Appendix E
Response to Comments on Draft Reservoir Water Quality Model Report

ECOLOGY'S COMMENTS ON THE DRAFT RESERVOIR WATER QUALITY REPORT

November 1, 2016

1. **Overall:** the report is well-written and conveys the information effectively and appropriately. A few suggestions for improvement follow.

2. **Section 1, page 1:**
   A. Explain that "water quality" primarily means dissolved oxygen (and the effects of temperature, BOD, and nutrients on DO) for the current analysis. However, pH, suspended solids, and metals are also of interest.
   B. Also note that TMDLs are in place both for temperature and for DO

   Anchor QEA Response: *Revised as suggested. Suspended solids and pH were evaluated in the water quality model even though they were not explicitly compared to water quality criteria in the water quality impact assessment.*

3. **Section 2.1, page 3:**
   A. In addition to the storage volume, also provide the surface area and maximum depth of full pool, and a list of the major tributaries that would be inundated.

   Anchor QEA Response: *The requested information has been included.*

4. **Section 2.3.1, page 5:**
   A. It seems like inflows could have been apportioned between Crim Creek and the upstream boundary based on watershed areas. The assumption that "*because conditions in Crim Creek are similar to the conditions in the mainstem above the reservoir area, this does not introduce a significant source of uncertainty in the reservoir model simulations*" should be tested by running a scenario with split flows. The lack of cool water inflows might influence temperatures in that arm.
   B. Was this assumption also true for the footprint model?

Anchor QEA Response:

A. A sensitivity run was conducted that split flows between Crim Creek and the mainstem based on contributing watershed areas. The model-predicted temperature and water quality were not appreciably sensitive to whether all the flow came from the mainstem or were split between Crim Creek and the mainstem. The statement cited above still holds.

B. As discussed in the draft modeling report from Portland State University, the flows were split in the footprint model between the mainstem, Crim Creek, and other minor tributaries (Lester Creek, Roger Creek, and Big Creek) based on contributing watershed area.

5. **Section 2.3.4.5, page 11:** Does the relationship of TIC and ALK to CO_2 change and atmospheric levels increase? I've seen some evidence that pH in pristine fresh waters is dropping as atmospheric CO_2 increases. Perhaps the sensitivity of the model to this parameter should be tested in the future scenarios.

Anchor QEA Response: *The relationship itself should hold. What will change is the concentration of dissolved CO2 in the water column, which in turn will affect pH and alkalinity. As described in the report, the model simulation of pH will require further investigation because the pH ranges simulated vary widely and seem unrealistic. The changes to the partial pressure of CO2 in the atmosphere resulting from climate change are not expected to have a notable change in the water column relative to the CO2 changes resulting from primary production and respiration cycle of algae and organic matter oxidation within the water column and sediments.*

6. **Table 4, page 26:** titles under "Condition" appear to be in error. The labels on the 2nd and 4th rows are identical, and I assume each row should be different. Tables 7 and 9 have the same problem.

Anchor QEA Response: *The table caption and row labels have been corrected.*

7. **Section 3.2.2.3, pages 27 to 28:**
   A. Does ammonia approach toxic levels? What are the ammonia toxicity criteria levels in the reservoir?
   B. Provide an equivalent figure to Figure 35 for the hypolimnion of the reservoir.

Anchor QEA Response: *Figure 35 has been updated to include the corresponding concentrations in the hypolimnion. A discussion on ammonia toxicity criteria has been added.*

8. **Section 3.2.2.4, page 28:** Winter pH does sound much too high. What were pH levels like in other seasons? Did you see differences between the top and bottom?

   Anchor QEA Response: *pH levels in the summer showed a greater variability between surface and bottom. Surface pH was high (near 10) and bottom pH was around 7. In the summer, primary production will increase pH in the photic zone due to CO2 removal, but the extent to which pH went up did not seem proportional to the algal levels predicted in the model. In the winter, pH levels throughout the water column were near 10.*

9. **Section 3.2.2.5, page 28:** Did the model predict SS levels from erosion and resuspension as the reservoir pool was being raised and lowered?

   Anchor QEA Response: *Full sediment transport (including erosion and resuspension) was not modeled. Only sediment deposition (based on a simple settling speed) was modeled.*

10. **Section 3.2.2.7, page 30:** Last sentence: "*migration*" – I think you meant "mitigation".

    Anchor QEA Response: *This word was changed to "mitigation."*

11. **Section 5.2.1, page 40:**
    A. *"…the temperatures are predicted to increase slightly from the current baseline in September in both years…*" The standards limit increases above "natural" to 0.3 degrees. This discussion should note the magnitude of the increase as compared to 0.3 degrees, and the length of time the FRFA increases by more than 0.3 degrees.
    B. The discussion and Figures 54a-e should note that the "future baseline" is different from the "current baseline".

    Anchor QEA Response:

    A. Tables 11 and 12 have been included to provide the number of days when temperature increases are predicted to be greater than 0.3°C.
    B. The discussion of Figures 54a through 54e notes that the future baseline is 4°C warmer than the current baseline.

12. **Section 5.2.2.1.1, page 40:** "Impacts in the upstream segment (Segment 42) are predicted to be relatively minor because it is closer to the upstream model boundary and residence time within the reservoir area is still relatively short." Would it be better to say, or add, that because it's close to the upstream boundary, vegetation impacts are minor?

    Anchor QEA Response: *This sentence has been reworded to clarify this point.*

13. Was methylation of mercury evaluated as part of reservoir modeling? If so, it should be discussed in the report.

    Anchor QEA Response: *Mercury methylation was not evaluated as part of the water quality model.*

14. Was Greenhouse Gas emissions, especially methane, evaluated as part of reservoir modeling? If so, it should be discussed in the report.

    Anchor QEA Response: *Methane or CO2 emissions were not modeled.*

15. Provide more analysis of downstream temperatures for FRO during other times of the year besides just mid-July and August and the two pool events. Show peak temperature dates for non-pool conditions in March, May, and October as well.

    Anchor QEA Response: *FRO footprint model results have been included for March, May, and October.*