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**Sensitivity Analysis to Confirm RDEIR/SDEIS
Determinations for Fish and Aquatic Species Using
Updated Model Outputs for Alternatives 2D, 4A, and 5A**

Sensitivity Analysis to Confirm RDEIR/SDEIS Determinations for Fish and Aquatic Species Using Updated Model Outputs for Alternatives 2D, 4A, and 5A

11E.1 Introduction

The purpose of this appendix is to describe the comparison of model results from the CALSIM modeling used for the RDEIR/SDEIS (hereafter “REIR modeling”) effects analysis to model results from updated CALSIM modeling for Alternatives 2D, 4A, and 5A. There were two model updates compared: Alternatives 2D, 4A, and 5A were modeled using a 2010 updated CALSIM modeling (hereafter “2010 modeling”) and Alternative 4A was modeled using a 2015 refined CALSIM model scenario (hereafter “2015 modeling”) that was used for the effects analysis in the 2016 Draft Biological Assessment. The goal of this effort was to verify that model results using 2010 and 2015 modeling were similar to model results using the REIR modeling such that NEPA and CEQA effects determinations for aquatic resources made in Chapter 11 of the REIR would not change if 2010 or 2015 modeling were used in place of REIR modeling.

The 2010 and 2015 CALSIM modeling for Alternative 2D, 4A, and 5A included several updates from the REIR modeling to reflect corrected assumptions and criteria (see Appendix 5F, *Comparison of FEIRS Alternatives 2D, 4A and 5A Modeling Results to RDEIR/SDEIS Modeling Results*, for details). Of particular concern, compared to REIR modeling, 2010 and 2015 modeling did not include 25,000 acres of restoration, did include CM2 in the No Action Alternatives (NAA_ELT_2010 and NAA_ELT_2015), and reverted the compliance point to Emmatton. There were also spring X2 criteria in 2015 modeling that were only in the H4 scenario of REIR modeling, and there was an effort to keep upstream reservoir operations in 2015 Alternative 4A modeling as close to the 2015 NAA model scenario as possible.

11E.2 Methods

For each alternative separately, CALSIM model outputs are reviewed for 12 output locations within all major waterways upstream of the Delta and for 7 outputs locations within the Delta. For each location, two tables of results are presented in Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*. In the first table, mean output values by month and water year type for NAA and the alternative for all modeling efforts are presented. Model outputs from REIR modeling are denoted with “_REIR” at the end of the column title; model outputs from 2010 modeling are denoted with “_2010” at the end of the column title.

In the second table for each location, the effect of an alternative is calculated by comparing the model output for the alternative compared to its respective baseline (e.g., “A2D_REIR Effect” = NAA_ELT_REIR vs. A2D_ELT_REIR). The last column (or set of columns for Alternative 4A) is the comparison used in the current analysis to determine how similar or different the effects from each modeling effort were. To determine whether the difference in model efforts could alter the

1 determination for NEPA, the magnitude and frequency of any moderate to large values from these
2 last columns was examined in combination with how the difference affected the direction (positive
3 or negative) and magnitude of change between effects using each model scenario. For example, if the
4 difference in effects between REIR and 2010 modeling was 30%, but the change went from an 80%
5 increase in flow to a 50% increase in flow, this 30% difference would not affect the determination,
6 regardless of its magnitude, because both were high increases in flow, which would be beneficial.
7 Alternatively, if the 30% difference caused a change from a 15% increase in flows in REIR modeling
8 to a 15% decrease in flows in 2010 modeling, this difference could cause a change in the
9 determination. Therefore, all moderate to large changes between REIR and 2010 model scenarios
10 and between REIR and 2015 model scenarios were examined on a case-by-case basis. Smaller
11 changes were generally not considered to be of sufficient magnitude to cause a change in a NEPA
12 determination, unless persistent across multiple water years and months. Although no strict
13 numerical thresholds were used in the analysis due to highly variable nature of flow, consistent with
14 the rest of Chapter 11, a change of less than ~15% was considered small, <~25% was considered
15 moderate, and a change of >~25% was considered large.

16 The analysis for Alternative 4A is more complicated and, therefore, warrants further explanation
17 here. The effect of Alternative 4A at a specific location was determined by comparing the model
18 output for Alternative 4A to the baseline, NAA, during the ELT implementation period. There are
19 two scenarios for Alternative 4A in REIR modeling and there is an additional modeling effort, 2015.
20 As such there are four total effects:

- 21 1. H3 REIR effect—NAA_ELT_REIR vs. H3_ELT_REIR
- 22 2. H4 REIR effect—NAA_ELT_REIR vs. H4_ELT_REIR
- 23 3. 2010 effect—NAA_ELT_2010 vs. A4A_ELT_2010
- 24 4. 2015 effect—NAA_ELT_2015 vs. A4A_ELT_2015

25 This analysis compares the 2010 and 2015 effects to the REIR H3 and H4 effects individually to
26 determine how closely the 2015 effect fits within the REIR H3 and H4 effect bookends. Specifically,
27 two comparisons of effects were made:

- 28 1. H3 REIR effect vs. 2010 effect-- ([NAA_ELT_REIR vs. H3_ELT_REIR] vs. [NAA_ELT_2010 vs.
29 A4A_ELT_2010])
- 30 2. H4 REIR effect vs. 2010 effect-- ([NAA_ELT_REIR vs. H4_ELT_REIR] vs. [NAA_ELT_2010 vs.
31 A4A_ELT_2010])
- 32 3. H3 REIR effect vs. 2015 effect-- ([NAA_ELT_REIR vs. H3_ELT_REIR] vs. [NAA_ELT_2015 vs.
33 A4A_ELT_2015])
- 34 4. H4 REIR effect vs. 2015 effect-- ([NAA_ELT_REIR vs. H4_ELT_REIR] vs. [NAA_ELT_2015 vs.
35 A4A_ELT_2015])

1 **11E.3 Results**

2 **11E.3.1 Alternative 2D**

3 **11E.3.1.1 NEPA Effects**

4 Overall, the effects of Alternative 2D would be largely similar between REIR and 2010 modeling and,
5 therefore, no NEPA determinations based on REIR model outputs would change using 2010 model
6 outputs.

7 **11E.3.1.1.1 Sacramento River**

8 There would be no substantial or persistent differences between REIR and 2010 modeling in the
9 effects of Alternative 2D at Keswick, Red Bluff, and Wilkins Slough (Appendix 11C, *CALSIM II Model*
10 *Outputs Utilized in the Fish Analysis*). There is one difference at Keswick, no differences at Red Bluff,
11 and two differences at Wilkins. Because these differences are small and isolated, determinations
12 based on 2010 modeling at these locations would not differ from those in the REIR.

13 At Verona, there would be small flow increases under 2010 Alternative 2D model results relative to
14 the NAA, an improvement, during December through May, particularly in wetter water years, that
15 would not be observed in REIR modeling results (Appendix 11C, *CALSIM II Model Outputs Utilized in*
16 *the Fish Analysis*). This is a result of the difference in baseline flows between modeling efforts, which
17 tend to be lower under NAA_ELT_2010 relative to NAA_ELT_REIR, as a result of changes in Fremont
18 Weir operations in the NAA. Flows in these months under Alternative 2D would be very similar
19 between REIR and 2010 modeling. Effects of Alternative 2D during the remainder of the year (June
20 through November) would be similar between REIR and 2010 modeling efforts. Because the 2010
21 modeled effects during December through May would be only slightly higher than those observed in
22 REIR modeling, and flows in these months did not cause adverse effects in REIR, determinations
23 based on 2010 modeling would not differ from those based on REIR modeling.

24 **11E.3.1.1.2 Trinity River**

25 In the Trinity River, the effect of Alternative 2D would mostly be similar between REIR and 2010
26 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There are 3 isolated
27 moderately sized differences during specific months and water year types. These isolated changes in
28 the 2010 modeling relative to REIR modeling would not be frequent enough to alter the
29 determinations based on REIR modeling.

30 **11E.3.1.1.3 Clear Creek**

31 In Clear Creek, the effect of Alternative 2D would mostly be similar between REIR and 2010
32 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There are 3 isolated,
33 small differences between the REIR and 2010 modeling that are the result of distributing releases in
34 critical years among August, September, and October more in line with the baseline in 2010
35 modeling. Because flow effects of Alternative 2D in REIR modeling were small and isolated, and
36 because the change from REIR modeling to 2010 modeling in effects of Alternative 2D are small and
37 isolated, determinations based on 2010 modeling would not differ from those based on REIR
38 modeling.

1 **11E.3.1.1.4 Feather River**

2 There would be no differences between 2010 and REIR modeling in flow effects in the Feather River
3 low-flow channel (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Flows would
4 not differ between Alternative 2D and the no action alternative in either the REIR or 2010 model
5 outputs.

6 In the high-flow channel, the effect of Alternative 2D would mostly be similar between REIR and
7 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would
8 be reductions in the flows under the alternative relative to the baseline in the 2010 modeling that
9 would be larger than those in REIR modeling, primarily in December and January. In nearly all cases,
10 the change would be due to a small increase or negligible change in flows in the REIR modeling with
11 a concurrent increase, no change, or slight reduction in flows in 2010 modeling. In only one case
12 (January of critical years) would there be a moderate change between modeling efforts that caused a
13 benefit to become a negative effect. These isolated changes in the 2010 modeling relative to REIR
14 modeling would not be frequent enough to alter the determinations based on REIR modeling at this
15 location.

16 At the confluence with the Sacramento River, the effect of Alternative 2D would mostly be similar
17 between REIR and 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish
18 Analysis*). There would be some small increases and decreases in Alternative 2D effects between
19 REIR and 2010 model outputs in some months and water year types, but they are too small and
20 isolated to change any REIR effects determinations at this location.

21 **11E.3.1.1.5 American River**

22 At Nimbus, the effect of Alternative 2D would mostly be similar between REIR and 2010 modeling
23 (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would be small change
24 in critical years in 2010 modeling that largely reflect Folsom Dam releases being more consistent
25 with baseline releases than in the REIR modeling. A similar pattern is observed in the American
26 River at the confluence with the Sacramento River (Appendix 11C, *CALSIM II Model Outputs Utilized
27 in the Fish Analysis*). Overall, these differences in 2010 modeling in the American River would not be
28 large or frequent enough to affect the REIR determinations for any species.

29 **11E.3.1.1.6 Stanislaus River**

30 There would be negligible differences in model comparisons between REIR and 2010 modeling
31 (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Therefore, determinations
32 based on 2010 modeling would not change from those based on REIR modeling.

33 **11E.3.1.1.7 OMR flow**

34 The effects of Alternative 2D in 2010 modeling would predominantly be similar to the effects in
35 REIR modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would be
36 some isolated reductions in some water year types and months that would not change the
37 determinations based on REIR modeling. There would be some reduced benefits in January. These
38 shifts in OMR flows correspond to shifts in south Delta exports in January and summer months in
39 critical years (see Appendix 5F, *Comparison of FEIRS Alternatives 2D, 4A and 5A Modeling Results to
40 RDEIR/SDEIS Modeling Results*, for details. However, a reduction of beneficial flows in the REIR to
41 less beneficial flows in 2010 modeling would not cause a change in NEPA determinations based on

1 OMR. There are also differences in OMR in May that, on a relative scale, would appear large.
2 However, further evaluation reveals that this would be only a 65 to 71 cfs greater reduction in OMR
3 flows in 2010 modeling relative to REIR modeling, depending on water year type. This small
4 magnitude would not cause a change in any effects determinations based on OMR flows.

5 **11E.3.1.1.8 Sacramento River downstream of NDDF**

6 The effect of Alternative 2D on flows in the Sacramento River downstream of the north Delta
7 diversion facilities would mostly be similar between REIR and 2010 modeling (Appendix 11C,
8 *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would be many small (5-7%) improved
9 (lower) reductions from Alternative 2D in the 2010 modeling relative to REIR modeling. This is a
10 result of the difference in baseline flows between modeling efforts, which tend to be lower under
11 NAA_ELT_2010 relative to NAA_ELT_REIR, as a result of changes in Fremont Weir operations in the
12 NAA. However, flows under Alternative 2D would be similar between REIR and 2010 modeling.
13 Regardless, there would still be consistent moderate to large reductions in flows in most months
14 and water year types under both modeling efforts (REIR and 2010). Therefore, no determinations
15 from the REIR would change based on 2010 modeling.

16 **11E.3.1.1.9 Sacramento River at Rio Vista**

17 At Rio Vista, effects of Alternative 2D would be very similar between REIR and 2010 modeling and
18 determinations based on 2010 modeling would not change from those based on REIR modeling
19 (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*).

20 **11E.3.1.1.10 Delta Outflow**

21 Delta outflow would predominantly be similar between REIR and 2010 modeling efforts (Appendix
22 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There are two exceptions, both of which
23 would be beneficial for fish species. They would not be large or frequent enough to change any
24 determinations for any species from the REIR determinations.

25 **11E.3.1.1.11 San Joaquin River at Vernalis**

26 In the San Joaquin River at Vernalis, effects of Alternative 2D would be very similar between REIR
27 and 2010 modeling and determinations based on 2010 modeling would not change from those
28 based on REIR modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*).

29 **11E.3.1.1.12 Mokelumne River at the Delta**

30 In the Mokelumne River at the Delta, there would be negligible differences in effects of Alternative
31 2D between REIR and 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish
32 Analysis*). Therefore, determinations based on 2010 modeling would not change from those based
33 on REIR modeling.

34 **11E.3.1.1.13 South Delta Exports**

35 Effects of Alternative 2D on exports at the South Delta facilities would generally be similar between
36 REIR and 2010 modeling with some isolated increases and decreases in effects between modeling
37 (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Because these changes

1 between modeling are small and isolated, using 2010 model outputs would not change any
2 determinations for Alternative 2D that were made using REIR model outputs.

3 **11E.3.1.2 CEQA Effects**

4 Because CEQA conclusions were derived from the NEPA effects analysis, which included the effects
5 of climate change in the no action alternative, the comparison between REIR and 2010 modeling
6 efforts for the CEQA analysis would be similar to those for the NEPA analysis. Therefore, using 2010
7 model outputs would not change any CEQA determinations for Alternative 2D that were made using
8 REIR model outputs.

9 **11E.3.1.3 Conclusion**

10 In conclusion, due to a lack of substantial differences in model outputs between REIR and 2010
11 modeling, the determinations using 2010 modeling for Alternative 2D would be consistent with the
12 findings in REIR modeling. There are no locations in which effects to flows would differ
13 substantially.

14 **11E.3.2 Alternative 4A**

15 **11E.3.2.1 NEPA Effects**

16 **11E.3.2.1.1 Sacramento River**

17 There would be no substantial or persistent differences between REIR, 2010, and 2015 modeling in
18 the effects of H3 and H4 at Keswick, Red Bluff, and Wilkins Slough (Appendix 11C, *CALSIM II Model*
19 *Outputs Utilized in the Fish Analysis*). The 2010 and 2015 effects generally fall within or very near the
20 effects of H3 and H4 with few exceptions.

21 At Verona, there would be small flow increases in January through March under 2010 and 2015
22 Alternative 4A model results relative to the NAA, which would be an improvement not observed in
23 REIR modeling results (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). This is a
24 result of the difference in baseline flows between modeling efforts, which tend to be lower under
25 NAA_ELT_2010 and NAA_ELT_2015 relative to NAA_ELT_REIR, as a result of changes in Fremont
26 Weir operations in the NAA. Flows in these months under Alternative 4A would be very similar
27 among REIR (H3 and H4), 2010, and 2015 modeling. Because the 2010 and 2015 modeled effects
28 during these months would still be near the range of H3 and H4 REIR effects, the determinations
29 based on 2010 and 2015 modeling would not differ from those based on REIR modeling.

30 **11E.3.2.1.2 Trinity River**

31 In the Trinity River, the effect of Alternative 4A would mostly be similar between REIR and 2010
32 modeling and between REIR and 2015 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in*
33 *the Fish Analysis*). There are some isolated moderately sized differences during individual months
34 and water year types that would be outside the range of H3 to H4 effects in REIR modeling.
35 However, these isolated changes would not be frequent enough to alter the determinations based on
36 REIR modeling.

1 **11E.3.2.1.3 Clear Creek**

2 In Clear Creek, the effect of Alternative 4A in 2010 and 2015 modeling would be mostly within the
3 range of H3 to H4 REIR results with some small, isolated exceptions (*Appendix 11C, CALSIM II Model*
4 *Outputs Utilized in the Fish Analysis*). Because these differences would be small and isolated,
5 determinations based on 2010 and 2015 modeling would not differ from those based on REIR
6 modeling.

7 **11E.3.2.1.4 Feather River**

8 There would be no differences between 2010 and REIR modeling or between 2015 and REIR
9 modeling in flow effects in the Feather River low-flow channel above Thermalito Afterbay
10 (*Appendix 11C, CALSIM II Model Outputs Utilized in the Fish Analysis*). Flows do not differ between
11 Alternative 4A and the no action alternative in H3 REIR, H4 REIR, 2010, or 2015 model outputs.

12 In the high-flow channel below Thermalito Afterbay and at the confluence with the Sacramento
13 River, there were several differences between REIR and 2015 model outputs (*Appendix 11C, CALSIM*
14 *II Model Outputs Utilized in the Fish Analysis*). Most differences are attributable to the effort of
15 operating Oroville to make flows under Alternative 4A more similar to the baseline in the 2015
16 modeling than REIR modeling. As a result, some of the higher flows in March through May were no
17 longer seen in 2010 and 2015 modeling. There were still flow increases observed in February and
18 June and flow reductions in September in 2015 modeling results. Therefore, the determinations
19 from the REIR modeling in the high-flow channel would not change based on 2015 modeling despite
20 these changes in model outputs.

21 In addition, lower flows in the high flow channel during July through September under Alternative
22 4A seen in REIR modeling would not be as great and would not be considered substantial reductions
23 in 2010 and 2015 modeling (*Appendix 11C, CALSIM II Model Outputs Utilized in the Fish Analysis*).
24 Impact AQUA-78 in the REIR was found to be not adverse after Mitigation Measure AQUA-78D was
25 implemented. The adverse impact determination was a result of low flows in the Feather and
26 American rivers during August through December under REIR modeling. However, the 2010 and
27 2015 modeling indicates that there would be no adverse effect of Alternative 4A in the Feather River
28 before implementation of Mitigation Measure AQUA-78d. Therefore, there would be no adverse
29 effect, even before implementing any mitigation measures and MM AQUA-78d would no longer be
30 needed in Alternative 4A.

31 **11E.3.2.1.5 American River**

32 In the American River at Nimbus and the confluence with the Sacramento River, the effects of
33 Alternative 4A in 2010 and 2015 modeling would be generally be similar to effects in REIR modeling
34 during December through May (*Appendix 11C, CALSIM II Model Outputs Utilized in the Fish Analysis*).
35 There were several differences between REIR and 2010 model outputs during June through August.
36 Also, there were several differences between REIR and 2015 model outputs during June through
37 November. Most of these differences indicate that the negative effects of Alternative 4A in REIR
38 modeling would be reduced in 2010 and 2015 modeling or that effects that would be neither
39 beneficial nor detrimental in REIR modeling would be slightly beneficial in 2010 and 2015 modeling.
40 The most prevalent negative change in effects from REIR to 2010 modeling would occur during July
41 and August, but the effects would not be large enough to cause a substantial biological effect. The
42 most prevalent negative change in effects from REIR to 2015 modeling would occur during October,
43 although further examination of modeling results reveals that the change would be largely a result

1 of beneficial effects in REIR modeling becoming less beneficial in 2015 modeling. Overall, these
2 differences between modeling efforts in the American River would not warrant a change in
3 determinations based on REIR modeling.

4 **11E.3.2.1.6 Stanislaus River**

5 There would be negligible differences in model comparisons between REIR, 2010, and 2015
6 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Therefore,
7 determinations based on 2010 and 2015 modeling would not change from those based on REIR
8 modeling.

9 **11E.3.2.1.7 OMR flow**

10 The effects of Alternative 4A on OMR flows would be positive in all months and water year types
11 except April and May in REIR modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish*
12 *Analysis*). This is also true in 2010 modeling, despite differences in the magnitude of the effect
13 between REIR and 2010 modeling. In April and May, the reduction in flows under Alternative 4A in
14 2010 modeling would predominantly fall between the REIR H3 effects and REIR H4 effects.
15 Therefore, the determinations would not change between REIR and 2010 modeling.

16 In 2015 modeling, effects of Alternative 4A would be positive in nearly all months, including April
17 and May, and water year types although beneficial effects would be generally reduced during
18 November through January (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*).
19 Therefore, the main difference between REIR and 2015 efforts occurs in April and May. Because
20 OMR flows would not be adverse based on these two months for either REIR or 2015 modeling,
21 determinations made using REIR modeling would not change using 2015 modeling.

22 **11E.3.2.1.8 Sacramento River downstream of NDDF**

23 Flows in the Sacramento River downstream of the north Delta diversion facilities would be reduced
24 in nearly all months and water year types under REIR, 2010, and 2015 modeling (Appendix 11C,
25 *CALSIM II Model Outputs Utilized in the Fish Analysis*). Reduced flows would be smaller in 2010
26 modeling relative to REIR modeling between January and June but larger in 2010 modeling relative
27 to REIR modeling during July. Reduced flows under REIR modeling would be smaller during January,
28 April, and May in 2015 modeling but larger during June through August. Flow reductions during
29 winter and spring months are the result of the difference in baseline flows between modeling
30 efforts, which tend to be lower under NAA_ELT_2010 and NAA_ELT_2015 relative to NAA_ELT_REIR,
31 as a result of changes in Fremont Weir operations in the NAA. However, flows under Alternative 4A
32 would be similar among REIR, 2010, and 2015 modeling. Regardless, these changes between REIR
33 modeling and 2010 and 2015 modeling would not be large or frequent enough to cause a change in
34 determinations based on them.

35 **11E.3.2.1.9 Sacramento River at Rio Vista**

36 Similar to flows at the CALSIM output location just downstream of the north Delta diversion
37 facilities, flows in the Sacramento River at Rio Vista would be reduced in nearly all months and
38 water year types under REIR, 2010, and 2015 modeling (Appendix 11C, *CALSIM II Model Outputs*
39 *Utilized in the Fish Analysis*). Reduced flows would be smaller in 2010 modeling relative to REIR
40 modeling between April and June but larger in 2010 modeling relative to REIR modeling during July.
41 The reduction in flows under REIR modeling would be smaller during September through November

1 in 2015 modeling, but larger during June through August. These changes between REIR modeling
2 and 2010 and 2015 modeling would not be large or frequent enough to cause a change in
3 determinations based on them.

4 **11E.3.2.1.10 Delta Outflow**

5 Delta outflow in 2010 and 2015 modeling would generally fit between H3 and H4 REIR modeling
6 bookends, particularly in spring, which is expected because H3 does not have a spring outflow
7 requirement whereas H4 does (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*).
8 One exception would be during October in 2015 modeling, in which flow increases would be
9 reduced in wetter water years and increased in drier water years. Another exception would be
10 during June in 2015 modeling and July in both 2010 and 2015 modeling, in which flow effects would
11 be more negative in 2010 or 2015 modeling. However, closer examination reveals that these flow
12 changes would not be large enough to cause a change in REIR determinations.

13 **11E.3.2.1.11 San Joaquin River at Vernalis**

14 In the San Joaquin River at Vernalis, effects of Alternative 4A would be very similar between REIR,
15 2010, and 2015 modeling and determinations based on 2010 and 2015 modeling would not change
16 from those based on REIR modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish*
17 *Analysis*).

18 **11E.3.2.1.12 Mokelumne River at the Delta**

19 In the Mokelumne River at the Delta, there would be negligible differences in effects of Alternative
20 4A between REIR, 2010, and 2015 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the*
21 *Fish Analysis*). Therefore, determinations based on 2010 and 2015 modeling would not change from
22 those based on REIR modeling.

23 **11E.3.2.1.13 South Delta Exports**

24 Reductions in south Delta exports under Alternative 4A modeling in 2010 and 2015 modeling would
25 be greater than or similar to reductions in one or both of the scenarios (H3 and H4) under REIR
26 modeling during most months and water year types (Appendix 11C, *CALSIM II Model Outputs*
27 *Utilized in the Fish Analysis*). In nearly all cases, there would be export reductions during all months
28 and in water year types in REIR, 2010 and 2015 modeling. Therefore, there would be no difference
29 in determinations based on south Delta exports between REIR, 2010, and 2015 modeling.

30 **11E.3.2.2 CEQA Analysis**

31 Because CEQA conclusions were derived from the NEPA effects analysis, which included the effects
32 of climate change in the no action alternative, the comparison between REIR and 2010 modeling and
33 between REIR and 2015 modeling efforts for the CEQA analysis would be similar to those for the
34 NEPA analysis. Therefore, using 2010 and 2015 model outputs would not change any CEQA
35 determinations for Alternative 4A that were made using REIR model outputs. In addition, for Impact
36 AQUA-78, Mitigation Measure AQUA-78D would not be necessary to ensure that the effect would be
37 less than significant.

1 **11E.3.2.3 Conclusion**

2 The REIR analysis found “not adverse” and “less than significant” impacts of Alternative 4A on fish
3 and aquatic species. For some locations, there were some inconsistent upstream flow increases and
4 reductions and water temperature increases and reductions during certain months and water year
5 types under H3 and H4 relative to NAA_ELT_REIR, but these would not be substantial enough to
6 cause an adverse effect or significant impact in the RDEIR/SDEIS with one exception, Impact AQUA-
7 78. Impact AQUA-78 in the REIR was found to be not adverse and less than significant only after
8 Mitigation Measure AQUA-78d was implemented. Therefore, MM AQUA-78d is no longer needed for
9 Alternative 4A.

10 These findings are consistent with the findings in 2010 and 2015 modeling that there would be no
11 adverse effects or significant impacts of the alternative. The effects of the alternative using 2010 and
12 2015 modeling outputs are similar to effects of either H3 or H4, or both, in the REIR modeling.
13 However, using 2010 and 2015 model outputs, the effects of Alternative 4A in the Feather River
14 would not cause an adverse effect or significant impact before mitigation. Therefore, although the
15 determination would not change, no mitigation measures would be needed to make the impact not
16 adverse and less than significant.

17 **11E.3.3 Alternative 5A**

18 **11E.3.3.1 NEPA Effects**

19 Overall, the two modeling efforts are largely similar for Alternative 5A and no NEPA determinations
20 that were based on REIR model outputs would change using 2010 model outputs.

21 **11E.3.3.1.1 Sacramento River**

22 There would be no substantial or persistent differences between REIR and 2010 modeling in the
23 effects of Alternative 5A at Keswick, Red Bluff, and Wilkins Slough (Appendix 11C, *CALSIM II Model*
24 *Outputs Utilized in the Fish Analysis*). The only differences in flows >5% would occur at Wilkins
25 Slough in critical years during May through August. Because they are small and isolated differences
26 in Alternative 5A effects between REIR and 2010 modeling efforts, determinations based on 2010
27 modeling would not change from those based on REIR modeling.

28 At Verona, there would be small flow increases under 2010 Alternative 5A model results relative to
29 the NAA, an improvement, during December through May, particularly in wetter water years, that
30 would not be observed in REIR modeling results (Appendix 11C, *CALSIM II Model Outputs Utilized in*
31 *the Fish Analysis*). This is a result of the difference in baseline flows between modeling efforts, which
32 tend to be lower under NAA_ELT_2010 relative to NAA_ELT_REIR, as a result of changes in Fremont
33 Weir operations in the NAA. Flows under Alternative 5A in these months would be very similar
34 between REIR and 2010 modeling. Effects of Alternative 5A during the remainder of the year (June
35 through November) would be predominantly similar between REIR and 2010 modeling efforts.
36 Because the 2010 modeled effects during December through May would be only slightly higher than
37 those observed in REIR modeling, and flows in these months did not cause adverse effects in REIR,
38 determinations based on 2010 modeling would not differ from those based on REIR modeling.

1 **11E.3.3.1.2 Trinity River**

2 In the Trinity River, the effect of Alternative 5A would mostly be similar between REIR and 2010
3 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There are 4 isolated,
4 small to moderate differences between REIR and 2010 modeling, all of which indicate that
5 Alternative 5A would have more benefits and fewer negative effects on flows in 2010 modeling
6 relative to REIR modeling. These isolated changes in the 2010 modeling relative to REIR modeling
7 would not be frequent enough to alter the determinations that were based on REIR modeling.

8 **11E.3.3.1.3 Clear Creek**

9 In Clear Creek, the effect of Alternative 5A would mostly be similar between REIR and 2010
10 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There are 2 isolated,
11 small differences. Because flow effects of Alternative 5A in REIR modeling were small and isolated,
12 and because the change from REIR modeling to 2010 modeling in effects of Alternative 5A are small
13 and isolated, determinations based on 2010 modeling would not differ from those based on REIR
14 modeling.

15 **11E.3.3.1.4 Feather River**

16 There would be no differences between 2010 and REIR modeling in flow effects in the Feather River
17 low-flow channel (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Flows do not
18 differ between Alternative 5A and the no action alternative in either the REIR or 2010 model
19 outputs.

20 In the high-flow channel, the effect of Alternative 5A would mostly be similar between REIR and
21 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would
22 be isolated reductions in flows under the alternative relative to the baseline in the 2010 modeling
23 that would be larger than those in REIR modeling. In nearly all cases, the change would be from a
24 small increase or negligible change in flows in the REIR modeling to an increase, no change, or slight
25 reduction in flows in 2010 modeling. In only one case (August of dry years) would there be a small
26 change between modeling efforts that caused a flow reduction seen in REIR modeling to become a
27 larger flow reduction in 2010 modeling. Therefore, the REIR determinations using model outputs for
28 the high-flow channel would not change if 2010 model outputs were used.

29 At the confluence with the Sacramento River, the effect of Alternative 5A would mostly be similar
30 between REIR and 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish
31 Analysis*). There would be small to moderate, isolated increases and decreases in Alternative 5A
32 effects between REIR and 2010 model outputs in some months and water year types. However,
33 these differences are too small and isolated to cause a change in any determinations based on REIR
34 modeling.

35 **11E.3.3.1.5 American River**

36 At Nimbus, the effect of Alternative 5A would mostly be similar between REIR and 2010 modeling
37 (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would be small to
38 moderate changes from REIR modeling to 2010 modeling in flow differences from May to October in
39 critical water years. The same pattern is observed in the American River at the confluence with the
40 Sacramento River (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). In addition,
41 there would be small differences in flow effects under the Alternative 5A in January of below normal

1 and dry years. Collectively, however, these isolated changes observed in 2010 modeling results
2 would not be large or frequent enough to change REIR determinations.

3 **11E.3.3.1.6 Stanislaus River**

4 There would be negligible differences in model comparisons between REIR and 2010 modeling
5 (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Therefore, determinations
6 based on 2010 modeling would not change from those based on REIR modeling.

7 **11E.3.3.1.7 OMR Flow**

8 The effects of Alternative 5A in 2010 modeling would predominantly be similar to the effects in
9 REIR modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There would be
10 several small to moderate differences in effects between 2010 and REIR modeling. In most cases,
11 2010 modeling would either reduce beneficial effects of Alternative 5A seen in REIR modeling. In
12 only two cases would there be a change from no effect in REIR modeling to a negative effect in 2010
13 modeling. Collectively, differences between 2010 and REIR modeling would not be large and
14 frequent enough to change REIR determinations based on OMR flows.

15 **11E.3.3.1.8 Sacramento River downstream of NDDF**

16 There would be many small reductions in negative effects of Alternative 5A in 2010 modeling results
17 compared to REIR modeling results (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish*
18 *Analysis*). These differences primarily occur from December to April. This is a result of the difference
19 in baseline flows between modeling efforts, which tend to be lower under NAA_ELT_2010 relative to
20 NAA_ELT_REIR, as a result of changes in Fremont Weir operations in the NAA. However, flows under
21 Alternative 5A would be similar between REIR and 2010 modeling. Regardless, there would still be
22 consistent moderate to large reductions in flows in most months and water year types under both
23 modeling efforts (REIR and 2010). Therefore, no determinations from the REIR would change based
24 on 2010 modeling.

25 **11E.3.3.1.9 Sacramento River at Rio Vista**

26 At Rio Vista, effects of Alternative 5A would be similar between REIR and 2010 modeling in nearly
27 all months and water years with 4 small and isolated exceptions (Appendix 11C, *CALSIM II Model*
28 *Outputs Utilized in the Fish Analysis*). Despite these small, isolated differences, determinations based
29 on 2010 modeling would not change from those based on REIR modeling.

30 **11E.3.3.1.10 Delta Outflow**

31 Effects of Alternative 5A on Delta outflow would be mostly similar between REIR and 2010
32 modeling efforts (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). There are
33 some small, isolated increases and decreases in 2010 modeling effects. Regardless, changes would
34 not be large or frequent enough to change any REIR determinations for any species.

1 **11E.3.3.1.11 San Joaquin River at Vernalis**

2 In the San Joaquin River at Vernalis, there would be minimal (<2%) differences in model
3 comparisons between REIR and 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in*
4 *the Fish Analysis*). Therefore, determinations based on 2010 modeling would not change from those
5 based on REIR modeling.

6 **11E.3.3.1.12 Mokelumne River at the Delta**

7 In the Mokelumne River at the Delta, there would be negligible differences in model comparisons
8 between REIR and 2010 modeling (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish*
9 *Analysis*). Therefore, determinations based on 2010 modeling would not change from those based
10 on REIR modeling.

11 **11E.3.3.1.13 South Delta Exports**

12 Effects of Alternative 5A on exports at the South Delta facilities would generally be similar between
13 REIR and 2010 modeling with some isolated increases and decreases in effects between modeling
14 efforts (Appendix 11C, *CALSIM II Model Outputs Utilized in the Fish Analysis*). Because these changes
15 between modeling efforts are small and isolated, using 2010 model outputs would not change any
16 determinations for Alternative 5A that were made using REIR model outputs.

17 **11E.3.3.2 CEQA Effects**

18 Because CEQA conclusions were derived from the NEPA effects analysis, which included the effects
19 of climate change in the no action alternative, the comparison between REIR and 2010 modeling
20 efforts for the CEQA analysis would be similar to those for the NEPA analysis. Therefore, using 2010
21 model outputs would not change any CEQA determinations for Alternative 5A that were made using
22 REIR model.

23 **11E.3.3.3 Conclusion**

24 In conclusion, due to a lack of substantial differences in model outputs between REIR and 2010
25 modeling, the determinations using 2010 modeling for Alternative 5A would be consistent with the
26 findings in REIR modeling. There are no locations in which effects to flows would differ
27 substantially.