Appendix 30B Comparison of Regional Hydrologic Model Results to Inform Economic Analyses

30B.1 Introduction

This appendix provides a comparison of previous hydrologic modeling water supply results for inclusion as input into various economic models to current hydrologic modeling results. The current hydrologic model results were post-processed prior to comparing them with the 2017 Draft Environmental Impact Report/Environmental Impact Statement (EIR/EIS) model results to determine if the results are similar.[1]

30B.2 Results of Comparison

The previous hydrologic model results were used as inputs to the previous economic models, including SWAP, Least Cost Planning Simulation Model (LCPSIM), and the Other Municipal Water Economics Model (OMWEM). It is anticipated that the results related to economics associated with agricultural and municipal and industrial water supply would remain positive and beneficial for Alternatives 1, 2, and 3 in this Final EIR/EIS, and would be similar to the results of the economic analysis conducted for the 2017 Draft EIR/EIS alternatives, based on the current hydrologic model results.

The current hydrologic model represents water supply deliveries to the same regions as previously analyzed in the 2017 Draft EIR/EIS. *Deliveries* in this appendix include both deliveries to Storage Partners and deliveries to State Water Project (SWP) and Central Valley Project (CVP) contractors incidental to the effects of the Project. The delivery amount (i.e., thousand acre-feet [TAF]) is measured at the boundary of the hydrologic units and summarized in the regions shown in the tables in this appendix. Estimated release rates and delivery amounts were greater in the alternatives modeled in 2017 than they would be for the Project in this Final EIR/EIS. This difference is primarily due to changes in participating Storage Partners since the earlier model run and is not related to changes in modeling methodology or current demands. The timing and spatial distribution of releases identified in the current hydrologic model are within the range of what was evaluated in the 2017 Draft EIR/EIS modeling. As shown in the tables below, while release rates and delivery amounts are lower under Alternatives 1, 2, and 3,

[1] Differences in the delivery volumes presented in this appendix may vary slightly from delivery volumes presented in Chapter 5, *Surface Water Resources*, and Chapter 32, *Other Required Analyses*, due to rounding during processing of modeling results.

none of the alternatives in the Final EIR/EIS would reduce water supply from existing conditions.

Tables 30B-1a through 30B-1e compare the simulated modeling results of water supply deliveries by region between the 2017 Draft EIR/EIS and this Final EIR/EIS. The 2017 Draft EIR/EIS generally analyzed alternatives with larger reservoirs and three intakes. This Final EIR/EIS generally analyzes smaller reservoirs; it also includes refined diversion criteria as described in Chapter 2, *Project Description and Alternatives*. Therefore, the overall simulated deliveries are reported to be lower in Alternatives 1, 2, and 3 in this Final EIR/EIS. There is also a large decrease in Wet and Above Normal Water Year deliveries because there are many water year type constraints on Authority deliveries under Alternatives 1, 2, and 3. As shown in Tables 30B-1a through 30B-1e, regional water deliveries to these hydrologic regions generally remain positive. However, there are some negative results. Negative numbers do not mean less water is delivered to the hydrologic region or water users; negative numbers mean the simplified CALSIM model is attempting to implement complex regulatory requirements and water supply allocation decisions and is over reacting. This is potentially because of rules that use functions involving thresholds or stepped values to determine simulated operations in CALSIM. Overall, the simulated regional deliveries results indicate that the current hydrologic modeling results are within a similar range and distribution relative to those from the 2017 Draft EIR/EIS modeling.

Tables 30B-2a through 30B-2e compare the simulated agricultural deliveries between the 2017 Draft EIR/EIS and this Final EIR/EIS. These simulations are the output used by the SWAP model in the 2017 Draft EIR/EIS. Appendix 30A, *Regional Economic Modeling*, provides a description of the SWAP model. SWAP allocates the hydrologic modeling outputs from CALSIM to SWAP districts. These results are then aggregated to the regional level to show how the Project would change water deliveries to agricultural regions. The model is run separately for long-term Normal, Dry, and Critically Dry Water Years. As is the case with overall Project deliveries, deliveries to agriculture remain positive under Alternatives 1, 2, and 3, although smaller due to participant changes between the 2017 Draft EIR/EIS alternatives and the Project. Overall, these results indicate that the current hydrologic modeling results are within a similar range and distribution relative to those previously reported for agricultural deliveries being made to the same hydrologic regions.

Tables 30B-3a through 30B-3e compare the municipal and industrial (M&I) deliveries for the 2017 Draft EIR/EIS and this Final EIR/EIS as modeled by LCPSIM and OMWEM. Appendix 30A provides a description both these models. LCPSIM is an annual time-step urban water service system reliability management model that estimates a least-cost water supply management strategy for SWP and CVP M&I supplies to the San Francisco Bay Area and the South Coast regions of California. OMWEM is a spreadsheet model that estimates the economic benefits of changes in supplies based on estimated water supply and demand of SWP and CVP M&I regions that are not included in LCPSIM. As shown in Tables 30B-3a through 30B-3e, water deliveries to areas with M&I uses generally remain positive and constitute a similar proportion of the total deliveries for this Final EIR/EIS when compared to the 2017 Draft EIR/EIS results. However, there are negative results. Negative numbers do not mean less water is delivered to the hydrologic region or water users; negative numbers mean the simplified CALSIM model is attempting to implement complex regulatory requirements and water supply

allocation decisions and is over reacting. This is potentially because of rules that use functions involving thresholds or stepped values to determine simulated operations in CALSIM. Similar to the regional deliveries and agricultural deliveries, overall these results indicate that the current hydrologic modeling results are within a similar range and distribution relative to those from the 2017 Draft EIR/EIS modeling.

Table 30B-1a. CALSIM Simulated Regional Deliveries Comparison: Total – All Regions (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-Term Average	164	135	165	218	120	117	112	109
Dry and Critically Dry Water Years Average	328	267	339	415	275	270	256	278
Wet Water Years	84	76	84	98	14	-1	14	8
Above Normal Water Years	35	81	39	67	42	43	38	41
Below Normal Water Years	63	2	40	138	46	65	44	-15
Dry Water Years	310	242	306	287	297	284	279	310
Critically Dry Water Years	355	306	388	457	242	248	222	231

Table 30B-1b. CALSIM Simulated Regional Deliveries Comparison: Sacramento River (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	22	11	20	96	23	22	21	22
Proportion of Total	13%	8%	12%	44%	19%	19%	19%	20%
Dry and Critically Dry Water Years Average	28	13	23	171	48	47	45	46
Proportion of Total	9%	5%	7%	41%	18%	17%	18%	17%
Wet Water Years	9	9	10	23	5	5	5	5
Above Normal Water Years	19	11	29	49	3	3	3	3
Below Normal Water Years	34	7	24	107	16	16	15	15
Dry Water Years	25	17	26	146	45	45	44	47
Critically Dry Water Years	33	8	18	209	53	49	46	45

Note: Deliveries to the Sacramento Valley in 2017 Draft EIR/EIS Alternative D were much higher than the other 2017 Draft EIR/EIS alternatives due to a 320 TAF dedicated account for Sacramento Valley participants. The other 2017 Draft EIR/EIS alternatives did not include this account.

Table 30B-1c. CALSIM Simulated Regional Deliveries Comparison: San Francisco Bay (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	11	10	12	9	9	9	8	7
Proportion of Total	7%	7%	7%	4%	7%	8%	7%	7%
Dry and Critically Dry Water Years Average	21	18	23	17	22	21	21	21
Proportion of Total	6%	7%	7%	4%	8%	8%	8%	8%
Wet Water Years	6	5	5	6	-2	-3	-2	-3
Above Normal Water Years	3	8	4	4	2	2	0	0
Below Normal Water Years	5	2	5	5	6	9	6	3
Dry Water Years	17	15	18	15	24	23	24	23
Critically Dry Water Years	27	22	30	21	18	19	17	19

Table 30B-1d. CALSIM Simulated Regional Deliveries Comparison: San Joaquin/Tulare Lake/Central Coast (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	56	35	51	41	8	10	8	20
Proportion of Total	34%	26%	31%	19%	7%	9%	7%	19%
Dry and Critically Dry Water Years Average	107	77	104	81	8	13	7	56
Proportion of Total	33%	29%	31%	20%	3%	5%	3%	20%
Wet Water Years	28	15	21	25	7	0	7	9
Above Normal Water Years	18	38	25	15	27	29	28	32
Below Normal Water Years	27	-23	11	6	-5	8	-3	-43
Dry Water Years	115	71	104	87	10	11	8	68
Critically Dry Water Years	95	87	104	72	5	17	6	37

Note: The large decrease in San Joaquin/Tulare Lake/Central Coast deliveries from the 2017 Draft EIR/EIS to this Final EIR/EIS is because there was a dedicated SWP Sites account and a large CVP Sites account in the 2017 Draft EIR/EIS alternatives that would have delivered water throughout the CVP and SWP systems. This Final EIR/EIS does not include an SWP account and two alternatives have no CVP account; deliveries are based on anticipated participation levels. Participation levels in the San Joaquin and Tulare Lake regions would be relatively low.

Table 30B-1e. CALSIM Simulated Regional Deliveries Comparison: South Coast – East/West Branch[2] (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	76	80	83	71	81	75	75	59
Proportion of Total	46%	59%	50%	33%	67%	65%	67%	54%
Dry and Critically Dry Water Years Average	172	159	188	145	197	188	183	155
Proportion of Total	53%	60%	56%	35%	72%	70%	71%	56%
Wet Water Years	41	47	48	44	5	-3	5	-3
Above Normal Water Years	-5	25	-19	-1	9	9	8	5
Below Normal Water Years	-3	15	1	21	28	32	26	11
Dry Water Years	153	140	158	138	218	206	203	171
Critically Dry Water Years	201	189	235	155	166	162	153	131

Table 30B-2a. SWAP CALSIM Output Comparison: Total Regional Agricultural Deliveries (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	69	37	61	130	30	32	28	41
Dry and Critically Dry Water Years Average	120	76	110	241	56	60	52	101

Table 30B-2b. SWAP CALSIM Output Comparison: Sacramento River Agricultural Deliveries (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	19	9	16	94	22	22	21	21
Proportion of Total	27%	23%	26%	72%	75%	68%	73%	50%
Dry and Critically Dry Water Years Average	25	11	19	169	48	46	44	44
Proportion of Total	20%	14%	17%	70%	85%	76%	85%	43%

Note: Deliveries to the Sacramento Valley in 2017 Draft EIR/EIS Alternative D were much higher than the other 2017 Draft EIR/EIS alternatives due to a 320 TAF dedicated account for Sacramento Valley participants. The other 2017 Draft EIR/EIS alternatives did not include this account.

[2] Note that the South Coast East/West Branch Region comprises the combination of the South Lahontan Hydrologic Region and South Coast Hydrologic Region, as included in Chapter 5, *Surface Water Resources*, and Chapter 32, *Other Required Analyses*. These regions are combined in this section to enable comparison with delivery numbers from the 2017 Draft EIR/EIS.

Table 30B-2c. SWAP CALSIM Output Comparison: San Francisco Bay Agricultural Deliveries (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	1	0	0	0	0	0	-1	0
Proportion of Total	1%	0%	1%	0%	-2%	-1%	-3%	0%
Dry and Critically Dry Water Years Average	2	0	1	1	0	0	0	2
Proportion of Total	1%	1%	1%	0%	0%	1%	0%	2%

Table 30B-2d. SWAP CALSIM Output Comparison: San Joaquin/Tulare Lake/Central Coast (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	49	28	44	36	8	10	8	20
Proportion of Total	71%	76%	72%	27%	26%	32%	28%	49%
Dry and Critically Dry Water Years Average	93	65	89	70	7	13	7	55
Proportion of Total	78%	85%	81%	29%	13%	22%	13%	54%

Note: The large decrease in San Joaquin/Tulare Lake/Central Coast deliveries from the 2017 Draft EIR/EIS to this Final EIR/EIS is because there was a dedicated SWP Sites account and a large CVP Sites account in the 2017 Draft EIR/EIS alternatives that delivered water throughout the CVP and SWP systems. This Final EIR/EIS does not include an SWP account and two alternatives have no CVP account, so Sites water deliveries are based on anticipated participation levels. Participation levels in the San Joaquin and Tulare Lake regions would be relatively low.

Table 30B-2e. SWAP CALSIM Output Comparison: South Coast – East/West Branch (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	0	0	0	0	0	0	0	0
Proportion of Total	1%	1%	1%	0%	1%	1%	1%	1%
Dry and Critically Dry Water Years Average	1	1	1	1	1	1	1	1
Proportion of Total	1%	1%	1%	0%	1%	1%	2%	1%

Table 30B-3a. M&I CALSIM Output Comparisons: Total – All Regions (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	95	97	104	88	90	85	84	67
Dry and Critically Dry Water Years Average	207	191	229	174	219	210	205	177

Table 30B-3b. M&I CALSIM Output Comparisons: Sacramento River (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	3	2	4	2	0	0	0	1
Proportion of Total	3%	2%	3%	2%	0%	1%	0%	2%
Dry and Critically Dry Water Years Average	3	3	4	2	1	1	1	3
Proportion of Total	2%	1%	2%	1%	0%	1%	0%	2%

Note: Deliveries to the Sacramento Valley in the 2017 Draft EIR/EIS Alternative D were much higher than the other 2017 Draft EIR/EIS alternatives due to a 320 TAF dedicated accout for Sacramento Valley participants. The other 2017 Draft EIR/EIS alternatives did not include this account. However, those deliveries were all for agriculture, so this is not reflected when looking solely at M&I deliveries.

Table 30B-3c. M&I CALSIM Output Comparisons: San Francisco Bay (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	10	10	11	9	9	9	9	7
Proportion of Total	11%	10%	11%	10%	10%	11%	11%	11%
Dry and Critically Dry Water Years Average	19	17	22	16	22	21	21	19
Proportion of Total	9%	9%	10%	9%	10%	10%	10%	11%

Table 30B-3d. M&I CALSIM Output Comparisons: San Joaquin/Tulare Lake/Central Coast (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	6	6	7	6	0	0	0	0
Proportion of Total	7%	7%	7%	6%	0%	0%	0%	0%
Dry and Critically Dry Water Years	13	12	15	11	0	0	0	1
Proportion of Total	6%	7%	7%	7%	0%	0%	0%	0%

Notes: The large decrease in San Joaquin/Tulare Lake/Central Coast deliveries from the 2017 Draft EIR/EIS to the Final EIR/EIS is because there was a dedicated SWP Sites account and a large CVP Sites account in the 2017 Draft EIR/EIS alternatives that delivered water throughout the CVP and SWP systems. In the Final EIR/EIS, there is no SWP account and two alternatives have no CVP account, so Sites water deliveries are based on anticipated participation levels. Participation levels in the San Joaquin and Tulare Lake regions would be relatively low.

Table 30B-3e. M&I CALSIM Output Comparisons: South Coast – East/West Branch (TAF)

	2017 Draft EIR/EIS				Final EIR/EIS			
	Alt A	Alt B	Alt C	Alt D	Alt 1A	Alt 1B	Alt 2	Alt 3
Long-term Average	75	79	82	71	80	75	75	59
Proportion of Total	80%	82%	79%	81%	89%	89%	89%	87%

	2017 Draft EIR/EIS				Final EIR/EIS			
Dry and Critically Dry Water Years Average	171	159	188	144	196	187	182	155
Proportion of Total	83%	83%	82%	83%	90%	89%	89%	87%