Working Draft - Preliminary Assessment of

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CDFW's Proposed Bypass Flow Criteria for the Sites Reservoir Project

June 13, 2017

This preliminary assessment provides average annual Sites Project diversion results for a range of CDFW suggested bypass flow criteria. Results are preliminary and subject to change.

These criteria specify the amount of storm event flow that must be present at a given location in the system before Sites diversions can occur upstream. These criteria are **not** minimum flow criteria that that must be met or supplemented by the Sites Project.

The analysis included evaluation of eight sensitivity runs under current conditions using the DWR Delivery Capability Report (DCR 2015) CalSim II model with the WSIP implementation of the Sites Project (Alternative D) as the base case. The sensitivity runs include interpretations of three flow criteria proposed by CDFW:

- Diversion restrictions to maintain Tisdale Weir spills up to 5,000 cfs
- Increasing Wilkins Slough bypass flows requirements from 8,000 cfs to 14,000 cfs in November through May
- Delta Outflow criteria of 44,500 cfs in March, April, and May.

In addition, a sensitivity run with no monthly pulse bypass flow requirement was conducted to assess the impact the current monthly pulse bypass flow criteria has on average annual diversions to Sites Reservoir.

Results of the analyses are summarized and presented in the table and figures below.

Summary

The base case DCR2015 current conditions model run with Alternative D shows an average annual diversion to sites Reservoir of 514 TAF/year, as show in the table below. Alternative D includes a bypass flow criteria of 5,000 cfs at Wilkins Slough consistent with the project description in the EIS/R. There is no Tisdale Weir or Delta Outflow criteria above D-1641 specified in Alternative D.

Adding the Tisdale Weir spill criteria reduces the annual average diversion to Sites Reservoir by about 12 TAF/year, the smallest impact on Sites fills of all of the sensitivity runs.

Increasing the Wilkins Slough bypass flow criteria from 5,000 cfs to 8,000 cfs reduces average annual diversions by 65.2 TAF/year, a reduction of about 9%. Increasing the Wilkins Slough bypass flow criteria in 2,000 cfs increments from 8,000 cfs to 14,000 cfs reduces average annual Sites fills by additional increments of approximately 9%.

The addition of the Delta Outflow criteria of 44,500 cfs in March through May reduces average annual diversions by 72.6 TAF/year.

The combination of the Tisdale, Wilkins Slough (8,000 cfs), and Delta Outflow criteria reduce annual average Sites diversions by 24% or 124 TAF/year.

The elimination of the monthly pulse bypass flow requirement included in Alternative D resulted in an increase in average annual diversions to Sites Reservoir of about 10 TAF/Year.

Sensitivity Analysis

The runs are defined as follows:

1. **DCR2015** = Base Case (DCR2015 With Alternative D Project)
2. **No Pulse Bypass Flow** = "DCR2015" + No Monthly Pulse Bypass Flow Criteria
3. **Tisdale** = "DCR2015" + Tisdale Weir Spill Criteria
4. **Wilkins8k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 8,000 cfs
5. **Wilkins10k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 10,000 cfs
6. **Wilkins12k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 12,000 cfs
7. **Wilkins14k** = "DCR2015" + Wilkins Slough winter Bypass Flow of 14,000 cfs
8. **DO Criteria** = "DCR2015" + Delta Outflow flow of 44,500 cfs in March, April, and May
9. **DO+T+W8k** = Combination of Delta Outflow 44,500 cfs + Tisdale + "Wilkins Slough 8,000 cfs

The summary table, bar chart, and exceedance figures below present the preliminary results of the analysis.

October-September

Total Average Annual Diversion to Sites Reservoir

Volume (TAF)		Difference from Previous	Difference DCR2015 Alternativ
DCR2015 with Alternative D	514.0		
Eliminate Monthly Bypass Pulse Flow	523.4	9.5	9
Tisdale Weir	502.0	-21.4	-11
Wilkins8k	468.3	-33.7	-45
Wilkins10k	426.4	-41.9	-87
Wilkins12k	388.5	-37.9	-125
Wilkins14k	355.3	-33.2	-158
Delta Outflow Criteria 44,500 cfs March – May	441.3	86.1	-72
Delta Outflow +Tisdale +Wilkins Slough 8,000 cfs	390.0	-51.3	-123

Modeling Assumptions for Sites Reservoir Intakes (Oct-Jun)

Modeling Assumptions for Sites Reservoir Intakes (Oct-Jun)

The following assumptions were developed by CDFW for a modeling exercise to evaluate the ability of Sites Reservoir to operate while ensuring species specific habitat needs and protection are met in the Sacramento River and Delta. It is assumed that these Sacramento River and Net Delta Outflow Index criteria will be met during the specified timeframes prior to and during Sites Reservoir operations. Results from this modeling exercise are intended to support the evaluation of project alternatives and their ability to contribute to ecosystem benefits.

Sacramento River Assumptions

- No pumping at TCCA facility until January
- No pumping until after first initial pulse flow greater than or equal to 15,000 cfs at Wilkins Slough for five consecutive days
- Wilkins Slough bypass flow requirement of 15,000 cfs
- Colusa bypass flow requirement of 29,500 cfs

Habitat and Species Protection

- No pumping at TCCA facility until January
  - The majority of winter-run pass this facility as very small fry.
  - 99% of downstream juvenile winter-run passage is typically completed by the end of December each year (Poytress et al. 2014).

- No pumping until after first initial pulse flow greater than or equal to 15,000 cfs at Wilkins Slough for five consecutive days.
  - The first major pulse flow past Wilkins Slough has been correlated with peak winter-run passage at the Knights Landing rotary screw traps.
  - Substantial increases in cumulative catch of winter-run at Knights Landing have been observed and correspond to a flow threshold of approximately 14,000 cfs at Wilkins Slough (del Rosario et al. 2013).

- 15,000 cfs Wilkins Slough bypass flow requirement.
  - Based on flow survival relationships of juvenile salmonids in the Sacramento River.
  - Increased emigration has also been observed at Knights Landing when flows increase.

- 29,500 cfs Colusa bypass flow requirement.
  - There is substantial benefit to providing floodplain rearing habitat in the Sutter Bypass.
    - This flow rate should provide at 5,000 cfs spill at Tisdale Weir (CDEC data and linear regression analysis of COL and TIS) to provide floodplain rearing habitat in the Sutter Bypass.
  - Based on flow survival relationships of juvenile salmonids in the Sacramento River.

Net Delta Outflow Index Assumptions

Month	W	AN	BN	D	C
Oct	12,400 (74km)	7,100 (81km)	D-1641	D-1641	D-1641
Nov	12,400 (74km)	7,100 (81km)	D-1641	D-1641	D-1641
Dec	11,400	5,000	D-1641	D-1641	D-1641
Jan	25,000				
Feb					
Mar	44,500		25,000	11,400	11,400
Apr					
May					
Jun	D-1641 or 11,400 (74km)[1]	D-1641 or 11,4000 (74km)[1]	D-1641 or 11,400 (74km)[1]	D-1641	D-1641

Habitat and Species Protection	
D-1641	Existing SWRCB D-1641 requirements
BiOp RPA	Existing Fall X2 requirements (Delta Smelt) FWS BiOp
Delta Smelt	Holds LSZ around suitable abiotic habitat for spawning and rearing
Longfin Smelt	Protects flows for LFS abundance
Sturgeon	Protects attraction flows

[1] Whichever flow value is higher