

1 water quality and habitat conditions, impacts on splittail would be less than significant.
2 Consequently, no mitigation is required.

3 Impact AQUA-121: Effects of Localized Reduction of Predatory Fish on Sacramento Splittail
4 (Environmental Commitment 15)

5 *NEPA Effects:* Potential impacts on Sacramento splittail from predator removal at the north Delta
6 intakes and at the south Delta export facilities is expected to slightly reduce the predation rates on
7 Sacramento splittail. However and as concluded for Alternative 1A (Impact AQUA-121), because the
8 affected proportion of the population would be very small this effect would not be detectable. There
9 would not be an adverse effect on splittail.

10 *CEQA Conclusion:* Because the proportion of the population affected by Environmental
11 Commitment 15 would be very small and not measurable, there would be a less than significant
12 impact to splittail. Consequently, no mitigation would be required.

13 Impact AQUA-122: Effects of Nonphysical Fish Barriers on Sacramento Splittail
14 (Environmental Commitment 16)

15 As described for Alternative 1A, although the NPB at the divergence of Georgiana Slough from the
16 Sacramento River under Alternative 4A would be constructed and operated to benefit salmonids,
17 Sacramento splittail are likely to also be deterred by the NPB based on their hearing ability and
18 strong swimming ability as young juveniles. This would reduce the risk of predation for juvenile
19 splittail by reducing their entry into the low-survival interior Delta.

20 *NEPA Effects:* The NPB also has the potential to attract predatory fish, which often hold around
21 underwater human-made structure. Therefore, there is a slightly increased risk of predation for
22 juvenile Sacramento splittail in the area immediately around the NPB. However, the structure is
23 intended to promote successful survival of salmonids and designs are being tested to minimize any
24 risk of predation associated with the structure. Additionally, the 2011 pilot study of the NPB at
25 Georgiana Slough did not find that predation near the NPB was more frequent than predation
26 farther from the NPB (DWR 2012). As such, the overall effects of NPB would not be adverse.

27 *CEQA Conclusion:* As described for Alternative 1A, the first months of the juvenile Sacramento
28 splittail migration to the Delta overlap with the latter portion of the main juvenile salmonid
29 outmigration period during which the NPB would be implemented. Deterrence away from the
30 interior Delta would reduce the risk of predation for juvenile splittail, although the NPB also has the
31 potential to attract predatory fish, which often hold around underwater human-made structures.
32 Therefore, there is a slightly increased risk of predation for juvenile Sacramento splittail in the area
33 immediately around the NPB. However the overall impacts of the NPB are expected to be less than
34 significant on Sacramento splittail because they would reduce entry into the low-survival interior
35 Delta, where entrainment and predation potential increases. Consequently, no mitigation would be
36 required.

37 Green Sturgeon

38 Construction and Maintenance of Water Conveyance Facilities

39 The discussion of potential effects to delta smelt from construction and maintenance of the water
40 conveyance facilities under Alternative 4A is also relevant to green sturgeon. Adult and juvenile

1 green sturgeon would have the potential to encounter construction and maintenance because of
2 their presence in the Delta for considerable periods of time (Table 11-8).

3 Impact AQUA-127: Effects of Construction of Water Conveyance Facilities on Green Sturgeon

4 The potential effects of construction of the water conveyance facilities on green sturgeon or their
5 designated critical habitat would be the same as described for Alternative 4 (Impact AQUA-127).
6 This section provides additional detail on underwater noise impacts which are also applicable to
7 Impact AQUA-127 in Alternative 4.

8 Table 11-8 presents the life stages of green sturgeon and months of their potential presence in the
9 north, east, and south Delta during the proposed in-water construction window (June 1–October
10 31). Based on the proposed timing of pile driving activities and the occurrence of sensitive life stages
11 of the covered species in the affected reaches, green sturgeon are considered most vulnerable to pile
12 driving impacts because of their potential year-round presence in the plan area.

13 Under Alternative 4A, impact pile driving could result in exposure of juvenile and adult green
14 sturgeon to underwater noise levels exceeding the injury thresholds at a number of construction
15 sites where in-water pile driving is proposed. The potential for exposure of adults and juveniles to
16 pile driving noise is highest in the north Delta (Sacramento River in the vicinity of the three
17 proposed intakes) which serves as the primary migration route utilized by adults to access
18 upstream spawning areas, and the primary migration route for juveniles entering the Delta from
19 natal rearing areas in the upper Sacramento River. Restricting impact pile driving to June 1 to
20 October 31 avoids the peak periods of upstream migration of adults (late February to early May)
21 although some adults may migrate through the Delta as late as June or July. Some adults may also be
22 exposed to pile driving noise during their outmigration; outmigration of tagged adults has been
23 observed during summer (June–August) and late fall or winter (November–December) coincident
24 with increases in flow from the first significant rain events (Heublein et al. 2009). Juvenile and sub-
25 adult green sturgeon may be present in the Delta year-round and therefore subject to pile driving
26 noise during pile driving activities at the proposed intakes, barge landings, and other in-water
27 structures. Following the larval rearing period, young-of-the-year juveniles enter the Delta where
28 they continue to rear for up to three years before entering the ocean. Fish salvage data collected at
29 the state and federal water export facilities in the southern Delta indicate that juvenile green
30 sturgeon in the Delta range in length from 100 to 600 mm, with most being greater than 200 mm
31 (Adams et al. 2002, Beamesderfer et al. 2007).

32 Several factors likely reduce the potential for injury or mortality of adult and juvenile sturgeon
33 during pile driving activities at the proposed intake structures. As described earlier, the estimated
34 impact distances above are worst-case estimates based on impact driving in open water with no
35 attenuation measures and an unimpeded underwater propagation path. To mitigate potential
36 adverse effects, DWR proposes to use vibratory driving to the extent feasible to minimize both the
37 area and duration of potentially harmful underwater noise levels associated with impact driving in
38 open water outside the work window (Mitigation Measure AQUA-1a). In addition, construction of
39 the intake facilities would be spread out over a period of five years, limiting the number of sites
40 where pile driving will take place and the duration of impact driving in any given year (Table 4.3.7-1
41 under Delta Smelt). Although pile driving activities could occur 42 to 55 days per season at each
42 intake location, in-water pile driving will not be continuous and limited to daylight hours only,
43 resulting in 12-16 hour periods each day for migrating fish to pass the construction sites
44 undisturbed.

1 Several aspects of green sturgeon life history and biology also affect the potential for injury or
2 mortality of adult and juvenile green sturgeon to pile driving noise. All in-water pile driving will be
3 performed after June 1 and before October 31, avoiding the primary upstream and downstream
4 migration periods of pre- and post-spawning adults. Adult sturgeon are large (>19 kilograms) and
5 presumably much less vulnerable to pile driving noise than smaller fish (approximately 2 grams or
6 smaller) protected by the SPL and SEL injury criteria. In addition, adult sturgeon are highly mobile
7 and thus able to rapidly avoid or swim away from areas of elevated noise. Their exposure would also
8 be limited by their rapid migration rate; recent telemetry studies indicate that adult green sturgeon
9 migrate rapidly to and from spawning areas in the upper Sacramento River, traversing the estuary
10 and Delta in less than one week (Heublein et al. 2009). The behavioral responses of green sturgeon
11 to pile driving noise are unknown but could include disruptions of normal migratory behavior and
12 potential delays in migration. However, given the intermittent nature of pile driving and the daily
13 cessation of pile driving at night, such delays are expected to be minor and not affect the ability of
14 adults to successfully reach the spawning grounds.

15 Because of their relatively small body size, widespread distribution, and year-round presence in the
16 Delta and estuary, juvenile and sub-adult green sturgeon are at higher risk of injury and mortality to
17 pile driving noise than adults. Similar to adults, the potential for exposure to pile driving noise is
18 highest in the North Delta (Sacramento River in the vicinity of the three proposed intakes) which
19 serves as the primary migration route for young-of-the-year juveniles entering the Delta from natal
20 rearing areas in the upper Sacramento River. Based on the size distribution of juveniles observed at
21 the export facilities in the southern Delta, most juveniles entering the Delta would be expected to be
22 actively swimming juveniles (>100 mm in length) capable of avoiding or swimming away from areas
23 of elevated noise. Because juveniles spend the majority of their lives in deep brackish portions of the
24 estuary before entering the ocean (Moyle 2002), the Sacramento River adjacent to the proposed
25 intake locations likely serves primarily as a migratory corridor, reducing the duration of potential
26 exposures of juveniles to pile driving sound. Another factor that may contribute to reducing the
27 exposure of juveniles to pile driving noise would be the cessation of pile driving activities at night
28 when juveniles appear to be most active and higher in the water column (Kynard et al. 2005).

29 A number of data sources suggest that the distribution of juvenile green sturgeon is widespread in
30 the Delta and estuary, indicating that juvenile green sturgeon could be exposed to pile driving
31 sounds at a number of construction sites in the Delta. In the absence of information on the
32 movements and distribution of juveniles, potential impacts to the population can be generally
33 assessed based on the proportion of total habitat subject to pile driving sounds. Under existing
34 conditions, the Delta comprises an estimated 84,280 acres of subtidal aquatic habitat. Using this
35 estimate as a measure of the total amount of potential foraging and rearing habitat available to
36 juveniles, Table 4.3.7-2 shows the percentage of habitat that would be subjected to pile driving noise
37 exceeding the injury thresholds during each year of pile driving activities.

1 Table 4.3.7-2. Potential underwater noise impact areas in each year of pile driving activities as a
2 percentage of the total amount of subtidal aquatic habitat in the Delta (Alternative 4A).

| Construction Year | Facilities/Structures | Potential Impact Area (acres) | Approximate Percentage of Subtidal Habitat |
|-------------------|--|-------------------------------|--|
| 2 | Intake 5 cofferdams | 69 | <0.1% |
| 3 | Intake 3 cofferdams Intake 5 foundation piles | 153 | 0.2% |
| 4 | Intake 2 cofferdams Intake 3 foundation piles Intake 5 bridge piles | 204 | 0.2% |
| 5 | Intake 2 foundation piles Intake 3 bridge piles Barge unloading facilities (5) | 3,436 | 4.1% |
| 6 | Intake 2 bridge piles | 45 | <0.1% |
| 7 | HOR barrier cofferdams and foundation | 36 | <0.1% |
| 8 | CCF cofferdams | 364 | 0.4% |
| 9 | CCF siphons | 175 | 0.2% |

3

4 These estimates represent a general order-of-magnitude estimate of the potential exposure of the
5 population to pile driving noise. Thus, potential for exposure of the population to project pile driving
6 noise is very low in most years. The exception is year 5 when an estimated 3,436 acres or 4.1% of
7 the total amount of subtidal habitat would be subject to pile driving noise levels that could harm
8 juvenile green sturgeon. This potential impact is due largely to the construction of six barge
9 unloading facilities at various locations along the pipeline/tunnel alignment. Factors that may
10 further limit exposure of the population to adverse effects include the short duration of pile driving
11 activities at most locations (Table 4.3.7-1 under Delta Smelt). In addition, the total area of habitat
12 available to juvenile green sturgeon expands beyond the Delta into the lower estuary and bays as
13 juveniles grow and develop salinity tolerance. Juvenile typically achieve full tolerance by the end of
14 their first year at sizes larger than 250 mm (Adams et al. 2002). Thus, there is a low likelihood of
15 significant population-level effects on green sturgeon due to pile driving noise.

16 *NEPA Effects:* As concluded for Alternative 4, Impact AQUA-127, the effect would not be adverse for
17 green sturgeon. Implementation of the measures described in Appendix 3B, *Environmental*
18 *Commitments*, such as *Environmental Training; Stormwater Pollution Prevention Plan; Erosion and*
19 *Sediment Control Plan; Hazardous Materials Management Plan; Spill Prevention, Containment, and*
20 *Countermeasure Plan; Disposal of Spoils, Reusable Tunnel Material, and Dredged Material; Fish Rescue*
21 *and Salvage Plan; and Barge Operations Plan* would guide rapid and effective response in the case of
22 inadvertent spills of hazardous materials. Construction will result in both temporary and permanent
23 alteration of rearing and migratory habitats used by green sturgeon. However, Alternative 4A
24 includes Environmental Commitment 4 to restore tidal habitat. The direct effects of underwater
25 construction noise on green sturgeon that may be present could be adverse if sturgeon are exposed.
26 However, considering the ability of green sturgeon to move away from the noise and migrate during
27 the night or other times that pile driving is not occurring, the relatively few green sturgeon in the
28 area of pile driving, and the implementation of Mitigation Measures AQUA-1a and AQUA-1b, that
29 would minimize exposure, this effect would not be adverse.

1 *CEQA Conclusion:* As described in Alternative 4, Impact AQUA-127, the impact of the construction of
2 the water conveyance facilities on green sturgeon would not be significant except for construction
3 noise associated with pile driving. Construction of Alternative 4A involves several elements with the
4 potential to affect green sturgeon. However, these turbidity and hazardous material spill effects will
5 be effectively avoided and/or minimized through implementation of environmental commitments
6 (see Impact AQUA-1 and Appendix 3B, *Environmental Commitments: Environmental Training;*
7 *Stormwater Pollution Prevention Plan; Erosion and Sediment Control Plan; Hazardous Materials*
8 *Management Plan; Spill Prevention, Containment, and Countermeasure Plan; Disposal of Spoils,*
9 *Reusable Tunnel Material, and Dredged Material; Fish Rescue and Salvage Plan; and Barge Operations*
10 *Plan*). Implementation of Mitigation Measures AQUA-1a and AQUA-1b would reduce that noise
11 impact to less than significant.

12 Mitigation Measure AQUA-1a: Minimize the Use of Impact Pile Driving to Address Effects
13 of Pile Driving and Other Construction-Related Underwater Noise

14 Mitigation Measure AQUA-1b: Monitor Underwater Noise and if Necessary, Use an
15 Attenuation Device to Reduce Effects of Pile Driving and Other Construction-Related
16 Underwater Noise

17 Impact AQUA-128: Effects of Maintenance of Water Conveyance Facilities on Green Sturgeon

18 *NEPA Effects:* The potential effects of the maintenance of water conveyance facilities under
19 Alternative 4A would be the same as those described for Alternative 4, Impact AQUA-128. As
20 concluded in Alternative 4, Impact AQUA-128, the impact would not be adverse for green sturgeon.

21 *CEQA Conclusion:* As described in Alternative 4, Impact AQUA-128, the impact of maintenance of
22 water conveyance facilities on green sturgeon or their designated critical habitat would be less than
23 significant and no mitigation is required.

24 Operations of Water Conveyance Facilities

25 Impact AQUA-129: Effects of Water Operations on Entrainment of Green Sturgeon

26 *Water Exports*

27 The potential entrainment effects under Alternative 4A would be the same as those under
28 Alternative 4, which reflects the analysis for Alternative 1A. Operating new north Delta intakes and
29 conveyance for SWP have the potential to avoid or reduce entrainment as described for Alternative
30 1A; there would be no adverse effect.

31 Scenario H3_ELT would substantially reduce entrainment of juvenile green sturgeon at the south
32 Delta export facilities. Entrainment loss would be reduced 56% in wetter years and by 37% in drier
33 years under Scenario H3_ELT compared to NAA_ELT (Table 11-4A-98). Entrainment losses of green
34 sturgeon would be somewhat less under HOS_ELT. Under both the H3_ELT and H4_ELT scenarios,
35 however, entrainment at the south Delta facilities would be substantially reduced compared to the
36 NAA_ELT.

1 Table 11-4A-98. Juvenile Green Sturgeon Entrainment Index at the SWP and CVP Salvage
2 Facilities—Differences (Absolute and Percentage) between Model Scenarios for Alternative 4A
3 (Scenario H3_ELT)

| Water Year Type ^b | Absolute Difference (Percent Difference) | |
|---------------------------------|--|--------------------|
| | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
| Wet and Above Normal | -68 (-58%) | -62 (-56%) |
| Below Normal, Dry, and Critical | -21 (-43%) | -17 (-37%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

^a Estimated annual number of fish lost, based on non-normalized data.

^b Sacramento Valley water year-types.

4

5 *Predation Associated with Entrainment*

6 Entrainment-related predation loss of juvenile green sturgeon would not be greater under
7 Alternative 4A and may be lower relative to baseline due to a reduction in entrainment loss.
8 Conditions under Scenario H4_ELT would likely reduce predation loss relative to Scenario H3_ELT.
9 The impact and conclusion for predation risk associated with NPB structures and the north Delta
10 intakes would be the same as described for Alternative 1A (Impact AQUA-129).

11 *NEPA Effects:* In conclusion, the effect of Alternative 4A on entrainment and associated predation of
12 green sturgeon would not be adverse and may provide modest benefit due to reduced losses at the
13 south Delta facilities.

14 *CEQA Conclusion:* Similar to differences in south Delta entrainment described above for the
15 NAA_ELT, there would be decreases in south Delta entrainment under H3_ELT relative to Existing
16 Conditions (58% in wetter years; 43% in drier years; Table 11-4A-90). Therefore, the impact of the
17 water operations on green sturgeon related to entrainment and associated predation losses would
18 be less than significant and no mitigation would be required.

19 Impact AQUA-130: Effects of Water Operations on Spawning and Egg Incubation Habitat for
20 Green Sturgeon

21 In general, Alternative 4A would not affect spawning and egg incubation habitat for green sturgeon
22 relative to the NAA_ELT.

23 H3_ELT/ESO_ELT

24 *Sacramento River*

25 Mean flows were examined in the Sacramento River between Keswick and upstream of Red Bluff
26 during the March to July spawning and egg incubation period for green sturgeon (Appendix 11C,
27 *CALSIM II Model Results utilized in the Fish Analysis*). Lower flows can reduce the instream area
28 available for spawning and egg incubation. Mean flows under H3_ELT would generally be similar to
29 or up to 12% greater than flows under NAA_ELT for all months and water year types at both
30 locations

31 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the March
32 through July green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*

1 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
2 would be no differences (<5%) in mean water temperature between NAA_ELT and H3_ELT in any
3 month or water year type throughout the period.

4 The number of days when temperatures exceeded the analysis criterion (i.e., 63°F identified in Table
5 11-4A-13) by >0.5°F to >5°F in 0.5°F increments was determined for each month (May through
6 September) and year of the 82-year modeling period. The combination of number of days and
7 degrees above the 63°F **threshold were further assigned a “level of concern”, as defined in Table 11-**
8 **4A-14.** Differences between baselines and H3_ELT in the highest level of concern across all months
9 and all 82 modeled years are presented in Table 11-4A-99. There would be no substantial
10 differences between NAA_ELT and H3_ELT in the number of years with each “level of concern”.

11 Table 11-4A-99. Differences between Baseline and H3_ELT Scenarios in the Number of Years in
12 Which Water Temperature Exceedances above 63°F are within Each Level of Concern, Sacramento
13 River at Bend Bridge, May through September

| Level of Concern | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|------------------|--------------------------------|--------------------|
| Red | 3 (75%) | 0 (0%) |
| Orange | 0 (0%) | 0 (0%) |
| Yellow | 1 (50%) | -1 (-25%) |
| None | -4 (-5%) | 1 (1%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

14
15 Total degree-days exceeding 63°F at Bend Bridge were summed by month and water year type
16 during May through September (Table 11-4A-100). Total degree-days (all water years combined)
17 under H3_ELT would be 18% lower than under NAA_ELT during July and similar to the total under
18 NAA_ELT in the remaining 4 months.

1 Table 11-4A-100. Differences between Baseline and H3_ELT Scenarios in Total Degree-Days
 2 (°F-Days) by Month and Water Year Type for Water Temperature Exceedances above 63°F in the
 3 Sacramento River at Bend Bridge, May through September

| Month | Water Year Type | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|-----------|-----------------|--------------------------------|--------------------|
| May | Wet | 17 (131%) | 0 (0%) |
| | Above Normal | 0 (NA) | -2 (-100%) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 2 (NA) | 1 (100%) |
| | All | 19 (146%) | -1 (-3%) |
| June | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 0 (NA) | 0 (NA) |
| July | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 129 (1613%) | -30 (-18%) |
| | All | 129 (1613%) | -30 (-18%) |
| August | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 28 (NA) | -1 (-3%) |
| | Critical | 610 (303%) | -56 (-6%) |
| | All | 638 (317%) | -57 (-6%) |
| September | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 4 (NA) | 3 (300%) |
| | Dry | 137 (442%) | 7 (4%) |
| | Critical | 497 (186%) | -44 (-5%) |
| | All | 638 (214%) | -34 (-4%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

4

5 *Feather River*

6 Flows were examined in the Feather River between Thermalito Afterbay and during the February
 7 through June green sturgeon spawning and egg incubation period (Appendix 11C, *CALSIM II Model*
 8 *Results utilized in the Fish Analysis*). Mean flows under H3_ELT at Thermalito would generally be
 9 similar to or up to 106% greater (June of below normal years) than flows under NAA_ELT, with
 10 minor exceptions. Differences at the confluence with the Sacramento River would generally be

1 similar to but smaller than those at Thermalito. These results indicate that flows in the Feather River
2 would increase overall under H3_ELT independent of climate change.

3 Mean water temperatures in the Feather River at Gridley were examined during the February
4 through June green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
5 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
6 would be no differences (<5%) between NAA_ELT and H3_ELT in mean water temperatures for any
7 month or water year type during the period.

8 Water temperature-related effects of H3_ELT on green sturgeon spawning, egg incubation, and
9 rearing habitat in the Feather River were evaluated by determining the percent of months during
10 May through September in which water temperatures exceed a 64°F temperature threshold at
11 Gridley (Table 11-4A-101). Effects on spawning and egg incubation are evaluated here for May and
12 June; effects on rearing are evaluated under Impact AQUA-131. The percent of months exceeding the
13 threshold during May and June under H3_ELT would generally be similar to or up to 26% lower
14 (absolute difference) than that under NAA_ELT with few exceptions.

15 Table 11-4A-101. Differences between Baselines and H3_ELT in Percent of Months during the
16 82-Year CALSIM Modeling Period during Which Water Temperatures in the Feather River at
17 Gridley Exceed the 64°F Threshold, May through September

| Month | Degrees Above Threshold | | | | |
|--|-------------------------|-----------|------------|------------|------------|
| | >1.0 | >2.0 | >3.0 | >4.0 | >5.0 |
| EXISTING CONDITIONS vs. H3_ELT | | | | | |
| May | 25 (77%) | 16 (87%) | 7 (75%) | 9 (233%) | 4 (150%) |
| June | 2 (3%) | 1 (1%) | -1 (-2%) | 1 (2%) | -1 (-3%) |
| July | 0 (0%) | 0 (0%) | 0 (0%) | 9 (10%) | 20 (29%) |
| August | 0 (0%) | 0 (0%) | 7 (8%) | 14 (17%) | 19 (30%) |
| September | -9 (-13%) | -9 (-16%) | 5 (17%) | 14 (183%) | 5 (200%) |
| NAA_ELT vs. H3_ELT | | | | | |
| May | -4 (-6%) | -1 (-3%) | -5 (-22%) | 0 (0%) | 0 (0%) |
| June | -1 (-1%) | -6 (-6%) | -14 (-15%) | -21 (-24%) | -26 (-36%) |
| July | 0 (0%) | 0 (0%) | 0 (0%) | -1 (-1%) | 4 (4%) |
| August | 0 (0%) | 0 (0%) | -1 (-1%) | -1 (-1%) | -1 (-2%) |
| September | 10 (20%) | 6 (16%) | 5 (17%) | 1 (6%) | -1 (-14%) |
| Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline). | | | | | |

18
19 Water temperature-related effects of H3_ELT on green sturgeon spawning, egg incubation, and
20 rearing habitat in the Feather River were also evaluated by determining the total degree-months
21 exceeding the 64°F temperature threshold at Gridley (Table 11-4A-102). Effects on spawning and
22 egg incubation are evaluated here for May and June; effects on rearing are evaluated under Impact
23 AQUA-131. Combining water years, total degree-months exceeding the threshold during May and
24 June under H3_ELT would be 6% to 23% lower relative to NAA_ELT. Within months, total degree-
25 months under H3_ELT would be similar or up to 45% lower than that under NAA_ELT depending on
26 month and water year type. These results indicate that there would be a small to moderate benefit

1 of H3_ELT to green sturgeon spawning and egg incubation temperature-related conditions in the
2 Feather River.

3 Table 11-4A-102. Differences between Baselines and H3_ELT in Total Degree-Months (°F-Months)
4 by Month and Water Year Type for Water Temperature Exceedances above 64°F in the Feather
5 River at Gridley, May through September

| Month | Water Year Type | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|-----------|-----------------|--------------------------------|--------------------|
| May | Wet | 11 (183%) | 0 (0%) |
| | Above Normal | 4 (36%) | -4 (-21%) |
| | Below Normal | 12 (150%) | -1 (-5%) |
| | Dry | 16 (114%) | -1 (-3%) |
| | Critical | 12 (71%) | -1 (-3%) |
| | All | 55 (98%) | -7 (-6%) |
| June | Wet | 12 (16%) | -32 (-27%) |
| | Above Normal | -6 (-12%) | -23 (-34%) |
| | Below Normal | -19 (-29%) | -37 (-45%) |
| | Dry | 10 (11%) | -16 (-13%) |
| | Critical | 21 (38%) | 1 (1%) |
| | All | 18 (5%) | -107 (-23%) |
| July | Wet | 11 (7%) | 6 (3%) |
| | Above Normal | 5 (9%) | 0 (0%) |
| | Below Normal | 19 (28%) | 4 (5%) |
| | Dry | 46 (53%) | 20 (18%) |
| | Critical | 58 (73%) | 32 (30%) |
| | All | 139 (31%) | 62 (12%) |
| August | Wet | 5 (3%) | 8 (5%) |
| | Above Normal | 15 (33%) | 7 (13%) |
| | Below Normal | 25 (36%) | 7 (8%) |
| | Dry | 69 (101%) | 26 (23%) |
| | Critical | 18 (21%) | -8 (-7%) |
| | All | 132 (30%) | 40 (7%) |
| September | Wet | -26 (-67%) | 7 (117%) |
| | Above Normal | -4 (-25%) | 11 (1100%) |
| | Below Normal | 6 (21%) | -7 (-17%) |
| | Dry | 13 (46%) | 2 (5%) |
| | Critical | 20 (100%) | 2 (5%) |
| | All | 9 (7%) | 15 (12%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

6

7 *San Joaquin River*

8 Flows in the San Joaquin River under H3_ELT would be similar to those under NAA_ELT throughout
9 the March through June period (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

1 H4_ELT /HOS_ELT

2 *Sacramento River*

3 Mean flows in the Sacramento River at Keswick and upstream of Red Bluff during the March through
 4 July spawning and egg incubation period for green sturgeon under H4_ELT would generally be
 5 similar to flows under NAA_ELT for all months and water year types at both locations (Appendix
 6 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

7 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the March
 8 through July green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
 9 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
 10 would be no differences (<5%) in mean water temperature between NAA_ELT and H4_ELT in any
 11 month or water year type throughout the period.

12 There would be no differences between NAA_ELT and H4_ELT in the number of years with each
 13 level of concern in the Sacramento River at Bend Bridge (Table 11-4A-103).

14 Table 11-4A-103. Differences between Baseline Scenarios and H1 and H4_ELT Scenarios in the
 15 Number of Years in Which Water Temperature Exceedances above 63°F Are within Each Level of
 16 Concern, Sacramento River at Bend Bridge, May through September

| Level of Concern | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|------------------|--------------------------------|--------------------|
| Red | 2 (50%) | -1 (-14%) |
| Orange | -1 (-100%) | -1 (-100%) |
| Yellow | -2 (-100%) | -4 (-100%) |
| None | 1 (1%) | 6 (9%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

17

18 Total degree-days (all water year types combined) exceeding the 63°F NMFS threshold in the
 19 Sacramento River at Bend Bridge under H4_ELT during May through September would range from
 20 no different than to 54% lower than those under NAA_ELT for all months during the period (Table
 21 11-4A-104). This represents a moderate benefit of H4_ELT to green sturgeon temperature-related
 22 spawning conditions in the Sacramento River.

1 Table 11-4A-104. Differences between Baseline Scenarios and H4_ELT in Total Degree-Days (°F-
2 Days) by Month and Water Year Type for Water Temperature Exceedances above 63°F in the
3 Sacramento River at Bend Bridge, May through September

| Month | Water Year Type | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|-----------|-----------------|-----------------------------------|--------------------|
| May | Wet | 17 (131%) | 0 (0%) |
| | Above Normal | 1 (NA) | -1 (-50%) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 1 (NA) | 0 (0%) |
| | All | 19 (146%) | -1 (-3%) |
| June | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 0 (NA) | 0 (NA) |
| July | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 69 (862.5%) | -90 (-54%) |
| | All | 69 (863%) | -90 (-54%) |
| August | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 23 (NA) | -6 (-21%) |
| | Critical | 352 (175%) | -314 (-36%) |
| | All | 375 (187%) | -320 (-36%) |
| September | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 5 (NA) | 4 (400%) |
| | Dry | 112 (361%) | -18 (-11%) |
| | Critical | 223 (84%) | -318 (-39%) |
| | All | 340 (114%) | -332 (-34%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

4

5 *Feather River*

6 Flows under H4_ELT in the Feather River between Thermalito Afterbay and the confluence with the
7 Sacramento River during the February through June period would generally be similar to or up to
8 548% greater (April of below normal water years) than flows under NAA_ELT (Appendix 11C,
9 *CALSIM II Model Results utilized in the Fish Analysis*).

1 Mean water temperatures in the Feather River at Gridley were examined during the February
2 through June green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
3 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
4 would be no differences (<5%) between NAA_ELT and H4_ELT in any month or water year type
5 during the period.

6 The percent of months exceeding the 64°F NMFS threshold during May and June under H4_ELT
7 would be similar to or up to 28% lower (absolute difference) than that under NAA_ELT,
8 representing a small to moderate benefit of H4_ELT (Table 11-4A-105).

9 Table 11-4A-105. Differences between Baselines and H4_ELT Scenarios in Percent of Months
10 during the 82-Year CALSIM Modeling Period during Which Water Temperatures in the Feather
11 River at Gridley Exceed the 64°F Threshold, May through September

| Month | Degrees Above Threshold | | | | |
|--------------------------------|-------------------------|------------|------------|-----------|------------|
| | >1.0 | >2.0 | >3.0 | >4.0 | >5.0 |
| EXISTING CONDITIONS vs. H4_ELT | | | | | |
| May | 0 (0%) | -2 (-13%) | 0 (0%) | 6 (167%) | 2 (100%) |
| June | 4 (4%) | 5 (6%) | 6 (8%) | 14 (21%) | 12 (26%) |
| July | 0 (0%) | 0 (0%) | 0 (0%) | 7 (8%) | 22 (32%) |
| August | 0 (0%) | 0 (0%) | 9 (9%) | 19 (23%) | 33 (54%) |
| September | -7 (-11%) | -6 (-11%) | 2 (9%) | 11 (150%) | 4 (150%) |
| NAA_ELT vs. H4_ELT | | | | | |
| May | -28 (-47%) | -20 (-55%) | -12 (-56%) | -2 (-20%) | -1 (-20%) |
| June | 0 (0%) | -2 (-3%) | -6 (-7%) | -9 (-10%) | -12 (-17%) |
| July | 0 (0%) | 0 (0%) | 0 (0%) | -2 (-2%) | 6 (7%) |
| August | 0 (0%) | 0 (0%) | 0 (0%) | 4 (4%) | 14 (17%) |
| September | 11 (22%) | 9 (22%) | 2 (9%) | -1 (-6%) | -2 (-29%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

12
13 Combining water years, total degree-months exceeding the 64°F NMFS threshold during the May
14 and June spawning period under H4_ELT would be 5% to 29% lower relative to NAA_ELT. Within
15 months, total degree-months under H4_ELT would be similar or up to 74% lower than that under
16 NAA_ELT depending on water year type (Table 11-4A-106). These results indicate that there would
17 be a small to moderate benefit of H4_ELT to green sturgeon spawning and egg incubation
18 temperature-related conditions in the Feather River

1 Table 11-4A-106. Differences between Baselines and H1 and H4_ELT Scenarios in Total
2 Degree-Months (°F-Months) by Month and Water Year Type for Water Temperature Exceedances
3 above 64°F in the Feather River at Gridley, May through September

| Month | Water Year Type | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|-----------|-----------------|-----------------------------------|-----------------------|
| May | Wet | 0 (0%) | -11 (-65%) |
| | Above Normal | -6 (-55%) | -14 (-74%) |
| | Below Normal | 6 (75%) | -7 (-33%) |
| | Dry | 17 (121%) | 0 (0%) |
| | Critical | 12 (71%) | -1 (-3%) |
| | All | 28 (50%) | -34 (-29%) |
| June | Wet | 40 (53%) | -4 (-3%) |
| | Above Normal | 14 (27%) | -3 (-4%) |
| | Below Normal | 4 (6%) | -14 (-17%) |
| | Dry | 22 (23%) | -4 (-3%) |
| | Critical | 20 (36%) | 0 (0%) |
| | All | 100 (29%) | -25 (-5%) |
| July | Wet | 37 (22%) | 32 (18%) |
| | Above Normal | 29 (55%) | 24 (41%) |
| | Below Normal | 33 (49%) | 18 (22%) |
| | Dry | 58 (67%) | 32 (29%) |
| | Critical | 49 (62%) | 23 (22%) |
| | All | 207 (45%) | 130 (24%) |
| August | Wet | 43 (24%) | 46 (26%) |
| | Above Normal | 30 (67%) | 22 (42%) |
| | Below Normal | 36 (51%) | 18 (20%) |
| | Dry | 71 (104%) | 28 (25%) |
| | Critical | 20 (24%) | -6 (-5%) |
| | All | 199 (45%) | 107 (20%) |
| September | Wet | -14 (-36%) | 19 (317%) |
| | Above Normal | 3 (19%) | 18 (1800%) |
| | Below Normal | 20 (71%) | 7 (17%) |
| | Dry | 9 (32%) | -2 (-5%) |
| | Critical | 20 (100%) | 2 (5%) |
| | All | 37 (28%) | 43 (34%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

4

5 *San Joaquin River*

6 Flows under H4_ELT in the San Joaquin River during the March through June period would be very
7 similar to flows under NAA_ELT (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

8 No water temperature modeling was in the San Joaquin River.

9 *NEPA Effects:* Collectively, these modeling results indicate that there would not be adverse effects
10 on green sturgeon spawning and egg incubation habitat because the amount of suitable habitat

1 would not be substantially reduced. Flow and temperature conditions would generally be similar
2 between Alternative 4A and the NEPA baseline in the Sacramento River and San Joaquin River and
3 would be beneficial under Alternative 4A relative the NEPA baseline in the Feather River.
4 Temperature conditions would be slightly improved under H4 relative to H3.

5 *CEQA Conclusion:* Collectively, the results of the Impact AQUA-130 CEQA analysis show that the
6 difference between the CEQA baseline and Alternative 4A could be significant because, when
7 compared to the CEQA baseline, the alternative would substantially reduce the quantity and quality
8 of spawning and egg incubation habitat for green sturgeon relative to Existing Conditions. However,
9 as further described below in the Summary of CEQA Conclusion, the comparison to the NAA is a
10 better approach because it isolates the effects of the alternative from those of sea level rise, climate
11 change, and future water demand. Based on this identification of the actual increment of change
12 attributable to the alternative, Alternative 4A would not affect the quantity and quality of spawning
13 and egg incubation habitat for green sturgeon relative to the CEQA baseline.

14 H3_ELT /ESO_ELT

15 *Sacramento River*

16 Mean flows were examined in the Sacramento River between Keswick and upstream of Red Bluff
17 during the March to July spawning and egg incubation period for green sturgeon (Appendix 11C,
18 *CALSIM II Model Results utilized in the Fish Analysis*). Flows under H3_ELT would generally be similar
19 to those under Existing Conditions at both locations, with minor exceptions. These results indicate
20 that there would be no effect on flows in the Sacramento River under H3_ELT relative to Existing
21 Conditions.

22 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the March
23 through July green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
24 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
25 would be no differences (<5%) in mean water temperature between Existing Conditions and
26 H3_ELT in any month or water year type throughout the period.

27 There would be 3 more years with a “red” NMFS level of concern in the Sacramento River at Bend
28 Bridge under H3_ELT than under Existing Conditions (Table 11-4A-99).

29 Total degree-days exceeding the 63°F NMFS threshold in the Sacramento River at Bend Bridge
30 under H3_ELT (for all water years combined) would be up to 1,613% higher than under Existing
31 Conditions during the May through September period (Table 11-4A-100). The very high increase
32 between Existing Conditions and H3_ELT on the relative scale (1,613%) is a mathematical artifact
33 resulting from the small value of the divisor (i.e., degree-days for Existing Conditions). On an
34 absolute scale, the increase of 129 degree days constitutes an increase of only 0.3 degrees on each
35 day over the 82-year period, which is a small change.

36 *Feather River*

37 Flows were examined in the Feather River between Thermalito Afterbay and the confluence with
38 the Sacramento River during the February through June green sturgeon spawning and egg
39 incubation period (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). At
40 Thermalito, mean flows under H3_ELT would generally be similar to or up to 48% lower than those
41 under Existing Conditions during February and March, and would generally be similar to or up to
42 140% greater than those under Existing Conditions during April through June. At the confluence

1 with the Sacramento River, flows under H3_ELT would generally be similar to those under Existing
2 Conditions in all months and water year types of the period, except June, in which flows under
3 H3_ELT would be up to 28% higher. These results indicate that there would generally be lower
4 flows in the Feather River under H3_ELT relative to Existing Conditions early in the spawning and
5 egg incubation period and greater flows later in the period.

6 Mean water temperatures in the Feather River at Gridley were examined during the February
7 through June green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
8 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
9 would be no differences (<5%) in mean water temperatures between H3_ELT and Existing
10 Conditions for any other month or water year type during the period.

11 Water temperature-related effects of H3_ELT on green sturgeon spawning, egg incubation, and
12 rearing habitat in the Feather River were evaluated by determining the percent of months during
13 May through September in which water temperatures exceed a 64°F temperature threshold at
14 Gridley (Table 11-4A-101). Effects on spawning and egg incubation are evaluated here for May and
15 June; effects on rearing are evaluated under Impact AQUA-131. The percent of months exceeding the
16 threshold during May and June under H3_ELT would be similar to or up to 25% greater (absolute
17 difference) than that under Existing Conditions, representing a small to moderate negative effect of
18 H3_ELT, although this comparison includes the effect of climate change.

19 Water temperature-related effects of H3_ELT on green sturgeon spawning, egg incubation, and
20 rearing habitat in the Feather River were also evaluated by determining the total degree-months
21 exceeding the 64°F temperature threshold at Gridley (Table 11-4A-102). Effects on spawning and
22 egg incubation are evaluated here for May and June; effects on rearing are evaluated under Impact
23 AQUA-131. Combining water years, total degree-months exceeding the threshold during May and
24 June under H3_ELT would be 5% to 98% greater relative to Existing Conditions. Within months,
25 total degree-months under H3_ELT would be similar or up to 183% higher than that under Existing
26 Conditions depending on water year type. These results indicate that there would be a moderate
27 negative effect of H3_ELT on green sturgeon spawning and egg incubation temperature-related
28 conditions in the Feather River, although this comparison includes the effect of climate change.

29 *San Joaquin River*

30 Mean flows in the San Joaquin River under H3_ELT would generally be up to 16% lower than those
31 under Existing Conditions throughout the March through June spawning and egg incubation period
32 for green sturgeon except during May, in which there would be no differences in flows between
33 H3_ELT and Existing Conditions (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

34 No water temperatures modeling was conducted in the San Joaquin River.

35 H4_ELT /HOS_ELT

36 *Sacramento River*

37 Mean flows under H4_ELT in the Sacramento River at Keswick and upstream of Red Bluff during the
38 March through July spawning and egg incubation period for green sturgeon would generally be
39 similar to flows under Existing Conditions for all months and water year types in the period.
40 (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

1 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the March
2 through July green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
3 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
4 would be no differences (<5%) in mean monthly water temperature between Existing Conditions
5 and H4_ELT in any month or water year type throughout the period.

6 There would be 2 more years with a “red” NMFS level of concern in the Sacramento River at Bend
7 Bridge under H4_ELT than under Existing Conditions (Table 11-4A-103).

8 Total degree-days exceeding the 63°F NMFS threshold in the Sacramento River at Bend Bridge
9 under H4_ELT would be up to 863% higher than under Existing Conditions during the May through
10 September period (Table 11-4A-104). On an absolute scale this increase is 69 degree days, which
11 constitutes a small change relative to the 82-year period of record used for the analysis.

12 *Feather River*

13 Mean flows under H4_ELT in the Feather River at Thermalito Afterbay during the February through
14 June period would generally be similar to or up to 19% lower than flows under Existing Conditions
15 in February. (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). However, flows
16 under H4_ELT during April through June would be up to 509% greater than flows under Existing
17 Conditions. Flows would be variable during March, but generally similar between Existing
18 Conditions and H4_ELT. Mean flows under H4_ELT at the confluence with the Sacramento River
19 would generally be similar to or up to 112% greater than those under Existing Conditions.

20 Mean water temperatures in the Feather River at Gridley were examined during the February
21 through June green sturgeon spawning and egg incubation period (Appendix 11D, *Sacramento River*
22 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
23 would be no differences (<5%) in any month or water year type during the period.

24 The percent of months exceeding the 64°F NMFS threshold during May and June under H4_ELT
25 would be similar to or up to 14% greater than (absolute difference) that under Existing Conditions,
26 representing a small negative effect of H4_ELT (Table 11-4A-105). This analysis includes climate
27 change.

28 Combining water years, total degree-months exceeding the threshold during May and June under
29 H4_ELT would be 29% to 50% greater relative to Existing Conditions. Within months, total degree-
30 months under H4_ELT would be 55% lower to 121% higher than that under Existing Conditions
31 depending on water year type (Table 11-4A-106). These results indicate that there would be a
32 moderate to large negative effect of H4_ELT on green sturgeon spawning and egg incubation
33 temperature-related conditions in the Feather River. This analysis includes the effect of climate
34 change.

35 *San Joaquin River*

36 Flows in the San Joaquin River under H4_ELT would be similar to or up to 16% lower than those
37 under Existing Conditions throughout the March through June spawning and egg incubation period
38 for green sturgeon (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

39 No water temperature modeling was in the San Joaquin River.

1 Summary of CEQA Conclusion

2 Under Alternative 4A, flows would generally not differ in the Sacramento River. However, flows
3 would be lower under Alternative 4A in the Feather and San Joaquin rivers and water temperature
4 conditions would be degraded in all rivers examined relative to Existing Conditions. Results would
5 generally be consistent between H3 and H4. Contrary to the NEPA conclusion set forth above, these
6 modeling results indicate that the difference between Existing Conditions and Alternative 4A could
7 be significant because the alternative could substantially reduce suitable spawning habitat and
8 substantially reduce the number of green sturgeon as a result of elevated exceedances above
9 temperature thresholds.

10 However, this interpretation of the biological modeling results is likely attributable to different
11 modeling assumptions for four factors: sea level rise, climate change, future water demands, and
12 implementation of the alternative. As discussed in Section 11.3.3, because of differences between the
13 CEQA and NEPA baselines, it is sometimes possible for CEQA and NEPA significance conclusions to
14 vary between one another under the same impact discussion. The baseline for the CEQA analysis is
15 Existing Conditions at the time the NOP was prepared. Both the action alternative and the NEPA
16 baseline (NAA_ELT) models anticipated future conditions that would occur at 2025 (ELT
17 implementation period), including the projected effects of climate change (precipitation patterns),
18 sea level rise and future water demands, as well as implementation of required actions under the
19 2008 USFWS BiOp and the 2009 NMFS BiOp. Because the action alternative modeling does not
20 partition the effects of implementation of the alternative from the effects of sea level rise, climate
21 change, and future water demands, the comparison to Existing Conditions may not offer a clear
22 understanding of the impact of the alternative on the environment. The comparison to the NAA_ELT
23 is a better approach because it isolates the effect of the alternative from those of sea level rise,
24 climate change, and future water demands.

25 When compared to NAA_ELT and informed by the NEPA analysis above, flow and water temperature
26 conditions under Alternative 4A would be similar to or better than those under NAA_ELT. These
27 modeling results represent the increment of change attributable to the alternative, demonstrating
28 the similarities in flows, reservoir storage, and water temperature under Alternative 4A and the
29 NAA_ELT, and addressing the limitations of the CEQA baseline (Existing Conditions). Therefore, this
30 impact is found to be less than significant and no mitigation is required.

31 Impact AQUA-131: Effects of Water Operations on Rearing Habitat for Green Sturgeon

32 In general, Alternative 4A would not affect the quantity and quality of green sturgeon larval and
33 juvenile rearing habitat relative to the NAA_ELT.

34 Water temperature was used to determine the potential effects of alternatives on green sturgeon
35 larval and juvenile rearing habitat because larvae and juveniles are benthic-oriented and, therefore,
36 their habitat is more likely to be limited by changes in water temperature than flow rates.

37 H3_ELT/ESO_ELT

38 *Sacramento River*

39 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the May
40 through October green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water
41 Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would

1 be no differences (<5%) in mean monthly water temperature between NAA_ELT and H3_ELT in any
2 month or water year type throughout the period.

3 *Feather River*

4 Mean water temperatures in the Feather River at Gridley were examined during the April through
5 August green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality
6 Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no
7 differences (<5%) in mean water temperature between NAA_ELT and H3_ELT in any month or
8 water year type throughout the period.

9 Water temperature-related effects of H3_ELT on green sturgeon rearing habitat in the Feather River
10 were evaluated by determining the percent of months during May through September in which
11 water temperatures exceed a 64°F temperature threshold at Gridley (Table 11-4A-101). The percent
12 of months exceeding the threshold under H3_ELT would be similar to or up to 26% lower (absolute
13 difference) than that under NAA_ELT during May and June, similar to that under NAA_ELT during
14 July and August, and similar to or up to 10% greater than that under NAA_ELT during September.

15 Water temperature-related effects of H3_ELT on green sturgeon rearing habitat in the Feather River
16 were also evaluated by determining the total degree-months exceeding the 64°F temperature
17 threshold at Gridley (Table 11-4A-102). Combining water years, total degree-months exceeding the
18 threshold under H3_ELT would be 6% to 23% lower relative to NAA_ELT during May and June and
19 7% to 112% higher during July through September. These results indicate that there would be both
20 beneficial and negative temperature-related effects to green sturgeon rearing in the Feather River.
21 However, the largest change in degree-months (62 degree-months during July) would equate to an
22 increase of less than 0.8 degrees per month. Given the highly variable nature of the Feather River
23 outside of the low-flow channel, this change is not expected to be biologically meaningful. In fact, it
24 is not unexpected that this amount of change would occur daily on a diel cycle.

25 *San Joaquin River*

26 Water temperature modeling was not conducted in the San Joaquin River, however flows in all
27 months and water year types, based on CALSIM II, were the same or very similar between NAA_ELT
28 and H3_ELT and H4_ELT (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*), and
29 therefore no temperature effects would occur as a result of Alternative 4A.

30 H4_ELT/HOS_ELT

31 *Sacramento River*

32 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the May
33 through October green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water
34 Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would
35 be no differences (<5%) in mean monthly water temperature between NAA_ELT and H4_ELT in any
36 month or water year type throughout the period.

37 *Feather River*

38 Mean water temperatures in the Feather River at Gridley were examined during the April through
39 August green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality
40 Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no

1 differences (<5%) in mean water temperature between NAA_ELT and H4_ELT in any month or
2 water year type throughout the period.

3 The percent of months exceeding the 64°F NMFS threshold under H4_ELT would be similar to or up
4 to 28% lower (absolute difference) than that under NAA_ELT during May and June, and similar or up
5 to 14% greater than that under NAA_ELT during July through September. (Table 11-4A-105).

6 Combining water years, total degree-months exceeding the 64°F NMFS threshold under H4_ELT
7 would be 5% to 29% lower relative to NAA_ELT during May and June and 20% to 34% higher
8 (relative scale) during July through September (Table 11-4A-106). These results indicate that there
9 would be both beneficial and negative temperature-related effects of H4_ELT on green sturgeon
10 rearing in the Feather River. However, the largest change in degree-months (130 degree-months
11 during July) would equate to an increase of less than 1.6 degrees per month. Given the highly
12 variable nature of the Feather River outside of the low-flow channel, this change is not expected to
13 be biologically meaningful. In fact, it is not unexpected that this amount of change would occur daily
14 on a diel cycle.

15 *San Joaquin River*

16 Water temperature modeling was not conducted in the San Joaquin River, however flows in all
17 months and water year types, based on CALSIM II, were the same or very similar between NAA_ELT
18 and H3_ELT and H4_ELT (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*), and
19 therefore no temperature effects would occur as a result of Alternative 4A.

20 *NEPA Effects:* Collectively, these modeling results indicate that the effect would not be adverse
21 because it does not have the potential to substantially reduce the amount of suitable habitat. Water
22 temperatures in the Sacramento and Feather rivers and exceedances of NMFS temperature
23 thresholds in the Feather River under Alternative 4A would be similar to those under NAA_ELT.
24 Although degree-months would be higher on a relative scale under Alternative 4A during some
25 months, these changes would not be biologically meaningful when considering the high variation in
26 water temperatures relative to these increases. These modeling results would generally be
27 consistent among scenarios.

28 *CEQA Conclusion:* In general, Alternative 4A would reduce the quantity and quality of rearing
29 habitat for larval and juvenile green sturgeon relative to Existing Conditions. However, as further
30 **described below in the Summary of CEQA Conclusion, reviewing the alternative's impacts in relation**
31 **to the NAA is a better approach because it isolates the effect of the alternative from those of sea level**
32 **rise, climate change, and future water demand. Informed by the NAA comparison, Alternative 4A**
33 **would not affect the quantity and quality of rearing habitat for larval and juvenile green sturgeon**
34 **relative to Existing Conditions.**

35 Water temperature was used to determine the potential effects of Alternative 4A on green sturgeon
36 larval and juvenile rearing habitat because larvae and juveniles are benthic-oriented and, therefore,
37 their habitat is more likely to be limited by changes in water temperature than flow rates.

38 H3_ELT /ESO_ELT

39 *Sacramento River*

40 Mean water temperatures in the Sacramento River at Bend Bridge were examined during the May
41 through October green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water*

1 *Quality Model and Reclamation Temperature Model Results Utilized in the Fish Analysis*). There would
2 be no differences (<5%) in mean water temperature between Existing Conditions and H3_ELT for
3 any month or water year type of the period, except a 6% higher mean temperature for August of
4 critical water years.

5 *Feather River*

6 Mean water temperatures in the Feather River at Gridley were examined during the April through
7 August green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality*
8 *Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no
9 differences (<5%) in mean water temperature between Existing Conditions and H3_ELT in any
10 month or water year type throughout the period, except during July of critical water years (7%
11 higher under H3_ELT) and August of dry years (6% higher under H3_ELT).

12 Water temperature-related effects of H3_ELT on green sturgeon rearing habitat in the Feather River
13 were evaluated by determining the percent of months during May through September in which
14 water temperatures would exceed a 64°F temperature threshold at Gridley (Table 11-4A-101). The
15 percent of months exceeding the threshold under H3_ELT would generally be greater by up to 25%
16 (absolute difference) than the percent under Existing Conditions during all months, except in
17 September for the >1.0°F and >2.0°F exceedance categories, in both of which exceedances would be
18 9 percent lower under H3_ELT. These modeling results include the effects of climate change.

19 Water temperature-related effects of H3_ELT on green sturgeon rearing habitat in the Feather River
20 were also evaluated by determining the total degree-months exceeding the 64°F temperature
21 threshold at Gridley (Table 11-4A-102). Combining water years, total degree-months exceeding the
22 threshold under H3_ELT would be 5% to 98% higher in all months. These results indicate that there
23 would be negative temperature-related effects of H3_ELT on green sturgeon rearing in the Feather
24 River. These modeling results include the effects of climate change.

25 *San Joaquin River*

26 Water temperature modeling was not conducted in the San Joaquin River.

27 H4_ELT /HOS_ELT

28 *Sacramento River*

29 Mean monthly water temperatures in the Sacramento River at Bend Bridge were examined during
30 the May through October green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River*
31 *Water Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There
32 would be no differences (<5%) in mean monthly water temperature between Existing Conditions
33 and H4_ELT during May through July and 5% lower during August and October.

34 *Feather River*

35 Mean water temperatures in the Feather River at Gridley were examined during the April through
36 August green sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality*
37 *Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no
38 differences (<5%) in mean water temperature between Existing Conditions and H4_ELT in any
39 month or water year type throughout the period, except for 6% lower means under H4_ELT during
40 July of critical water years and August of dry years.

1 The percent of months exceeding the 64°F NMFS threshold under H4_ELT would generally be
2 greater by up to 33% than the percent under Existing Conditions during all months and water year
3 types, except in September for the >1.0°F and >2.0°F exceedance categories, in which exceedances
4 would be 7 and 6 percent lower, respectively, under H3_ELT (Table 11-4A-105). These modeling
5 results include the effects of climate change.

6 Combining water years, total degree-months exceeding the 64°F NMFS threshold under H4_ELT
7 would be 28% to 50% higher in all months (Table 11-4A-106). These results indicate that there
8 would be negative temperature-related effects of H4 on green sturgeon rearing in the Feather River.
9 These modeling results include the effects of climate change.

10 *San Joaquin River*

11 Water temperature modeling was not conducted in the San Joaquin River.

12 Summary of CEQA Conclusion

13 Under Alternative 4A, water temperatures would be similar in the Sacramento River, although the
14 exceedance above NMFS temperature thresholds in the Feather River would be higher under
15 Alternative 4A than those under the CEQA baseline, which could increase stress, mortality, and
16 susceptibility to disease for larval and juvenile green sturgeon. These modeling results are
17 consistent among scenarios. Contrary to the NEPA conclusion set forth above, these modeling
18 results indicate that the difference between Existing Conditions and Alternative 4A could be
19 significant because the alternative could substantially reduce rearing habitat and substantially
20 reduce the number of green sturgeon as a result of fry and juvenile mortality.

21 However, this interpretation of the biological modeling results is likely attributable to different
22 modeling assumptions for four factors: sea level rise, climate change, future water demands, and
23 implementation of the alternative. As discussed in Section 11.3.3, because of differences between the
24 CEQA and NEPA baselines, it is sometimes possible for CEQA and NEPA significance conclusions to
25 vary between one another under the same impact discussion. The baseline for the CEQA analysis is
26 Existing Conditions at the time the NOP was prepared. Both the action alternative and the NEPA
27 baseline (NAA_ELT) models anticipated future conditions that would occur at 2025 (ELT
28 implementation period), including the projected effects of climate change (precipitation patterns),
29 sea level rise and future water demands, as well as implementation of required actions under the
30 2008 USFWS BiOp and the 2009 NMFS BiOp. Because the action alternative modeling does not
31 partition the effects of implementation of the alternative from the effects of sea level rise, climate
32 change, and future water demands, the comparison to Existing Conditions may not offer a clear
33 understanding of the impact of the alternative on the environment. This suggests that the
34 comparison of the results between the alternative and NAA_ELT is a better approach because it
35 isolates the effect of the alternative from those of sea level rise, climate change, and future water
36 demands.

37 When compared to NAA_ELT and informed by the NEPA analysis above, effects of Alternative 4A on
38 water temperatures would be negligible and exceedances above thresholds would be similar
39 between NAA_ELT and Alternative 4A. These modeling results represent the increment of change
40 attributable to the alternative, demonstrating the similarities in flows and water temperatures
41 under Alternative 4A and the NAA_ELT, and addressing the limitations of the CEQA baseline
42 (Existing Conditions). Therefore, this impact would be less than significant and no mitigation is
43 required.

1 Impact AQUA-132: Effects of Water Operations on Migration Conditions for Green Sturgeon

2 In general, effects of Alternative 4A on green sturgeon migration conditions relative to the NAA are
3 not adverse.

4 Upstream of the Delta

5 H3_ELT/ESO_ELT

6 Analyses for green sturgeon migration conditions focused on flows in the Sacramento River between
7 Keswick and Wilkins Slough and in the Feather River between Thermalito and the confluence with
8 the Sacramento River during the April through October larval migration period, the August through
9 March juvenile migration period, and the November through June adult migration period (Appendix
10 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Because these periods encompass the
11 entire year, flows during all months were compared. Reduced flows could slow or inhibit
12 downstream migration of larvae and juveniles and reduce the ability to sense upstream migration
13 cues and pass impediments by adults.

14 Sacramento River mean flows at Keswick under H3_ELT would generally be up to 23% lower than
15 flows under NAA_ELT during November, and similar to flows under NAA_ELT in the remaining
16 months, with minor exceptions (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).
17 Sacramento River flows at Wilkins Slough under H3_ELT would generally be up to 20% lower than
18 flows under NAA_ELT during September and November, up to 12% greater during May and June,
19 and similar to flows under NAA_ELT in the remaining eight months (Appendix 11C, *CALSIM II Model*
20 *Results utilized in the Fish Analysis*).

21 Differences between H3_ELT and NAA_ELT in Feather River mean flows at Thermalito would vary a
22 great deal with month and water year type. In general, mean flows under H3_ELT would be up to
23 48% lower than flows under NAA_ELT during July through September, although flows in critical
24 water years during August and September would be 23% and 25% higher (Appendix 11C, *CALSIM II*
25 *Model Results utilized in the Fish Analysis*). The mean flows would generally be up to 106% greater
26 during May and June, and similar to flows under NAA_ELT in the remaining seven months, with a
27 number of exceptions.

28 Feather River flows at the confluence with the Sacramento River under H3_ELT would generally be
29 up to 50% lower (critical water years) than flows under NAA_ELT during July through September,
30 although flows in critical water years during August and September would be 21% and 14% higher
31 (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). The mean flows would
32 generally be greater under H3_ELT during June (up to 77% greater) and similar to flows under
33 NAA_ELT in the remaining eight months, with minor exceptions.

34 Given the benthic nature of green sturgeon and that flows in the Feather River would be consistent
35 with the flow schedule provided by NMFS during the project planning process that is meant to
36 better mimic the natural flow regime while providing adequate storage to meet downstream
37 temperature and water quality requirements, the reductions in summer flows at both locations in
38 the Feather River are not expected to have a substantial effect on green sturgeon.

39 Larval transport flows were also examined by utilizing the positive correlation between white
40 sturgeon year class strength and Delta outflow during April and May (USFWS 1995) under the
41 assumption that the mechanism responsible for the relationship is that Delta outflow provides
42 improved green sturgeon larval transport that results in improved year class strength. However,

1 there is high uncertainty about what the mechanism responsible for this relationship is because
2 many flow variables correlate throughout the Central Valley. One hypothesis suggests that the
3 correlation is caused by high flows in the upper river resulting in improved migration, spawning,
4 and rearing conditions in the upper river. Another hypothesis suggests that the positive correlation
5 is a result of higher flows through the Delta triggering more adult sturgeon to move up into the river
6 to spawn. In addition, this correlation was developed using data collected in the absence of north
7 Delta intakes. Also, there are temporal and spatial differences between green and white sturgeon
8 larval presence that make using white sturgeon as a surrogate in this analysis highly uncertain and
9 potentially not applicable (Murphy et al. 2011). In particular, unlike white sturgeon, during April
10 and May, green sturgeon adults would be spawning and larvae would be rearing in the upper
11 Sacramento River and Feather River. This mismatch in timing and location limits the confidence in
12 using this as a surrogate for green sturgeon and suggests that year-class strength correlated with
13 flow at another location upstream or during a different period, if at all.

14 Regardless, for lack of a known relationship for green sturgeon year-class strength, the results using
15 white sturgeon as a surrogate for green sturgeon were examined here. Results for white sturgeon
16 presented in Impact AQUA-150 below suggest that, using the positive correlation between Delta
17 outflow and year class strength, green sturgeon year class strength would be lower under H3_ELT
18 than those under NAA_ELT (up to 50% lower). Given the increased spring outflow in April and May
19 under H4, it is expected that year-class strength would be similar or greater to NAA_ELT under
20 H4_ELT.

21 H4_ELT /HOS_ELT

22 Year-round flows in the Sacramento River at Keswick under H4_ELT would be up to 20% lower than
23 flows under NAA_ELT during November, and generally similar to flows under NAA_ELT in the
24 remaining months (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Mean flows
25 at Wilkins Slough under H4_ELT would generally be similar to those under NAA_ELT except during
26 August, September, and November, when flows would be up to 20% lower under H4_ELT.

27 Differences between H4_ELT and NAA_ELT in Feather River mean flows at Thermalito would vary a
28 great deal with month and water year type. In general, mean flows under H4_ELT would be up to
29 60% lower than flows under NAA_ELT during July through September, although flows in critical
30 water years during August and September would be 48% and 52% higher (Appendix 11C, *CALSIM II*
31 *Model Results utilized in the Fish Analysis*). The mean flows under H4_ELT would generally be up to
32 548% greater flows under NAA_ELT during April through June, and similar in the remaining six
33 months, with a number of exceptions.

34 Feather River flows at the confluence with the Sacramento River under H3_ELT would generally be
35 up to 42% lower than flows under NAA_ELT during July through September, although flows in
36 critical water years during August and September would be 42% and 34% higher (Appendix 11C,
37 *CALSIM II Model Results utilized in the Fish Analysis*). The mean flows would generally be greater
38 under H4_ELT during April through June (up to 119% greater) and similar to flows under NAA_ELT
39 in the remaining six months, with minor exceptions.

40 Given the benthic nature of green sturgeon and that flows in the Feather River would be consistent
41 with the flow schedule provided by NMFS during the Alternative 4a planning process that is meant
42 to better mimic the natural flow regime while providing adequate storage to meet downstream
43 temperature and water quality requirements, the reductions in summer flows at both locations in
44 the Feather River are not expected to have a substantial effect on green sturgeon.

1 Through-Delta

2 As described for other species (e.g., Sacramento splittail in Impact AQUA-114), migration conditions
3 in the southern Delta generally would be considerably improved relative to NAA_ELT, because of
4 reduced frequency of reverse OMR flows. The range of Alternative 4A operations (i.e., H3_ELT and
5 H4_ELT) includes a range of Delta outflows, as discussed below. The effect on green sturgeon would
6 not be adverse.

7 *NEPA Effects:* Upstream flows (above north Delta intakes) are generally similar between Alternative
8 4A and NAA_ELT. However, due to the removal of water at the North Delta intakes, there are
9 substantial differences in through-Delta flows between Alternative 4A and NAA_ELT. An
10 examination of monthly average Delta outflow exceedances above 15,000 cfs, 20,000 cfs, and 25,000
11 cfs during April and May of wet and above-normal years was used to provide context for differences
12 in through-Delta migration conditions, per recommendations by the Anadromous Fish Restoration
13 Program (USFWS 1995) (see Table 11-4A-114 in the discussion of white sturgeon below). This
14 showed that the percentage of months exceeding the above Delta outflow thresholds in April and
15 May of wet and above normal years was appreciably lower than NAA_ELT **for Alternative 4A's**
16 **H3_ELT scenario, but was similar or considerably greater than NAA_ELT for Alternative 4A's H4_ELT**
17 **scenario.** As noted for Alternative 4, analysis of white sturgeon year-class strength (USFWS 1995),
18 used here as a surrogate for green sturgeon, found a positive correlation between year class
19 strength and Delta outflow during April and May. However, this conclusion was reached in the
20 absence of north Delta intakes and the exact mechanism that causes this correlation is not known at
21 this time. One hypothesis suggests that the correlation is caused by high flows in the upper river
22 resulting in improved migration, spawning, and rearing conditions in the upper river. Another
23 hypothesis suggests that the positive correlation is a result of higher flows through the Delta
24 triggering more adult sturgeon to move up into the river to spawn. It is also possible that some
25 combination of these factors are working together to produce the positive correlation between high
26 flows and sturgeon year-class strength.

27 The scientific uncertainty regarding which mechanisms are responsible for the positive correlation
28 between year class strength and river/Delta flow will be addressed through targeted research and
29 monitoring to be conducted in the years leading up to the initiation of north Delta facilities
30 operations as described in the adaptive management and monitoring section in Section 4.1. These
31 investigations will inform decisions regarding Delta outflow within the range of H3_ELT/H4_ELT
32 operations such that the effect on green sturgeon Delta flow conditions would not be adverse. This,
33 combined with similarities in upstream flow conditions between Alternative 4A and NAA_ELT,
34 indicate that Alternative 4A would not be adverse to migration conditions for green sturgeon.

35 *CEQA Conclusion:* In general, Alternative 4A would reduce the quantity and quality of migration
36 habitat for green sturgeon in upstream locations relative to Existing Conditions. However, as further
37 described below in the **Summary of CEQA Conclusion, reviewing the alternative's impacts in relation**
38 **to the NAA is a better approach** because it isolates the effect of the alternative from those of sea level
39 rise, climate change, and future water demand. Informed by the NAA comparison, Alternative 4A
40 would not affect the quantity and quality of migration habitat for green sturgeon.

1 Upstream of the Delta

2 H3_ELT/ESO_ELT

3 Analyses for green sturgeon migration conditions focused on flows in the Sacramento River between
4 Keswick and Wilkins Slough and in the Feather River between Thermalito and the confluence with
5 the Sacramento River during the April through October larval migration period, the August through
6 March juvenile migration period, and the November through July adult migration period (Appendix
7 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Because these periods encompass the
8 entire year, flows during all months were compared. Reduced flows could slow or inhibit
9 downstream migration of larvae and juveniles and reduce the ability to sense upstream migration
10 cues and pass impediments by adults.

11 Sacramento River flows at Keswick under H3_ELT would generally be up to 24% lower than flows
12 under Existing Conditions during August, September, and November of dry and critical water years
13 and up to 34% higher during September of wet and above normal water years (Appendix 11C,
14 *CALSIM II Model Results utilized in the Fish Analysis*). In the other months and water year types, the
15 mean flows would generally be similar between H3_ELT and Existing Conditions, with several
16 exceptions. Mean flows at Wilkins Slough under H3_ELT would generally be up to 24% lower than
17 flows under Existing Conditions during August, September, and November of dry and critical water
18 years and up to 33% higher during September of wet and above normal water years. Mean flow in
19 June would be up to 18% higher under H3_ELT, and flows would be similar in other months and
20 water year types.

21 For Delta outflow, the percent of months exceeding outflow thresholds under H3_ELT would
22 consistently be lower than those under Existing Conditions for each flow threshold, water year type,
23 and month (4% to 50% lower on a relative scale) (see Table 11-4A-114 below).

24 Feather River flows at Thermalito Afterbay under H3_ELT would generally be up to 52% lower than
25 flows under Existing Conditions during January, February, and July, higher than flows under Existing
26 Conditions during April through June and September, and similar to flows under Existing Conditions
27 during the remaining months (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).
28 Mean flow under H3_ELT at the confluence with the Sacramento River would generally be up to
29 140% greater than flows under Existing Conditions during February, June, and September, up to
30 55% lower than flows under Existing Conditions during July, and similar to flows under Existing
31 Conditions during the remaining months.

32 H4_ELT /HOS_ELT

33 Year-round flows were examined in the Sacramento River at Keswick and Wilkins Slough. Flows at
34 Keswick under H4_ELT would generally be similar to flows under Existing Conditions, except during
35 September and November, in which mean flows would be up to 20% lower, and during February, in
36 which flows would be up to 12% higher. Flows at Wilkins Slough would generally be similar to flows
37 under Existing Conditions except during September and October, in which flows would be up to
38 21% lower, and during July, in which flows would be up to 8% greater. (Appendix 11C, *CALSIM II*
39 *Model Results utilized in the Fish Analysis*).

40 Year-round flows in the Feather River below Thermalito Afterbay (high-flow channel) and at the
41 confluence under H4_ELT would generally be similar to or up to 36% lower than flows under
42 Existing Conditions during January through March, and up to 55% lower during July through

1 September, although flow would be up to 55% higher during critical water years in August and
2 September, (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). During April
3 through June, mean flow under H4_ELT would be up to 509% greater than flow under Existing
4 Conditions. During September, mean flow under H4_ELT would be up to 49% lower in below normal
5 and dry water years and up to 166% higher in wet, above normal, and critical water years.
6 Reductions in flows in the Feather River would be persistent and large enough to have biologically
7 meaningful effects to green sturgeon migration.

8 Through-Delta

9 **Given the improved OMR flows and the range of Delta outflows under Alternative 4A's H3_ELT and**
10 **H4_ELT that would be refined through the Adaptive Management Program to avoid negative impacts**
11 **to green sturgeon (see NEPA Effects discussion above), the potential impact of Alternative 4A on in-**
12 **Delta conditions for green sturgeon is considered less than significant, and no mitigation would be**
13 **required.**

14 Summary of CEQA Conclusion

15 Under Alternative 4A, there would be frequent small to large reductions in flows in the Sacramento
16 and Feather Rivers upstream of the Delta that would reduce the ability of all three life stages of
17 green sturgeon to migrate successfully. Exceedance of Delta outflow thresholds would be lower
18 under Alternative 4A's H3_ELT scenario than under Existing Conditions, but would be similar or
19 greater than under Existing Conditions for the H4_ELT scenario. Note that there is high uncertainty
20 that year class strength is due to Delta outflow or if both year class strength and Delta outflows co-
21 vary with another unknown factor. Contrary to the NEPA conclusion set forth above, these modeling
22 results indicate that the difference between Existing Conditions and Alternative 4A could be
23 significant because the alternative could substantially reduce upstream migration conditions for
24 green sturgeon.

25 However, this interpretation of the biological modeling is likely attributable to different modeling
26 assumptions for four factors: sea level rise, climate change, future water demands, and
27 implementation of the alternative. As discussed in Section 11.3.3, because of differences between the
28 CEQA and NEPA baselines, it is sometimes possible for CEQA and NEPA significance conclusions to
29 vary between one another under the same impact discussion. The baseline for the CEQA analysis is
30 Existing Conditions at the time the NOP was prepared. Both the action alternative and the NEPA
31 baseline (NAA_ELT) models anticipated future conditions that would occur at 2025 (ELT
32 implementation period), including the projected effects of climate change (precipitation patterns),
33 sea level rise and future water demands, as well as implementation of required actions under the
34 2008 USFWS BiOp and the 2009 NMFS BiOp. Because the action alternative modeling does not
35 partition the effects of implementation of the alternative from the effects of sea level rise, climate
36 change, and future water demands, the comparison to Existing Conditions may not offer a clear
37 understanding of the impact of the alternative on the environment. This suggests that the
38 comparison in results between the alternative and NAA_ELT, is a better approach because it isolates
39 the effect of the alternative from those of sea level rise, climate change, and future water demands.

40 When compared to NAA_ELT and informed by the NEPA analysis above, there would be negligible
41 effects on green sturgeon migration conditions in upstream areas. Within the Plan Area, the
42 Adaptive Management Program will evaluate water operations through the adaptive management
43 and monitoring program as described in Section 4.1 and ensure the impacts of water operations on

1 migration conditions for green sturgeon are less than significant. Therefore, this impact is found to
2 be less than significant and no mitigation is required.

3 Restoration Measures (Environmental Commitment 4, Environmental Commitment 6,
4 Environmental Commitment 7, and Environmental Commitment 10)

5 As described for other covered fishes, Alternative 4A includes a greatly reduced extent of restoration
6 measures relative to Alternative 4 and Alternative 1A. The mechanisms of impacts of habitat
7 restoration discussed for winter-run Chinook salmon generally would be similar for green sturgeon.
8 Because green sturgeon may inhabit the Delta year-round, they would be more likely to encounter
9 any effects from restoration measures. However, because the extent of restoration is limited to
10 offsetting losses from construction of the water conveyance facilities, any such effects would be
11 greatly limited compared to Alternative 1A and 4, for example.

12 Impact AQUA-133: Effects of Construction of Restoration Measures on Green Sturgeon

13 **As noted for Alternative 1A's discussion of Impact AQUA-133**, in-water and shoreline construction
14 activities (e.g., riprap removal and levee breaching; shoreline excavation and recontouring) could
15 increase turbidity, but green sturgeon are tolerant to such increases and implementation of the
16 environmental commitments described under Impact AQUA-1 for delta smelt and in Appendix 3B,
17 Environmental Commitments (Environmental Training; Stormwater Pollution Prevention Plan;
18 Erosion and Sediment Control Plan; Hazardous Materials Management Plan; Spill Prevention,
19 Containment, and Countermeasure Plan; and Disposal of Spoils, Reusable Tunnel Material, and
20 Dredged Material), would minimize or eliminate effects on green sturgeon.

21 *NEPA Effects:* The effects of short-term construction activities would not be adverse to green
22 sturgeon because environmental commitments would limit the potential for construction-related
23 effects.

24 *CEQA Conclusion:* As discussed for Alternative 1A, habitat restoration activities could result in
25 short-term effects on green sturgeon but would be localized, sporadic, and of low magnitude; such
26 effects would be avoided by limiting the frequency, duration, and spatial extent of in-water work
27 and with implementation of environmental commitments (see Appendix 3B, *Environmental*
28 *Commitments*). The potential impact of habitat restoration activities is considered less than
29 significant because it would not substantially reduce green sturgeon habitat, restrict its range, or
30 interfere with its movement. No additional mitigation would be required.

31 Impact AQUA-134: Effects of Contaminants Associated with Restoration Measures on Green
32 Sturgeon

33 The factors influencing the potential effects of contaminants from restored areas on green sturgeon
34 are discussed in the analysis of Impact AQUA-134 under Alternative 1A. Because the extent of
35 habitat restoration under Alternative 4A is considerably reduced relative to Alternative 1A, any
36 effects from contaminants also would be considerably reduced.

37 *NEPA Effects:* While Alternative 4A habitat restoration actions may result in a very small increase
38 production, mobilization, and bioavailability of methylmercury, selenium, copper, and pesticides in
39 the aquatic system, any such releases would be short-term and localized, and would be unlikely to
40 result in measurable increases in the bioaccumulation of these contaminants in green sturgeon.
41 Alternative 4A would restore 59 acres of tidal wetlands that, depending on the specific site

1 conditions of the restoration, may result in the colonization of benthic grazers that bioaccumulate
2 selenium. As sturgeon are benthic feeders, the increased habitat for grazers may result in increased
3 exposure to selenium. However, the small amount of area to be restored would not result in a
4 substantial change in exposure potential. Overall, the effects of contaminants associated with
5 restoration measures would not be adverse for green sturgeon.

6 *CEQA Conclusion:* Habitat restoration under Alternative 4A may result in increased production,
7 mobilization, and bioavailability of contaminants in the aquatic system, but these would be short-
8 term and localized, and would be unlikely to result in measurable increases in the bioaccumulation
9 in green sturgeon. For methylmercury, implementation of *Environmental Commitment 12*
10 *Methylmercury Management* would help to minimize the increased mobilization of methylmercury
11 in the limited restoration areas. Therefore, the impact of contaminants is considered less than
12 significant because it would not substantially affect green sturgeon either directly or through habitat
13 modifications. Consequently, no mitigation would be required.

14 Impact AQUA-135: Effects of Restored Habitat Conditions on Green Sturgeon

15 Restored habitat under *Environmental Commitment 4 Tidal Natural Communities Restoration* and
16 *Environmental Commitment 6 Channel Margin Enhancement* is intended to offset habitat
17 loss/modification caused by construction and operation of the water facilities proposed under
18 Alternative 4A.

19 *NEPA Effects:* The effects of restored habitat conditions on green sturgeon would not be adverse
20 because restoration is intended to provide habitat benefits for green sturgeon.

21 *CEQA Conclusion:* As described above, habitat restoration would be undertaken to offset
22 loss/modification of habitat from water facility construction and operation. The effects of restored
23 habitat conditions on green sturgeon would be less than significant. Consequently, no mitigation
24 would be required.

25 Other Environmental Commitments (Environmental Commitment 12, Environmental Commitment 26 15, and Environmental Commitment 16)

27 As noted for other covered species, Alternative 4A includes three other Environmental
28 Commitments, which are reduced in their extent relative to the Conservation Measures included in
29 other Alternatives (e.g., Alternative 1A and Alternative 4A). While the extent of these measures is
30 reduced compared to these alternatives, the nature of the mechanisms for green sturgeon remains
31 the same.

32 Impact AQUA-136: Effects of Methylmercury Management on Green Sturgeon (Environmental 33 Commitment 12)

34 The impact discussion for winter-run Chinook salmon (Impact AQUA-46) is also applicable to green
35 sturgeon.

36 *NEPA Effects:* The effects of methylmercury management on green sturgeon would not be adverse
37 because it is expected to reduce overall methylmercury levels resulting from habitat restoration.

38 *CEQA Conclusion:* As noted for winter-run Chinook salmon, effects of *Environmental Commitment 12*
39 *Methylmercury Management* within the areas restored under Alternative 4A are expected to reduce
40 overall methylmercury levels resulting from habitat restoration. Because it is designed to improve

1 water quality and habitat conditions, impacts on green sturgeon would be less than significant.
2 Consequently, no mitigation is required.

3 Impact AQUA-139: Effects of Localized Reduction of Predatory Fish on Green Sturgeon
4 (Environmental Commitment 15)

5 Alternative 4A includes a predator removal program similar to Conservation Measure 15 included in
6 Alternative 1A, although the environmental commitment under Alternative 4A is reduced in scope to
7 focus solely on the north and south Delta export locations, whereas Alternative 1A would include
8 predator removal at these and other potential hotspots. As described under Alternative 1A, it is
9 possible, but not assured, that there would be some reduction in predation losses of green sturgeon
10 under *Environmental Commitment 15 Localized Reduction of Predatory Fish*. As described for
11 Alternative 1A, there is uncertainty in the potential efficacy of Environmental Commitment 15 and
12 also uncertainty in the importance of predation to juvenile green sturgeon, given the likely limited
13 period of vulnerability to predation in the Delta. Due to these uncertainties, there would be no
14 demonstrable effect of this conservation measure on green sturgeon. As noted for Alternative 1A,
15 there is a very small risk of sturgeon by-catch during implementation of Environmental
16 Commitment 15, but the number of green sturgeon affected is expected to be very low.

17 *NEPA Effects:* Consistent with the analysis for Alternative 1A and reflecting the above discussion,
18 the overall effect would not be adverse because few, if any, sturgeon would be affected.

19 *CEQA Conclusion:* Consistent with the analysis for Alternative 1A and reflecting the above
20 discussion, the impact is considered less than significant. Consequently, no mitigation would be
21 required.

22 Impact AQUA-140: Effects of Nonphysical Fish Barriers on Green Sturgeon (Environmental
23 Commitment 16)

24 As described for winter-run Chinook salmon, under Alternative 4A, an NPB at the divergence of
25 Georgiana Slough from the Sacramento River would be implemented to guide juvenile salmonids
26 away from Georgiana Slough and the interior Delta, wherein survival is relatively low compared to
27 the Sacramento River (Perry et al. 2010). As described in the *BDCP Effects Analysis*, the effects of an
28 NPB at this location would be expected to have little to no effect on green sturgeon because of their
29 position in the water column (near the river bottom, whereas an NPB at this location would be likely
30 to function in the upper half of the water column; DWR 2012) and their physiology (limited hearing
31 **ability in the range employed by the NPB's acoustic deterrence stimuli; see section 5C.5.3.9 in *BDCP***
32 *Effects Analysis Appendix 5.C* and section 5.B.6.1.11.1 *BDCP Effects Analysis Appendix 5.B*, both hereby
33 *incorporated by reference*).

34 *NEPA Effects:* Consistent with the analysis for Alternative 1A and reflecting the above discussion,
35 the overall effect would not be adverse because green sturgeon are unlikely to encounter the NPB,
36 which would not be located near the channel bottom and because green sturgeon have limited
37 hearing within the range of acoustic sound generated by the NPB.

38 *CEQA Conclusion:* Consistent with the analysis for Alternative 1A and reflecting the above
39 discussion, the impact is considered less than significant. Consequently, no mitigation would be
40 required.

1 White Sturgeon

2 Construction and Maintenance of Water Conveyance Facilities

3 Impact AQUA-145: Effects of Construction of Water Conveyance Facilities on White Sturgeon

4 The potential effects of construction of the water conveyance facilities on white sturgeon would be
5 the same as those described for Alternative 4, Impact AQUA-145. This section provides additional
6 detail on underwater noise impacts which are also applicable to Impact AQUA-145 in Alternative 4.

7 Table 11-8 presents the life stages of white sturgeon and months of their potential presence in the
8 north, east, and south Delta during the proposed in-water construction window (June 1–October
9 31). Under Alternative 4A, white sturgeon adults and juveniles occur year-round in the Delta and
10 therefore could be exposed to pile driving noise during construction of the proposed intakes, barge
11 unloading facilities, CCF cofferdams, CCF siphons, and Head of Old River operable barrier. Larvae
12 may also be exposed to pile driving noise but are generally at lower risk than juveniles and adults
13 because of only minor spatial and temporal overlap with in-water pile driving activities. Because the
14 majority of the population spawns in the Sacramento River, adults, larvae, and juveniles are most
15 likely to encounter pile driving noise at the proposed intake locations in the north Delta as they
16 migrate or disperse to and from upstream spawning areas. Similar to green sturgeon, adult white
17 sturgeon are large (>15 kilograms) and less susceptible to noise from impact driving, and are able to
18 avoid injurious exposure to underwater noise from pile driving. They may experience short delays
19 in migration upon encountering pile driving noise; however, pile driving would occur only
20 intermittently through a portion of the day, and minor migration delays are not expected to affect
21 their ability to successfully reach the spawning grounds.

22 Because of their relatively small body size, larvae and juvenile white sturgeon are at higher risk of
23 injury or mortality from pile driving noise. Juveniles are most likely to encounter pile driving noise
24 because of their widespread distribution and year-round presence in the Delta. Although juvenile
25 white sturgeon are capable of actively avoiding pile driving noise and other in-water disturbances,
26 some may be injured or killed if they remain in the areas subject to cumulative SELs exceeding the
27 injury thresholds (Table 4.3.7-1 under Delta smelt). In the absence of information on the movements
28 and distribution of juveniles, potential impacts to the population can be generally assessed based on
29 the proportion of total habitat subject to pile driving sounds. Under existing conditions, the Delta
30 comprises an estimated 84,280 acres of subtidal aquatic habitat. Using this estimate as a measure of
31 the total amount of potential foraging and rearing habitat available to juveniles, Table 4.3.7-2 shows
32 the percentage of habitat that would be subjected to pile driving noise exceeding the injury
33 thresholds during each year of pile driving activities.

34 These estimates represent a general order-of-magnitude estimate of the potential exposure of the
35 population to pile driving noise. Thus, potential for exposure of the population to project pile driving
36 noise is very low in most years. The exception is year 5 when an estimated 3,436 acres or 4.1% of
37 the total amount of subtidal habitat would be subject to pile driving noise levels that could harm
38 juvenile sturgeon. This potential impact is due largely to the construction of six barge unloading
39 facilities at various locations along the pipeline/tunnel alignment. Factors that may further limit
40 exposure of the population to adverse effects include the short duration of pile driving activities at
41 most locations (Table 4.3.7-1 under Delta Smelt). In addition, the total area of habitat available to
42 juvenile white sturgeon expands beyond the Delta into Suisun and San Pablo Bays as juveniles grow
43 and develop salinity tolerance, further reducing the probability of encountering pile driving noise.

1 Based on these considerations and the implementation of Mitigation Measures AQUA-1a and AQUA-
2 1b, there is a low likelihood of significant population-level effects on white sturgeon due to pile
3 driving noise.

4 *NEPA Effects:* As concluded for Alternative 4, Impact AQUA-145, the effect would not be adverse for
5 white sturgeon. Implementation of the measures described in Appendix 3B, *Environmental*
6 *Commitments*, such as *Environmental Training; Stormwater Pollution Prevention Plan; Erosion and*
7 *Sediment Control Plan; Hazardous Materials Management Plan; Spill Prevention, Containment, and*
8 *Countermeasure Plan; Disposal of Spoils, Reusable Tunnel Material, and Dredged Material; Fish Rescue*
9 *and Salvage Plan; and Barge Operations Plan* would guide rapid and effective response in the case of
10 inadvertent spills of hazardous materials. Construction will result in both temporary and permanent
11 alteration of rearing and migratory habitats used by white sturgeon. However, Alternative 4A
12 includes Environmental Commitment 4 to restore tidal habitat. The direct effects of underwater
13 construction noise on white sturgeon that may be present could be adverse if sturgeon are exposed.
14 However, considering the ability of white sturgeon to move away from the noise and migrate during
15 the night or other times that pile driving is not occurring, the relatively few white sturgeon in the
16 area of pile driving, and the implementation of Mitigation Measures AQUA-1a and AQUA-1b, that
17 would minimize exposure, this effect would not be adverse.

18 *CEQA Conclusion:* As described in Alternative 4, Impact AQUA-145, the impact of the construction of
19 the water conveyance facilities on white sturgeon would not be significant except for construction
20 noise associated with pile driving. Construction of Alternative 4A involves several elements with the
21 potential to affect white sturgeon. However, these turbidity and hazardous material spill effects will
22 be effectively avoided and/or minimized through implementation of environmental commitments
23 (see Impact AQUA-1 and Appendix 3B, *Environmental Commitments: Environmental Training;*
24 *Stormwater Pollution Prevention Plan; Erosion and Sediment Control Plan; Hazardous Materials*
25 *Management Plan; Spill Prevention, Containment, and Countermeasure Plan; Disposal of Spoils,*
26 *Reusable Tunnel Material, and Dredged Material; Fish Rescue and Salvage Plan; and Barge Operations*
27 *Plan*). Implementation of Mitigation Measures AQUA-1a and AQUA-1b would reduce that noise
28 impact to less than significant.

29 Mitigation Measure AQUA-1a: Minimize the Use of Impact Pile Driving to Address Effects
30 of Pile Driving and Other Construction-Related Underwater Noise

31 Mitigation Measure AQUA-1b: Monitor Underwater Noise and if Necessary, Use an
32 Attenuation Device to Reduce Effects of Pile Driving and Other Construction-Related
33 Underwater Noise

34 Impact AQUA-146: Effects of Maintenance of Water Conveyance Facilities on White Sturgeon

35 *NEPA Effects:* The potential effects of the maintenance of water conveyance facilities under
36 Alternative 4A would be the same as those described for Alternative 4, Impact AQUA-146. As
37 concluded in Alternative 4, Impact AQUA-146, the impact would not be adverse for white sturgeon.

38 *CEQA Conclusion:* As described in Alternative 4, Impact AQUA-146, the impact of the maintenance
39 of water conveyance facilities on white sturgeon would be less than significant and no mitigation is
40 required.

1 Operations of Water Conveyance Facilities

2 Impact AQUA-147: Effects of Water Operations on Entrainment of White Sturgeon

3 *Water Exports*

4 The potential effects of the water operations under Alternative 4A would be the same as those
5 described for green sturgeon (see Impact AQUA-129), which is a reduction in entrainment at the
6 south Delta facilities, and avoidance or reduction of entrainment at the proposed north Delta
7 diversion facilities. As concluded in Impact AQUA-129, the impact of Alternative 4A on white
8 sturgeon would not be adverse.

9 *Predation Associated with Entrainment*

10 The potential effects would be the same as described for green sturgeon in Alternative 4A (see
11 Impact AQUA-129).

12 *NEPA Effects:* In conclusion, the effect of Alternative 4A operations on entrainment and associated
13 predation of white sturgeon would not be adverse and may provide modest benefit due to reduced
14 losses at the south Delta facilities.

15 *CEQA Conclusion:* As described above for green sturgeon (Impact AQUA-129) the impact of water
16 operations on white sturgeon would be less than significant and no mitigation would be required.

17 Impact AQUA-148: Effects of Water Operations on Spawning and Egg Incubation Habitat for
18 White Sturgeon

19 In general, Alternative 4A would not affect spawning and egg incubation habitat for white sturgeon
20 relative to the NAA_ELT. Alternative 4A would provide flow-related benefits to white sturgeon
21 spawning in the Feather River.

22 H3_ELT/ESO_ELT

23 *Sacramento River*

24 Flows in the Sacramento River at Wilkins Slough and Verona were examined during the February to
25 May spawning and egg incubation period for white sturgeon. Mean flows under H3_ELT would
26 generally be similar to those under NAA_ELT throughout the spawning and egg incubation period at
27 both locations (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

28 Mean monthly water temperatures in the Sacramento River at Hamilton City were examined during
29 the February through May white sturgeon spawning period (Appendix 11D, *Sacramento River Water
30 Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would
31 be no differences (<5%) in mean monthly water temperature between NAA_ELT and H3_ELT in any
32 month or water year type throughout the period.

33 The number of days at Hamilton City on which temperature exceeded a 61°F optimal and 68°F lethal
34 threshold by >0.5°F to >5°F in 0.5°F increments were determined for each month (March through
35 June) and year of the 82-year modeling period (Table 11-4A-13). The combination of number of
36 **days and degrees above each threshold were further assigned a “level of concern”**, as defined in
37 Table 11-4A-14. Differences between baselines and H3_ELT in the highest level of concern across all
38 months and all 82 modeled years are presented in Table 11-4A-107. For the 61°F threshold, there

1 would be 5 fewer (14% fewer) “red” years under H3_ELT than under NAA_ELT. For the 68°F
2 threshold, there would be negligible differences in the number of years under each level of concern
3 between NAA_ELT and H3_ELT.

4 Table 11-4A-107. Differences between Baselines and H3_ELT in the Number of Years in Which
5 Water Temperature Exceedances above the 61°F and 68°F Thresholds Are Within Each Level of
6 Concern, Sacramento River at Hamilton City, March through June

| Level of Concern | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|------------------|--------------------------------|--------------------|
| 61°F threshold | | |
| Red | 23 (288%) | -5 (-14%) |
| Orange | 4 (27%) | -2 (-10%) |
| Yellow | -12 (-39%) | 2 (12%) |
| None | -15 (-54%) | 5 (63%) |
| 68°F threshold | | |
| Red | 0 (NA) | 0 (NA) |
| Orange | 0 (NA) | 0 (NA) |
| Yellow | 1 (NA) | -1 (-100%) |
| None | -1 (-1%) | 1 (1%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

7
8 Total degree-days exceeding 61°F and 68°F were summed by month and water year type at
9 Hamilton City during March through June (Table 11-4A-108, Table 11-4A-109). Total degree-days
10 exceeding the 61°F threshold under H3_ELT would be 2 degree-day (67%) greater than those under
11 NAA_ELT during March, which would not be biologically meaningful. During April through June,
12 total degree days above 61°F would be 2 to 373 (1% to 11%) lower under H3_ELT than under
13 NAA_ELT. These totals would not be biologically meaningful to white sturgeon considering that the
14 daily reduction in temperature would be <0.2 degrees (2542 and 2460 total days during May and
15 June, respectively over the 82-year modeling period. Total degree-days exceeding the 68°F
16 threshold would be similar between NAA_ELT and H3_ELT, except during May, in which
17 exceedances would be 10 degree-days (33%) fewer under H3_ELT.

1 Table 11-4A-108. Differences between Baseline and H3_ELT Scenarios in Total Degree-Days
2 (°F-Days) by Month and Water Year Type for Water Temperature Exceedances above 61°F in the
3 Sacramento River at Hamilton City, March through June

| Month | Water Year Type | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|-------|-----------------|--------------------------------|--------------------|
| March | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 2 (NA) | 2 (NA) |
| | Dry | 3 (NA) | 0 (0%) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 5 (NA) | 2 (67%) |
| April | Wet | 18 (150%) | 0 (0%) |
| | Above Normal | 15 (150%) | 0 (0%) |
| | Below Normal | 16 (267%) | -4 (-15%) |
| | Dry | 47 (92%) | 4 (4%) |
| | Critical | 2 (200%) | -2 (-40%) |
| | All | 98 (123%) | -2 (-1%) |
| May | Wet | 478 (144%) | -1 (0%) |
| | Above Normal | 123 (56%) | -113 (-25%) |
| | Below Normal | 227 (123%) | -42 (-9%) |
| | Dry | 209 (103%) | -105 (-20%) |
| | Critical | 219 (108%) | -7 (-2%) |
| | All | 1,256 (110%) | -268 (-10%) |
| June | Wet | 425 (74%) | -65 (-6%) |
| | Above Normal | 151 (50%) | -56 (-11%) |
| | Below Normal | 177 (84%) | -70 (-15%) |
| | Dry | 203 (61%) | -127 (-19%) |
| | Critical | 181 (48%) | -55 (-9%) |
| | All | 1,137 (63%) | -373 (-11%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

4

1 Table 11-4A-109. Differences between Baseline and H3_ELT Scenarios in Total Degree-Days
2 (°F-Days) by Month and Water Year Type for Water Temperature Exceedances above 68°F in the
3 Sacramento River at Hamilton City, March through June

| Month | Water Year Type | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|-------|-----------------|--------------------------------|--------------------|
| Mar | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 0 (NA) | 0 (NA) |
| Apr | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 0 (NA) | 0 (NA) |
| May | Wet | 9 (129%) | 0 (0%) |
| | Above Normal | 3 (NA) | -10 (-77%) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 1 (NA) | 0 (0%) |
| | All | 13 (186%) | -10 (-33%) |
| Jun | Wet | 2 (NA) | 0 (0%) |
| | Above Normal | -1 (-100%) | -2 (-100%) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 1 (NA) | 0 (0%) |
| | All | 2 (200%) | -2 (-40%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

4

5 *Feather River*

6 Flows in the Feather River between Thermalito Afterbay and the confluence with the Sacramento
7 River were examined during the February to May spawning and egg incubation period for white
8 sturgeon (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Mean flows at
9 Thermalito Afterbay under H3_ELT would generally be similar to or greater by up to 30% greater
10 than those under NAA_ELT, with some exceptions. Mean flows at the confluence with the
11 Sacramento River under H3_ELT would be similar to flows under NAA_ELT, with minor exceptions.

12 Mean water temperatures in the Feather River below Thermalito Afterbay and at the confluence
13 with the Sacramento River were examined during the February through May white sturgeon
14 spawning and egg incubation period. Mean water temperatures would not differ (<5%) between
15 NAA_ELT and H3_ELT at either location throughout the period.

1 *San Joaquin River*

2 Flows in the San Joaquin River at Vernalis under H3_ELT during February through May would be
3 little different from flows under NAA_ELT (Appendix 11C, *CALSIM II Model Results utilized in the Fish*
4 *Analysis*).

5 Water temperature modeling was not conducted for the San Joaquin River.

6 H4_ELT /HOS_ELT

7 *Sacramento River*

8 Flows under H4_ELT in the Sacramento River at Wilkins Slough and Verona during February to May
9 would generally be similar to flows under NAA_ELT except during April and May at Verona, in which
10 flows would be up to 36% and 25% higher, respectively (Appendix 11C, *CALSIM II Model Results*
11 *utilized in the Fish Analysis*).

12 Mean water temperatures in the Sacramento River at Hamilton City were examined during the
13 February through May white sturgeon spawning period (Appendix 11D, *Sacramento River Water*
14 *Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would
15 be no differences (<5%) in mean monthly water temperature between NAA_ELT and H4_ELT in any
16 month or water year type throughout the period.

17 The number of days when temperatures exceeded the analysis criterion (i.e., 61°F optimal and 68°F
18 lethal threshold identified in Table 11-4A-13) by >0.5°F to >5°F in 0.5°F increments were
19 determined for each month (March through June) and year of the 82-year modeling period. The
20 combination of number of days and degrees above each threshold were further assigned a “level of
21 concern”, as defined in Table 11-4A-14. Differences between baselines and H4_ELT in the highest
22 level of concern across all months and all 82 modeled years are presented in Table 11-4A-110. For
23 the 61°F threshold, there would be 1 more (3% increase) “red” year and 3 fewer (14% reduction)
24 “orange” years under H4_ELT than under NAA_ELT, which would not be biologically meaningful. For
25 the 68°F threshold, there would be negligible differences in the number of years under each level of
26 concern between NAA_ELT and H4_ELT.

1 Table 11-4A-110. Differences between Baselines and H4_ELT Scenario in the Number of Years in
2 Which Water Temperature Exceedances above the 61°F and 68°F Thresholds are within Each Level
3 of Concern, Sacramento River at Hamilton City, March through June

| Level of Concern | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|------------------|--------------------------------|--------------------|
| 61°F threshold | | |
| Red | 29 (363%) | 1 (3%) |
| Orange | 3 (20%) | -3 (-14%) |
| Yellow | -14 (-45%) | 0 (0%) |
| None | -18 (-64%) | 2 (25%) |
| 68°F threshold | | |
| Red | 0 (NA) | 0 (NA) |
| Orange | 0 (NA) | 0 (NA) |
| Yellow | 1 (NA) | -1 (-50%) |
| None | -1 (-1%) | 1 (1%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

4
5 Total degree-days exceeding 61°F and 68°F were summed by month and water year type at
6 Hamilton City during March through June (Table 11-4A-111, Table 11-4A-112). Total degree-days
7 exceeding the 61°F threshold under H4_ELT would be 2 degree-days (67%) greater than those
8 under NAA_ELT during March and 3 degree-days (2%) greater during April, which would not be
9 biologically meaningful. During the May and June, there would be reductions of 152 degree-days
10 (6%) and 29 degree-days (1%) between NAA_ELT and H4_ELT in total degree-days exceeding the
11 61°F threshold. Total degree-days exceeding the 68°F threshold would be similar between NAA_ELT
12 and H4_ELT for all four months.

1 Table 11-4A-111. Differences between Baselines and H4_ELT in Total Degree-Days (°F-days) by
2 Month and Water Year Type for Water Temperature Exceedances above 61°F in the Sacramento
3 River at Hamilton City, March through June

| Month | Water Year Type | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|-------|-----------------|--------------------------------|--------------------|
| March | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 2 (NA) | 2 (NA) |
| | Dry | 3 (NA) | 0 (0%) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 5 (NA) | 2 (67%) |
| April | Wet | 18 (150%) | 0 (0%) |
| | Above Normal | 14 (140%) | -1 (-4%) |
| | Below Normal | 20 (333%) | 0 (0%) |
| | Dry | 49 (96%) | 6 (6%) |
| | Critical | 2 (200%) | -2 (-40%) |
| | All | 103 (129%) | 3 (2%) |
| May | Wet | 488 (147%) | 9 (1%) |
| | Above Normal | 158 (72%) | -78 (-17%) |
| | Below Normal | 273 (148%) | 4 (1%) |
| | Dry | 267 (132%) | -47 (-9%) |
| | Critical | 186 (92.1%) | -40 (-9%) |
| | All | 1,372 (120%) | -152 (-6%) |
| June | Wet | 487 (84%) | -3 (0%) |
| | Above Normal | 265 (87%) | 58 (11%) |
| | Below Normal | 237 (112%) | -10 (-2%) |
| | Dry | 325 (97%) | -5 (-1%) |
| | Critical | 167 (45%) | -69 (-11%) |
| | All | 1,481 (82%) | -29 (-1%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

4

1 Table 11-4A-112. Differences between Baselines and H4_ELT in Total Degree-Days (°F-Days) by
2 Month and Water Year Type for Water Temperature Exceedances above 68°F in the Sacramento
3 River at Hamilton City, March through June

| Month | Water Year Type | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|-------|-----------------|--------------------------------|--------------------|
| March | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 0 (NA) | 0 (NA) |
| April | Wet | 0 (NA) | 0 (NA) |
| | Above Normal | 0 (NA) | 0 (NA) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 0 (NA) | 0 (NA) |
| | All | 0 (NA) | 0 (NA) |
| May | Wet | 9 (129%) | 0 (0%) |
| | Above Normal | 12 (NA) | -1 (-8%) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 1 (NA) | 0 (0%) |
| | All | 22 (314%) | -1 (-3%) |
| June | Wet | 2 (NA) | 0 (0%) |
| | Above Normal | 4 (400%) | 3 (150%) |
| | Below Normal | 0 (NA) | 0 (NA) |
| | Dry | 0 (NA) | 0 (NA) |
| | Critical | 1 (NA) | 0 (0%) |
| | All | 7 (700%) | 3 (60%) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

4

5 *Feather River*

6 Mean flows under H4_ELT in the Feather River between Thermalito Afterbay and the confluence
7 with the Sacramento River during the February to May would be similar to or up to 518% greater
8 than flows under NAA_ELT at Thermalito and up to 12% greater at the confluence.

9 Mean water temperatures in the Feather River below Thermalito Afterbay and at the confluence
10 with the Sacramento River were examined during the February through May white sturgeon
11 spawning and egg incubation period. Mean monthly water temperatures would not differ between
12 NAA_ELT and H4_ELT at either location throughout the period.

1 *San Joaquin River*

2 Mean monthly flows in the San Joaquin River at Vernalis under H4_ELT during February through
3 May would be similar to those under NAA_ELT (Appendix 11C, *CALSIM II Model Results utilized in the*
4 *Fish Analysis*).

5 Water temperature modeling was not conducted for the San Joaquin River.

6 *NEPA Effects:* Collectively, these modeling results indicate that the effect is not adverse because it
7 does not have the potential to substantially reduce the amount of suitable habitat. Flows under
8 Alternative 4A would generally be higher in the Feather River relative to the NAA_ELT and generally
9 similar to flows under the NAA_ELT in the Sacramento and San Joaquin Rivers. Alternative 4A would
10 not affect temperatures in any river during the white sturgeon spawning and egg incubation period.
11 Results would generally be similar between H3_ELT and H4_ELT.

12 *CEQA Conclusion:* Collectively, the results of the Impact AQUA-148 CEQA analysis show that the
13 difference between the CEQA baseline and Alternative 4A could be significant because, when
14 compared to the CEQA baseline, the alternative would substantially reduce the quantity and quality
15 of spawning and egg incubation habitat for white sturgeon relative to Existing Conditions. However,
16 as further described below in the Summary of CEQA Conclusion, the comparison to the NAA_ELT is a
17 better approach because it isolates the effects of the alternative from those of sea level rise, climate
18 change, and future water demand. Based on this identification of the actual increment of change
19 attributable to the alternative, Alternative 4A would not affect the quantity and quality of spawning
20 and egg incubation habitat for white sturgeon relative to the Existing Conditions.

21 H3_ELT /ESO_ELT

22 *Sacramento River*

23 Flows in the Sacramento River at Wilkins Slough and Verona were examined during the February to
24 May spawning and egg incubation period for white sturgeon (Appendix 11C, *CALSIM II Model Results*
25 *utilized in the Fish Analysis*). At Wilkins Slough, mean flows under H3_ELT would generally be similar
26 to those under Existing Conditions. At Verona, mean flow under H3_ELT for most of the months and
27 water year types would be slightly lower (less than 10% lower) than flows under Existing
28 Conditions during February and April, and similar during March and May.

29 Mean water temperatures in the Sacramento River at Hamilton City were examined during the
30 February through May white sturgeon spawning period (Appendix 11D, *Sacramento River Water*
31 *Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would
32 be no differences (<5%) in mean monthly water temperature between Existing Conditions and
33 H3_ELT in any month or water year type throughout the period

34 The number of days when temperatures exceeded the analysis criterion (i.e., 61°F optimal and 68°F
35 lethal threshold identified in Table 11-4A-13) by >0.5°F to >5°F in 0.5°F increments were
36 determined for each month (March through June) and year of the 82-year modeling period. The
37 combination of number of days and degrees above each threshold were further assigned a “level of
38 concern”, as defined in Table 11-4A-14. Differences between baselines and H3_ELT in the highest
39 level of concern across all months and all 82 modeled years are presented in Table 11-4A-107. For
40 the 61°F threshold, there would be 23 more (288% increase) “red” years under H3_ELT than under
41 Existing Conditions. For the 68°F threshold, there would be negligible differences in the number of
42 years under each level of concern between Existing Conditions and H3_ELT.

1 Total degree-days exceeding 61°F and 68°F were summed by month and water year type at
2 Hamilton City during March through June (Table 11-4A-108, Table 11-4A-109). Total degree-days
3 exceeding the 61°F threshold under H3_ELT would be 5 degree-days (percent change unable to be
4 calculated due to division by 0) to 1,256 degree-days (110%) higher depending on month. Total
5 degree-days exceeding the 68°F threshold would not differ between Existing Conditions and H3_ELT
6 during March and April. During May and June, total degree-days would be 13 (186%) and 2 (200%)
7 degree-days higher under H3_ELT, although these small absolute differences would not have a
8 biologically meaningful effect on white sturgeon.

9 *Feather River*

10 Flows in the Feather River between Thermalito Afterbay and the confluence with the Sacramento
11 River were examined during the February to May spawning and egg incubation period for white
12 sturgeon (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Differences in mean
13 flows between H3_ELT and Existing Conditions at Thermalito Afterbay would vary greatly during
14 the period. Mean flows during February and March would be up to 48% lower under H3_ELT in
15 below normal and dry water years and would be similar or moderately higher in other water year
16 types, while in April and May they would be up to 33% higher depending on water year type. Mean
17 flows at the confluence with the Sacramento River under H3_ELT would generally be similar to or
18 greater than flows under Existing Conditions, except in below normal years during February and
19 March (14% and 15% lower, respectively). These results indicate that there would be some
20 reductions in flows in the Feather River under H3_ELT relative to Existing Conditions.

21 Mean water temperatures in the Feather River below Thermalito Afterbay and at the confluence
22 with the Sacramento River were examined during the February through May white sturgeon
23 spawning and egg incubation period (Appendix 11D, *Sacramento River Water Quality Model and
24 Reclamation Temperature Model Results utilized in the Fish Analysis*). Mean water temperatures
25 would not differ (<5%) between Existing Conditions and H3_ELT at either location throughout the
26 period.

27 *San Joaquin River*

28 Mean flows under H3_ELT were examined in the San Joaquin River at Vernalis during February
29 through May. Flows under H3_ELT during March and April would be up to 12% lower than those
30 under Existing Conditions, whereas flows under H3_ELT during February and May would be similar
31 to those under Existing Conditions (Appendix 11C, *CALSIM II Model Results utilized in the Fish
32 Analysis*).

33 Water temperature modeling was not conducted for the San Joaquin River.

34 H4_ELT/HOS_ELT

35 *Sacramento River*

36 Mean flows under H4_ELT in the Sacramento River at Wilkins Slough and Verona during February to
37 May would generally be similar to or lower than flows under Existing Conditions, except during
38 April and May at Verona, in which flows under H4_ELT would be up to 30% greater (Appendix 11C,
39 *CALSIM II Model Results utilized in the Fish Analysis*).

40 Mean water temperatures in the Sacramento River at Hamilton City were examined during the
41 February through May white sturgeon spawning period (Appendix 11D, *Sacramento River Water*

1 *Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would
2 be no differences (<5%) in mean monthly water temperature between Existing Conditions and
3 H4_ELT in any month or water year type throughout the period.

4 The number of days when temperatures exceeded the analysis criterion (i.e., 61°F optimal and 68°F
5 lethal threshold identifies in Table 11-4A-13) by >0.5°F to >5°F in 0.5°F increments were
6 determined for each month (March through June) and year of the 82-year modeling period. The
7 combination of number of days and degrees above each threshold were further assigned a “level of
8 concern”, as defined in Table 11-4A-14. Differences between baselines and H4_ELT in the highest
9 level of concern across all months and all 82 modeled years are presented in Table 11-4A-110. For
10 the 61°F threshold, there would be 29 more (363% increase) “red” years under H4_ELT than under
11 Existing Conditions. For the 68°F threshold, there would be negligible differences in the number of
12 years under each level of concern between Existing Conditions and H4_ELT.

13 Total degree-days exceeding 61°F and 68°F were summed by month and water year type at
14 Hamilton City during March through June (Table 11-4A-108, Table 11-4A-109). Total degree-days
15 exceeding the 61°F threshold under H4_ELT would be 5 degree-days (percent change unable to be
16 calculated due to division by 0) to 1,481 degree-days (82%) higher depending on month. Total
17 degree-days exceeding the 68°F threshold would not differ between Existing Conditions and H4_ELT
18 during March and April. During May and June, total degree-days under H4_ELT would be 22 (314%)
19 and 7 (700%) degree-days higher, although these small absolute differences would not have a
20 biologically meaningful effect on white sturgeon.

21 *Feather River*

22 Mean flows under H4_ELT in the Feather River at Thermalito Afterbay and the confluence with the
23 Sacramento River during the February to May would generally be similar to or up to 22% lower
24 than flows under Existing Conditions during February and March and would be up to 509% greater
25 than flows under Existing Conditions during April and May, except for critical water years in which
26 flows would be similar for the two scenarios. (Appendix 11C, *CALSIM II Model Results utilized in the*
27 *Fish Analysis*).

28 Mean water temperatures in the Feather River below Thermalito Afterbay and at the confluence
29 with the Sacramento River were examined during the February through May white sturgeon
30 spawning and egg incubation period (Appendix 11D, *Sacramento River Water Quality Model and*
31 *Reclamation Temperature Model Results utilized in the Fish Analysis*). Mean monthly water
32 temperatures would not differ between Existing Conditions and H4_ELT at either location
33 throughout the period.

34 *San Joaquin River*

35 Mean flows under H4_ELT in the San Joaquin River would generally be similar or up to 12% lower
36 than flows under Existing Conditions.

37 Summary of CEQA Conclusion

38 Under Alternative 4A, there would be small to moderate, persistent reductions in flows in the
39 Sacramento, Feather, and San Joaquin Rivers that would cause biologically meaningful effects to
40 white sturgeon spawning and egg incubation habitat. Further, there would be increases in
41 exceedances of NMFS temperature thresholds in the Sacramento River that would cause a
42 biologically meaningful effect to white sturgeon spawning and egg incubation. Results would

1 generally be consistent between H3_ELT and H4_ELT. Contrary to the NEPA conclusion set forth
2 above, these modeling results indicate that the difference between Existing Conditions and
3 Alternative 4A could be significant because the alternative could substantially reduce the quantity
4 and quality of suitable spawning and egg incubation habitat.

5 However, this interpretation of the biological modeling results is likely attributable to different
6 modeling assumptions for four factors: sea level rise, climate change, future water demands, and
7 implementation of the alternative. As discussed in Section 11.3.3, because of differences between the
8 CEQA and NEPA baselines, it is sometimes possible for CEQA and NEPA significance conclusions to
9 vary between one another under the same impact discussion. The baseline for the CEQA analysis is
10 Existing Conditions at the time the NOP was prepared. Both the action alternative and the NEPA
11 baseline (NAA_ELT) models anticipated future conditions that would occur at 2025 (ELT
12 implementation period), including the projected effects of climate change (precipitation patterns),
13 sea level rise and future water demands, as well as implementation of required actions under the
14 2008 USFWS BiOp and the 2009 NMFS BiOp. Because the action alternative modeling does not
15 partition the effects of implementation of the alternative from the effects of sea level rise, climate
16 change, and future water demands, the comparison to Existing Conditions may not offer a clear
17 understanding of the impact of the alternative on the environment. The comparison to the NAA_ELT
18 is a better approach because it isolates the effect of the alternative from those of sea level rise,
19 climate change, and future water demands.

20 When compared to NAA_ELT and informed by the NEPA analysis above, flows under Alternative 4A
21 would generally be higher in the Feather River and generally similar in the Sacramento and San
22 Joaquin Rivers. Alternative 4A would not affect temperatures in any river during the white sturgeon
23 spawning and egg incubation period. These modeling results represent the increment of change
24 attributable to the alternative, demonstrating the similarities in flows, reservoir storage, and water
25 temperature under Alternative 4A and the NAA_ELT, and addressing the limitations of the CEQA
26 baseline (Existing Conditions). Therefore, this impact is found to be less than significant and no
27 mitigation is required.

28 Impact AQUA-149: Effects of Water Operations on Rearing Habitat for White Sturgeon

29 In general, Alternative 4A would not affect quantity and quality of white sturgeon larval and juvenile
30 rearing habitat relative to the NAA_ELT.

31 Water temperature was used to determine the potential effects of alternatives on white sturgeon
32 larval and juvenile rearing habitat because larvae and juveniles are benthic-oriented and, therefore,
33 their habitat is more likely to be limited by changes in water temperature than flow rates.

34 H3_ELT/ESO_ELT

35 Mean water temperatures in the Sacramento River at Hamilton City were examined during the year-
36 round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality Model
37 and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no
38 differences (<5%) in mean water temperature between NAA_ELT and H3_ELT in any month or
39 water year type throughout the period.

40 Mean water temperatures in the Feather River at Honcut Creek were examined during the year-
41 round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality Model
42 and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no

1 differences (<5%) in mean water temperature between NAA_ELT and H3_ELT in any month or
2 water year type throughout the period

3 Water temperatures were not modeled in the San Joaquin River.

4 H4_ELT /HOS_ELT

5 Mean monthly water temperatures in the Sacramento River at Hamilton City were examined during
6 the year-round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water
7 Quality Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would
8 be no differences (<5%) in mean monthly water temperature between NAA_ELT and H4_ELT in any
9 month or water year type throughout the period.

10 Mean monthly water temperatures in the Feather River at Honcut Creek were examined during the
11 year-round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality
12 Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no
13 differences (<5%) in mean monthly water temperature between NAA_ELT and H4_ELT in any month
14 or water year type throughout the period.

15 Water temperatures were not modeled in the San Joaquin River.

16 *NEPA Effects:* These modeling results indicate that the effect is not adverse because it does not have
17 the potential to substantially reduce the amount of suitable habitat. There would be no differences
18 in water temperatures between Alternative 4A and the NAA_ELT. Results would be similar between
19 H3_ELT and H4_ELT.

20 *CEQA Conclusion:* In general, Alternative 4A would not affect the quantity and quality of white
21 sturgeon larval and juvenile rearing habitat relative to Existing Conditions.

22 Water temperature was used to determine the potential effects of alternatives on white sturgeon
23 larval and juvenile rearing habitat because larvae and juveniles are benthic-oriented and, therefore,
24 their habitat is more likely to be limited by changes in water temperature than flow rates.

25 H3_ELT /ESO_ELT

26 Mean water in the Sacramento River at Hamilton City were examined during the year-round white
27 sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality Model and
28 Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no differences
29 (<5%) in mean water temperature between Existing Conditions and H3_ELT in any month or water
30 year type throughout the period.

31 Mean water temperatures in the Feather River at Honcut Creek were examined during the year-
32 round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality Model
33 and Reclamation Temperature Model Results utilized in the Fish Analysis*). Mean water temperatures
34 would be similar between Existing Conditions and H3_ELT during all months and water year types
35 except July of critical water years and August of dry years, in which the means would be 7% and 6%
36 higher, respectively, under H3_ELT.

37 Water temperatures were not modeled in the San Joaquin River.

1 H4_ELT/HOS_ELT

2 Mean water temperatures in the Sacramento River at Hamilton City were examined during the year-
3 round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality Model*
4 *and Reclamation Temperature Model Results utilized in the Fish Analysis*). There would be no
5 differences (<5%) in mean water temperature between Existing Conditions and H4_ELT in any
6 month or water year type throughout the period.

7 Mean monthly water temperatures in the Feather River at Honcut Creek were examined during the
8 year-round white sturgeon juvenile rearing period (Appendix 11D, *Sacramento River Water Quality*
9 *Model and Reclamation Temperature Model Results utilized in the Fish Analysis*). Mean water
10 temperatures would be similar between Existing Conditions and H4_ELT during all months and
11 water year types except July of dry and critical water years, in which temperatures under H4_ELT
12 would be 5% and 6% higher, and August of dry years, in which the temperature would be 6%
13 higher.

14 Water temperatures were not modeled in the San Joaquin River.

15 Summary of CEQA Conclusion

16 These modeling results indicate that the effect is less than significant because it does not have the
17 potential to substantially reduce the amount of suitable habitat and no mitigation is required. There
18 would be few differences in water temperatures between Alternative 4A and the CEQA baseline.
19 Results would be similar between H3_ELT and H4_ELT.

20 Impact AQUA-150: Effects of Water Operations on Migration Conditions for White Sturgeon

21 In general, effects of Alternative 4A on white sturgeon migration conditions relative to NAA_ELT are
22 not adverse.

23 Upstream of the Delta

24 H3_ELT/ESO_ELT

25 Analyses for white sturgeon focused on the Sacramento River (North Delta to RM 143—i.e., Wilkins
26 Slough and Verona CALSIM nodes). Larval transport flows were represented by the average number
27 of months per year that exceeded thresholds of 17,700 cfs (Wilkins Slough) and 31,000 cfs (Verona)
28 (Table 11-4A-113). Exceedances of the 17,700 cfs threshold for Wilkins Slough and the 31,000 cfs
29 threshold at Verona under H3_ELT would generally be similar to those under NAA_ELT. Despite
30 some large relative difference (up to 25%), the changes on an absolute scale would be small (up to
31 0.2 fewer months per year).

1 Table 11-4A-113. Difference and Percent Difference in Number of Months in Which Flow Rates
2 Exceed 17,700 and 5,300 cfs in the Sacramento River at Wilkins Slough and 31,000 cfs at Verona

| | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT |
|---|--------------------------------|--------------------|
| Wilkins Slough, 17,700 cfs ^a | | |
| Wet | -0.1 (-4%) | 0 (0%) |
| Above Normal | 0.1 (6%) | 0 (0%) |
| Below Normal | -0.1 (-25%) | 0 (0%) |
| Dry | 0 (0%) | 0 (0%) |
| Critical | 0 (0%) | 0 (0%) |
| Wilkins Slough, 5,300 cfs ^b | | |
| Wet | 0 (-1%) | -0.1 (-1%) |
| Above Normal | -0.3 (-4%) | 0 (0%) |
| Below Normal | -0.2 (-4%) | 0.1 (3%) |
| Dry | -0.1 (-1%) | 0 (0%) |
| Critical | 0 (0%) | -0.1 (-2%) |
| Verona, 31,000 cfs ^a | | |
| Wet | -0.4 (-16%) | -0.2 (-8%) |
| Above Normal | 0 (0%) | 0 (0%) |
| Below Normal | -0.1 (-29%) | -0.1 (-17%) |
| Dry | -0.1 (-40%) | -0.1 (-25%) |
| Critical | 0 (NA) | 0 (NA) |

Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline).

NA = could not be calculated because the denominator was 0.

^a Months analyzed: February through May.

^b Months analyzed: November through May.

3

4 The effects of changes in flow for white sturgeon under Alternative 4A was also examined by
5 utilizing the positive correlation between year class strength and Delta outflow during April and
6 May (USFWS 1995) under the assumption that the mechanism responsible for the relationship is
7 that Delta outflow provides improved transport (e.g., for white sturgeon larvae or other early life
8 stages) that results in improved year class strength. An examination of monthly average Delta
9 outflow exceedances above 15,000 cfs, 20,000 cfs, and 25,000 cfs during April and May of wet and
10 above-normal years was used to provide context for differences in through-Delta migration
11 conditions, per recommendations by the Anadromous Fish Restoration Program (USFWS 1995). The
12 percentage of months exceeding flow thresholds under H3_ELT would generally be lower than those
13 under NAA_ELT (up to 50% lower) (Table 11-4A-114). These results indicate that, using the positive
14 correlation between Delta outflow and year class strength, year class strength generally would be
15 lower under H3_ELT.

1 Table 11-4A-114. Difference and Percent Difference in Percentage of Months in Which Average
2 Delta Outflow is Predicted to Exceed 15,000, 20,000, and 25,000 Cubic Feet per Second (cfs) in
3 April and May of Wet and Above-Normal Water Years

| Flow | Water Year Type | EXISTING CONDITIONS vs. H3_ELT | NAA_ELT vs. H3_ELT | EXISTING CONDITIONS vs. H4_ELT | NAA_ELT vs. H4_ELT |
|--|-----------------|--------------------------------|--------------------|--------------------------------|--------------------|
| April | | | | | |
| 15,000 cfs | Wet | -4 (-4%) | -4 (-4%) | 4 (4%) | 4 (4%) |
| | Above Normal | -17 (-18%) | -17 (-18%) | (0%) | (0%) |
| 20,000 cfs | Wet | -8 (-9%) | -8 (-9%) | 15 (18%) | 15 (18%) |
| | Above Normal | -33 (-44%) | -33 (-44%) | 8 (11%) | 8 (11%) |
| 25,000 cfs | Wet | -19 (-24%) | -19 (-24%) | 12 (14%) | 12 (14%) |
| | Above Normal | -17 (-29%) | -17 (-29%) | 25 (43%) | 25 (43%) |
| May | | | | | |
| 15,000 cfs | Wet | -12 (-13%) | -12 (-13%) | 8 (9%) | 8 (9%) |
| | Above Normal | -33 (-40%) | -25 (-33%) | (0%) | 8 (11%) |
| 20,000 cfs | Wet | -27 (-32%) | -15 (-21%) | -4 (-5%) | 8 (11%) |
| | Above Normal | -17 (-40%) | -8 (-25%) | 25 (60%) | 33 (100%) |
| 25,000 cfs | Wet | -19 (-28%) | -12 (-19%) | -8 (-11%) | (0%) |
| | Above Normal | -17 (-50%) | -17 (-50%) | (0%) | (0%) |
| April/May Average | | | | | |
| 15,000 cfs | Wet | -8 (-8%) | -4 (-4%) | 4 (4%) | 8 (8%) |
| | Above Normal | -17 (-17%) | -17 (-17%) | (0%) | (0%) |
| 20,000 cfs | Wet | -15 (-17%) | -15 (-17%) | 8 (9%) | 8 (9%) |
| | Above Normal | -17 (-25%) | -8 (-14%) | 17 (25%) | 25 (43%) |
| 25,000 cfs | Wet | -19 (-24%) | -12 (-16%) | (0%) | 8 (11%) |
| | Above Normal | -17 (-33%) | -17 (-33%) | 25 (50%) | 25 (50%) |
| Note: Negative numbers indicate lower values under Alternative 4A (i.e., the calculations are based on Alternative 4A minus the baseline). | | | | | |

4

5 For juveniles, flows in the Sacramento River at Verona were examined during the year-round
6 migration period (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*). Flows at
7 Verona under H3_ELT would be lower by up to 22% relative to NAA_ELT during July, September and
8 November, greater by up to 35% greater during June, and similar in the remaining eight months
9 (Appendix 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

10 For adults, the average number of months per year during the November through May adult
11 migration period in which flows in the Sacramento River at Wilkins Slough exceed 5,300 cfs was
12 determined (Table 11-4A-113). The average number of months exceeding 5,300 cfs under H3_ELT
13 would be similar to the number of months under NAA_ELT.

14 H4_ELT/HOS_ELT

15 Year-round flows under H4_ELT in the Sacramento River at Verona would be similar to those under
16 NAA_ELT, except during June, in which mean flows under H4_ELT would be up to 35% higher,

1 during July through September and November, in which flows would be up to 22% lower (Appendix
2 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

3 **For H4_ELT, the percentage of months exceeding the USFWS's (1995) recommended Delta outflow**
4 **thresholds in April and May of wet and above normal years was similar or considerably greater than**
5 **NAA_ELT (Table 11-4A-114). These results indicate that, using the positive correlation between**
6 **Delta outflow and year class strength, year class strength generally would be similar or greater**
7 **under H4_ELT relative to NAA_ELT.**

8 Through-Delta

9 As described for other species (e.g., Sacramento splittail in Impact AQUA-114), migration conditions
10 in the southern Delta generally would be considerably improved relative to NAA_ELT, because of
11 reduced frequency of reverse OMR flows. The range of Alternative 4A operations (i.e., H3_ELT and
12 H4_ELT) includes a range of Delta outflows, as described above (see Table 11-4A-114), which is
13 discussed further below.

14 *NEPA Effects:* Upstream flows (above north Delta intakes) would generally be similar between
15 Alternative 4A and NAA_ELT. As noted for green sturgeon and described above, due to the removal
16 of water at the North Delta intakes, there are substantial differences in through-Delta flows between
17 Alternative 4A and NAA_ELT. The percentage of months exceeding the USFWS (1995) Delta outflow
18 thresholds in April and May of wet and above normal years was appreciably lower than NAA_ELT
19 **for Alternative 4A's H3_ELT scenario, but was similar or considerably greater than NAA_ELT for**
20 **Alternative 4A's H4_ELT scenario (Table 11-4A-114).** As noted for Alternative 4 and in the analysis
21 of green sturgeon, the exact mechanism for the correlation between white sturgeon year-class
22 strength and Delta outflow is not known at this time.

23 The scientific uncertainty regarding which mechanisms are responsible for the positive correlation
24 between year class strength and river/Delta flow will be addressed through targeted research and
25 monitoring to be conducted in the years leading up to the initiation of north Delta facilities
26 operations as described in the adaptive management and monitoring program in Section 4.1 to
27 inform decisions regarding Delta outflow such that the effect on white sturgeon Delta flow
28 conditions would not be adverse. This uncertainty and the associated adaptive management and
29 monitoring program, combined with similarities in upstream flow conditions between Alternative
30 4A and NAA_ELT, indicate that Alternative 4A would not be adverse to migration conditions for
31 white sturgeon.

32 *CEQA Conclusion:* In general, Alternative 4A would reduce the quantity and quality of migration
33 habitat for white sturgeon relative to Existing Conditions. However, as further described below in
34 the Summary of CEQA Conclusion, **reviewing the alternative's impacts in relation to the NAA_ELT is**
35 **a better approach because it isolates the effect of the alternative from those of sea level rise, climate**
36 **change, and future water demand. Informed by the NAA_ELT comparison, Alternative 4A would not**
37 **affect the quantity and quality of migration habitat for white sturgeon.**

38 Upstream of the Delta

39 H3_ELT/ESO_ELT

40 The number of months per year with exceedances above the 17,700 cfs threshold for Wilkins Slough
41 under H3_ELT would be similar to those under Existing Conditions on the relative scale (%), except
42 in below normal years (25% lower) (Table 11-4A-113). The number of months per year exceeding

1 31,000 cfs at Verona under H3_ELT would be up to 40% lower than those under Existing Conditions.
2 All of these changes would be small to moderate on the absolute scale (up to 0.4 fewer months per
3 year).

4 For Delta outflow, the percent of months exceeding outflow thresholds under H3_ELT would
5 consistently be lower than those under Existing Conditions for each flow threshold, water year type,
6 and month (4% to 50% lower on a relative scale) (Table 11-4A-114).

7 For juveniles, flows in the Sacramento River at Verona were examined during the year-round
8 migration period. In general, mean flows under H3_ELT would be similar or lower relative to
9 Existing Conditions during January through May and July through December, with the largest
10 reductions in flow (up to 31% lower) during July through September. Flows under H3_ELT would be
11 higher (up to 50%) during June of above normal, below normal, and dry water years and during
12 September of wet and above normal water years (Appendix 11C, *CALSIM II Model Results utilized in*
13 *the Fish Analysis*).

14 For adult migration, the average number of months per year exceeding 5,300 cfs at Wilkins Slough
15 under H3_ELT would be similar to or slightly lower than the number of months under Existing
16 Conditions (up to 4% lower) (Table 11-4A-113).

17 H4_ELT/HOS_ELT

18 Year-round flows under H4_ELT in the Sacramento River at Verona would be similar to or up to 43%
19 greater than flows under Existing Conditions during April through June, September, and December,
20 and up to 28% lower than flows under Existing Conditions in the remaining 7 months (Appendix
21 11C, *CALSIM II Model Results utilized in the Fish Analysis*).

22 Through-Delta

23 **Given the improved OMR flows and the range of Delta outflows under Alternative 4A's H3_ELT and**
24 **H4_ELT that would be refined to avoid negative impacts to green sturgeon (see NEPA Effects**
25 **discussion above), the potential impact of Alternative 4A on in-Delta conditions for white sturgeon**
26 **is considered less than significant, and no mitigation would be required.**

27 Summary of CEQA Conclusion

28 Under Alternative 4A, the exceedance of flow thresholds in the Sacramento River would be lower
29 than under Existing Conditions. Exceedance of Delta outflow thresholds would be lower under
30 **Alternative 4A's H3_ELT** scenario than under Existing Conditions, but would be similar or greater
31 than under Existing Conditions for the H4_ELT scenario, although there is high uncertainty that year
32 class strength is due to Delta outflow or if both year class strength and Delta outflows are co-varying
33 with another unknown factor. Juvenile migration flows in the Sacramento River at Verona would be
34 up to 31% lower in six (for H3_ELT) or seven (for H4_ELT) of 12 months relative to Existing
35 Conditions. These reduced flows would have a substantial effect on the ability to migrate
36 downstream, delaying or slowing rates of successful migration downstream and increasing the risk
37 of mortality. Contrary to the NEPA conclusion set forth above, these modeling results indicate that
38 the difference between Existing Conditions and Alternative 4A could be significant because the
39 alternative could substantially reduce migration conditions for white sturgeon.

40 However, this interpretation of the biological modeling is likely attributable to different modeling
41 assumptions for four factors: sea level rise, climate change, future water demands, and

1 implementation of the alternative. As discussed in Section 11.3.3, because of differences between the
2 CEQA and NEPA baselines, it is sometimes possible for CEQA and NEPA significance conclusions to
3 vary between one another under the same impact discussion. The baseline for the CEQA analysis is
4 Existing Conditions at the time the NOP was prepared. Both the action alternative and the NEPA
5 baseline (NAA_ELT) models anticipated future conditions that would occur at 2025 (ELT
6 implementation period), including the projected effects of climate change (precipitation patterns),
7 sea level rise and future water demands, as well as implementation of required actions under the
8 2008 USFWS BiOp and the 2009 NMFS BiOp. Because the action alternative modeling does not
9 partition the effects of implementation of the alternative from the effects of sea level rise, climate
10 change, and future water demands, the comparison to Existing Conditions may not offer a clear
11 understanding of the impact of the alternative on the environment. This suggests that the
12 comparison in results between the alternative and NAA_ELT, is a better approach because it isolates
13 the effect of the alternative from those of sea level rise, climate change, and future water demands.

14 When compared to NAA_ELT and informed by the NEPA analysis above, there would be negligible
15 effects on upstream flows.

16 In addition and as noted for green sturgeon, Real Time Operations described for the water
17 conveyance facilities allow for optimization of short-term adjustments. This will ensure that the
18 impacts of water operations on migration conditions for white sturgeon are less than significant.
19 The adaptive management and monitoring program will evaluate water operations to ensure the
20 impacts of water operations on migration conditions for white sturgeon are less than significant.
21 Therefore, this impact is found to be less than significant and no mitigation is required.

22 Restoration Measures (Environmental Commitment 2, Environmental Commitment 4–
23 Environmental Commitment 7, and Environmental Commitment 10)

24 As described for other covered fishes, Alternative 4A includes a greatly reduced extent of restoration
25 measures relative to Alternative 4 and Alternative 1A. The mechanisms of impacts of habitat
26 restoration discussed for winter-run Chinook salmon generally would be similar for white sturgeon.
27 As noted for green sturgeon, white sturgeon may inhabit the Delta year-round and would be more
28 likely to encounter any effects from restoration measures. However, because the extent of
29 restoration is limited to offsetting losses from construction of the water conveyance facilities, any
30 such effects would be greatly limited compared to Alternative 1A and 4, for example.

31 Impact AQUA-151: Effects of Construction of Restoration Measures on White Sturgeon

32 The discussion of Impact AQUA-133 for green sturgeon also is applicable to white sturgeon.

33 *NEPA Effects:* The effects of short-term construction activities would not be adverse to white
34 sturgeon because environmental commitments would limit the potential for construction-related
35 effects.

36 *CEQA Conclusion:* As discussed for Alternative 1A, habitat restoration activities could result in
37 short-term effects on white sturgeon but would be localized, sporadic, and of low magnitude; such
38 effects would be avoided by limiting the frequency, duration, and spatial extent of in-water work
39 and with implementation of environmental commitments (see Appendix 3B, *Environmental*
40 *Commitments*). The potential impact of habitat restoration activities is considered less than
41 significant because it would not substantially reduce white sturgeon habitat, restrict its range, or
42 interfere with its movement. No additional mitigation would be required.

1 Impact AQUA-152: Effects of Contaminants Associated with Restoration Measures on White
2 Sturgeon

3 The discussion of Impact AQUA-134 for green sturgeon also is applicable to white sturgeon.

4 *NEPA Effects:* While Alternative 4A habitat restoration actions may result in a very small increase
5 production, mobilization, and bioavailability of methylmercury, selenium, copper, and pesticides in
6 the aquatic system, any such releases would be short-term and localized, and would be unlikely to
7 result in measurable increases in the bioaccumulation of these contaminants in white sturgeon.
8 Alternative 4A would restore 59 acres of tidal wetlands that, depending on the specific site
9 conditions of the restoration, may result in the colonization of benthic grazers that bioaccumulate
10 selenium. As sturgeon are benthic feeders, the increased habitat for grazers may result in increased
11 exposure to selenium. However, the small amount of area to be restored would not result in a
12 substantial change in exposure potential. Overall, the effects of contaminants associated with
13 restoration measures would not be adverse for white sturgeon.

14 *CEQA Conclusion:* Habitat restoration under Alternative 4A may result in increased production,
15 mobilization, and bioavailability of contaminants in the aquatic system, but these would be short-
16 term and localized, and would be unlikely to result in measurable increases in the bioaccumulation
17 in white sturgeon. For methylmercury, implementation of *Environmental Commitment 12*
18 *Methylmercury Management* would help to minimize the increased mobilization of methylmercury
19 in the limited restoration areas. Therefore, the impact of contaminants is considered less than
20 significant because it would not substantially affect white sturgeon either directly or through habitat
21 modifications. Accordingly, no mitigation would be required.

22 Impact AQUA-153: Effects of Restored Habitat Conditions on White Sturgeon

23 Restored habitat under *Environmental Commitment 4 Tidal Natural Communities Restoration* and
24 *Environmental Commitment 6 Channel Margin Enhancement* is intended to offset habitat
25 loss/modification caused by construction and operation of the water facilities proposed under
26 Alternative 4A.

27 *NEPA Effects:* The effects of restored habitat conditions on white sturgeon would not be adverse
28 because restoration is intended to provide habitat benefits for white sturgeon.

29 *CEQA Conclusion:* As described above, habitat restoration activities could result in short-term
30 effects on white sturgeon, primarily as a result of increased potential for contaminated sediments to
31 enter the water column. However, these effects are likely to be localized, sporadic, and of low
32 magnitude. Adverse effects during restoration would be avoided by limiting the frequency, duration,
33 and spatial extent of in-water work and implementing the commitments described in detail under
34 Impact AQUA-1 and in Appendix 3B, *Environmental Commitments*. The potential impact of habitat
35 restoration activities is considered less than significant because it would not substantially reduce
36 white sturgeon habitat, restrict its range or interfere with its movement. Additionally, there would
37 be substantial long-term net benefits of habitat restoration. Consequently, no additional mitigation
38 would be required.

39 Other Environmental Commitments (Environmental Commitment 12, Environmental Commitment
40 15, and Environmental Commitment 16)

41 As noted for other covered species such as green sturgeon, Alternative 4A includes three other
42 Environmental Commitments, which are reduced in their extent relative to the Conservation

1 Measures included in other Alternatives (e.g., Alternative 1A and Alternative 4). While the extent of
2 these measures is reduced compared to these alternatives, the nature of the mechanisms for white
3 sturgeon remains the same.

4 Impact AQUA-154: Effects of Methylmercury Management on White Sturgeon (Environmental
5 Commitment 12)

6 The impact discussion for winter-run Chinook salmon (Impact AQUA-46) is also applicable to white
7 sturgeon.

8 *NEPA Effects:* The effects of methylmercury management on white sturgeon would not be adverse
9 because it is expected to reduce overall methylmercury levels resulting from habitat restoration.

10 *CEQA Conclusion:* As noted for winter-run Chinook salmon, effects of *Environmental Commitment 12*
11 *Methylmercury Management* within the areas restored under Alternative 4A are expected to reduce
12 overall methylmercury levels resulting from habitat restoration. Because it is designed to improve
13 water quality and habitat conditions, impacts on white sturgeon would be less than significant.
14 Consequently, no mitigation is required.

15 Impact AQUA-157: Effects of Localized Reduction of Predatory Fish on White Sturgeon
16 (Environmental Commitment 15)

17 The discussion of Impact AQUA-139 for green sturgeon also is applicable to white sturgeon.

18 *NEPA Effects:* The overall effect would not be adverse because it is unlikely that the targeted
19 predators prey on white sturgeon and because the white sturgeon bycatch is expected to be
20 minimal.

21 *CEQA Conclusion:* Consistent with the analysis for Alternative 1A, the impact is considered less than
22 significant because it is unlikely that the targeted predators prey on white sturgeon and because the
23 white sturgeon bycatch is expected to be minimal. Consequently, no mitigation would be required.

24 Impact AQUA-158: Effects of Nonphysical Fish Barriers on White Sturgeon (Environmental
25 Commitment 16)

26 The discussion of Impact AQUA-140 for green sturgeon also is applicable to white sturgeon.

27 *NEPA Effects:* The overall effect would not be adverse because the NPB would not be located in the
28 same portion of the channel that white sturgeon are expected to occur and because their hearing
29 ability is low within the range of sound that the NPB generates.

30 *CEQA Conclusion:* Consistent with the analysis for Alternative 1A, the impact is considered less than
31 significant because the NPB would not be located in the same portion of the channel that white
32 sturgeon are expected to occur and because their hearing ability is low within the range of sound
33 that the NPB generates. Consequently, no mitigation would be required.