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November 13, 2011

Gerald Bowes, Ph.D.
Manager, Cal/EPA Scientific Peer Review Prgram
Office of Research, Planning and Performance
State Water Resources Control Board

Re: Review of the State Water Board's Technical Report

Dear Dr. Bowes:

Attached is my review of the State Water Board's Technical Report on the Scientific Basis for San Joaquin River Flow and Water Quality Objectives and Program of Implementation.

It was a pleasure working on the review.

Sincerely,

John A. Dracup

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November 13, 2011

John Dracup, Ph.D., P.E.

SCIENTIFIC PEER REVIEW OF THE TECHNICAL REPORT (TR) ON THE SCIENTIFIC BASIS FOR ALTERNATIVE SAN JOAQUIN RIVER FLOW OBJECTIVES FOR THE PROTECTION OF FISH AND WILDLIFE BENEFICIAL USES AND PROGRAM OF IMPLEMENTATION.

Issues pertaining to San Joaquin River Flows for the Protection of Fish and Wildlife Beneficial Uses

1. Adequacy of the Technical Report's hydrologic analysis of the San Joaquin River basin comparing unimpaired flow with actual observed flows in representing changes that have occurred to the hydrograph of the San Joaquin River basin in order to provide background and support for the remaining chapter of the Technical Report.

The hydrologic analysis of the San Joaquin River Basin is covered in Chapter 2, pages 2-1 to 2-38 of the TR. The first step in the hydrologic analysis is to determine the unimpaired flows using a modeling approach. The analysis was done on a monthly basis, from 1922-2003. Modeling the unimpaired flows in a developed river basin over this 82 year time period is a difficult and non-trivial task. It requires that all of the influences of the numerous dams, exports, imports and diversions within the SJR basin be reversed. The authors of this TR have relied on the work of the CA State Dept of Water Resources UF Report; DWR 2007al, and the work of academics to support their calculations.

The determination of unimpaired streamflows as modeled from observed streamflows is an crucial component of this analysis. Unimpaired flows are difficult to reconstruct from observed records and are subject to numerous judgment calls by the person or agency who is performing this analysis. However, there are many existing observed stream flows throughout the SJ Basin that are naturally unimpaired. An example of observed unimpaired streamflows are the two records on the Merced River in the Yosemite

Valley, the one at Pohona (1916 - present) and the one at Happy Isles (1915-present). It is my opinion that the modeled unimpaired streamflows, as presented in the TR, should be compared with these two streamflows and other naturally unimpaired streamflows in the SJ Basin in order to verify the accuracy of the modeled unimpaired record.

The exceedance probability curves for annual flows, shown in Figure 2.5, are as expected as the unimpaired flows are significantly higher than the observed flows.

The monthly flow results as shown in Figures 2.8 through 2.14 are as expected, that is, the unimpaired flows are higher than the observed flow. The one exception is the Stanislaus River from Apr to Sep (1984-2009) as shown in Figure 2.9 where the observed flows are higher than the unimpaired flows. The reason for this is probably the observed releases from upstream dams.

Chapter 2 would have benefited from a Conclusion section, and I recommend that it be included.

Other points are:

a. The term “the wettest month” on the first line of page 2-17, should be changed to “month of highest runoff”. The term “wettest” usually refers to rainfall not “volume of flow” as is the topic in this case.

b. I was surprised to note that nothing was said about the potential impact of global warming and climate change in this Chapter. Numerous scholarly journal articles have been written on the subject of the impact of climate change on the future hydrology of and the runoff from the Sierra Nevada Mountains. These can be summarized by stating that we can expect more runoff during early spring months when it is not needed and less runoff in the late summer and early fall months when it is needed for irrigation purposes.

2. Determination that the changes in the flow regime of the SJR basin are impairing fish and wildlife beneficial uses.

Since this is not my area of expertise, I am not going to comment on the material in Section 3, pages 3-1 to 3-56. However, I did like the fact that this section included a Conclusions section, pages 3-51 to 3-56.

3. Appropriateness of the approach used to develop SJR flow objectives for the reasonable protection of fish and wildlife beneficial uses and the associated program of implementation.

Since this is not my area of expertise, I am not going to comment on the material in Section 3, pages 3-1 to 3-56. However, I did like the fact that this section included a Conclusions section, pages 3-51 to 3-56.

4. Determination that more flow of a more natural spatial and temporal pattern is needed from the three salmon bearing tributaries to the San Joaquin River during the February through June time frame to protect San Joaquin River fish and wildlife beneficial uses.

Since this is not my area of expertise, I am not going to comment on the material in Section 3, pages 3-1 to 3-56. However, I did like the fact that this section included a Conclusions section, pages 3-51 to 3-56.

5. Appropriateness of using a percentage of unimpaired flow, ranging from 20 to 60 percent, during the February through June time frame, from the Stanislaus, Tuolumne, and Merced Rivers is an appropriate method for implementing the narrative San Joaquin River flow objective in a way that reasonably protects fish and wildlife beneficial uses, given the other factors that the State Water Board must consider when determining a reasonable level of protection for beneficial uses.

It is my opinion the that use of exceedance probabilities, as presented in Figures 3.15 to 3.20 (pages 3-53 to 3-56), is an excellent means of comparing the observed flows with the modeled unimpaired flows and with the three different percentages, 20-60, of the modeled unimpaired flows. The resulting plots are exactly as one would expect with the modeled unimpaired flow being the largest and the observed flows being a lesser

amount. It is interesting that the observed flows are greater than the modeled unimpaired flows for exceedance probabilities less that 10%. This is probably due to the difficulty in modeling unimpaired large flood flows.

6. Appropriateness of proposed method for evaluating potential water supply impacts associated with the flow objective alternatives on the San Joaquin River at Vernalis, and Stanislaus, Tuolumne, and Merced Rivers.

The water supply effects analysis is covered in Chapter 5, pages 5-1 to 5-16. The analysis was done using the USBR's CALSIM II model. The CALSIM II model was developed jointly by the USBR and the CA State DWR for modeling the Central Valley water system. It has been successfully vetted by a team of seven experts led by Professor D. (Pete) Loucks of Cornell University in a report published in December 2003.

Presented in Figure 5.1, page 5-3, is a comparison of the observed monthly average flow at Vernalis as compared to the CALSIM II model output. The comparison is excellent, however, a indication of the degree of correlation between these two parameters would have been helpful, i.e. an R^2 value.

It is my opinion that the use of CALSIM II for determining the potential waiter supply impacts associated with the flow objectives alternatives is an appropriate means of doing this analysis.

Issues pertaining to Water Quality Objectives for the Protection of Southern Delta Agricultural Beneficial Uses

Since the water quality and salinity is not my area of interest, I am not going to comment on or answer items 7, 8 and 9 of Appendix 2.

7. Sufficiency of the statistical approach used by the State Water Board staff in the Technical Report to characterized the degradation of salinity conditions between Vernalis and the interior southern Delta.

8. Sufficiency of the mass balance analysis presented by State Water Board staff in the Technical Report for evaluating the relative effects of

National Pollutant Discharge Elimination System (NPDES) permitted point sources discharging in the southern Delta.

9. Determination by State Water Board staff that the methodology and conclusion in the January 2010 report by Dr. Glenn Hoffman, regarding acceptable levels of salinity in irrigation water, are appropriate for reasonable protection of agricultural beneficial uses n the southern Delta.

10. **Other issues.**

- The Technical Report needs an Executive Summary at its beginning.
- I did not check all of the references in the Technical Report to see if they were included in the References, pgs 6-1 to 6-15, however, the ref to Lund et al. 2010 on pa 3-52 is not in the References.