)	2,000 cfs (All)	1,400 cfs (All)	2,000 cfs (All)	1,400 cfs (All)	2,000 cfs (All)
Nov-Jan	D-1641 water quality requirements	1,500 cfs (All)	D-1641 water quality requirements	1,500 cfs (All)	D-1641 water quality requirements	1,500 cfs (All)	D-1641 water quality requirements	1,500 cfs (All)
Feb-Apr and Jun	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)	D-1641 flow requirements (lower objective)	D-1641 flow requirements (higher objective)

Table B-6. Summary of model operational parameters for BDCP Conservation Strategy Options 1 - 4 (Cont.)

Parameter	1A	1B	2A	2B	3A	3B	4A	4B
X2								
Feb-Jun	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C)	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C)	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C)	D-1641 X_2 locations	64 km (W) 65 km (AN) 66 km (BN) 74 km (D) 81 km (C) * 25,000 cfs cap on required flow
Jul-Jan	Model output	Model output	No criterion	No criterion	No criterion	No criterion	No criterion	No criterion
Total Delta Outflow								
Jul-Jan	3,000 cfs (All)	3,000 cfs (All)	3,000 cfs (All)	3,000 cfs (All)	3,000 cfs (All)	3,000 cfs (All)	3,000 cfs (All)	3,000 cfs (All)
Hydraulic Residence Time in Selected Delta Channels								
	Model output	Model output	No criterion	No criterion	No criterion	No criterion	No criterion	No criterion
DCC								
Feb-Jun	Closed (All)	Open (All)	Closed (All)	Open (All)	Closed (All)	Closed (All)	Closed (All)	Closed (All)
Jul-Jan	Open (All)	Open (All)	Open (All)	Open (All)	Closed (All)	Closed (All)	Closed (All)	Closed (All)
HORB								
Mar-May	Closed (All)	Open (All)					Open (All)	Open (All)
Jun-Aug	Open (All)	Open (All)					Open (All)	Open (All)
Sep-Nov	Closed (All)	Open (All)					Open (All)	Open (All)
Dec-Feb	Closed (All)	Open (All)					Open (All)	Open (All)
SJRB – Installed in the San Joaquin River to direct fish and flows into Old River								
Mar-May			Closed (All)	Closed (All)	Closed (All)	Closed (All)		
Jun-Aug			Closed (All)	Closed (All)	Closed (All)	Closed (All)		
Sep-Nov			Closed (All)	Closed (All)	Closed (All)	Closed (All)		
Dec-Feb			Closed (All)	Closed (All)	Closed (All)	Closed (All)		
Old River Flows								
			No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion – No reverse flows are expected from SWP/CVP diversions; model output to assess	No criterion	No criterion

Table B-6. Summary of model operational parameters for BDCP Conservation Strategy Options 1 - 4 (Cont.)

Parameter	1A	1B	2A	2B	3A	3B	4A	4B
Middle River Flows								
Jun			No criterion	>-6,000 cfs (All)	No criterion	>-6,000 cfs (All)	No criterion	No criterion
Jul-Sep			No criterion	>-8,000 cfs (All)	No criterion	>-8,000 cfs (All)	No criterion	No criterion
Oct-Nov			No criterion	>-4,000 cfs (All)	No criterion	>-4,000 cfs (All)	No criterion	No criterion
Dec-Feb			No criterion	>-4,000 cfs (All)	No criterion	>-4,000 cfs (All)	No criterion	No criterion
Old and Middle River Flows (Combined)								
Mar-Jun	No criterion	>-1,000 cfs (All)						
Jul-Sep	No criterion	>-5,000 cfs (All)						
Oct-Nov	No criterion	>-1,000 cfs (All)						
Dec-Feb	No criterion	>-1,000 cfs (All)						
QWEST								
Mar-May	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	No criterion
Jun	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	No criterion
Jul-Nov	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	No criterion
Dec-Feb	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	Net positive flows (no reverse flow) (All)	No criterion	No criterion
SWP/CVP VAMP South Delta Diversion Operations								
Apr	Model output	VAMP	No criterion	VAMP	No criterion	VAMP		
May	VAMP	VAMP	VAMP	VAMP	VAMP	VAMP		
SWP/CVP VAMP Isolated facility Diversion Operations								
Mar-May					< 15,400 cfs	< 6,000 cfs	< 15,400 cfs	< 6,000 cfs
Jun-Feb					< 15,400 cfs	No criterion	< 15,400 cfs	No criterion

This page intentionally left blank.