THE SOUTHWESTERN WATER CONSERVATION DISTRICT
Developing And Conserving the Waters in the
SAN JUAN AND DOLORES RIVERS AND THEIR TRIBUTARIES
IN SOUTHWESTERN COLORADO

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July 16, 2010

Jennifer Gimbel, Director
Colorado Water Conservation Board
1313 Sherman Street, Room 721
Denver, Colorado 80203

Re: Comments on the Colorado River Water Availability Study, Phase 1

Dear Ms. Gimbel:

The Southwestern Water Conservation District (SWCD) appreciates the opportunity to comment on the Colorado River Water Availability Study (CRWAS) and is very impressed by the amount of effort and thought represented by the draft report. These comments are suggestions to improve the CRWAS in order to provide a better basis for evaluation of Colorado River water availability and to provide an understanding of the uncertainty and variability associated with the potential impacts of climate changes. Steve Harris, with Harris Water Engineering, coordinated the review of CRWAS and the development of these comments. He assisted SWCD and five other water districts within SWCD; a comment letter from the other five districts is similar to this letter.

SWCD would like to thank Ray Alvarado and Greg Johnson for the effort they made to attend the Southwest Basins Roundtable on July 7 and several phone calls to assist Mr. Harris in his evaluation. Ray was especially helpful and knowledgeable.

The following comments are separated into general comments and comments that SWCD believe are critical and should be addressed before the Phase 1 CRWAS is finalized.

A. General Comments

A.1. The CRWAS is a major study with numerous models and assumptions that were developed by numerous CWCB staff and consultants (refer to Figure 1-1). The report is thorough and well organized, but due to its complexity and content it is not possible to understand the content solely by reading the report and reviewing the tables and charts. Mr. Harris spent many hours reading the report; attended several presentations at IBCC, Roundtable, and Colorado Water Congress meetings; attended the July 7 Southwest Roundtable meeting; and talked to CWCB staff on several occasions to attempt to understand some of the details of the study. Even with that effort, it is unlikely that all of the critical assumptions were reviewed for possible comment.

Depending upon feedback from other water user entities, the CWCB might consider a one or two day technical workshop to provide a full briefing and especially a review of assumptions. If

there is a consensus for a workshop, we suggest this be conducted prior to beginning Phase 2 of CRWAS.

A.2. Figure 3-37 shows five bar graphs reflecting five different estimates of the water available to Colorado under the Colorado River Compact. The "Modeled Study Period", "Extended Historical Hydrology", and "Alternate Climate Projections" were prepared at part of CRWAS. The bar graphs for "Modeled Study Period" and "Extended Historical Hydrology" provide useful information based on actual hydrology data and tree ring evaluations, but the "Alternate Climate Projections" bar graph is based on significant uncertainty and variability associated with attempting to quantify the potential affects of global warming.

The "Alternate Climate Projections" bar graph in Figure 3-37 does not provide a better understanding of the available supply but increased the misunderstanding and uncertainty. To further confuse the availability, apparently any point between 0 and 1 million acre-feet has the same probability as any other point. This bar graph seems to have more fully politicized the water available because the range is so large that any amount can be selected based on a political position.

SWCD had understood the CRWAS would provide a better understanding of the range of water available to Colorado under the Colorado River Compact. In order to accomplish that goal, SWCD recommends that the "Modeled Study Period" and "Extended Historical Hydrology" bar graphs be emphasized as study results; however, the "Alternate Climate Projections" bar graph be de-emphasized because of the uncertainty and variability inherent in the climate change estimates.

A.3. Nearly all of the figures, hydrographs in the appendices are based on alternative climate analysis. With few exceptions, the historic "2040 (or 2070) Average Monthly Modeled Streamflow" is within the range of the five climate generated streamflows in Appendix E. Based on this information it appears that the historic streamflow is as good as any modeled estimate. Though the climate change models are interesting, using the historic flow data is the best assumption because it is the most certain, understood, and repeatable of any of the potential hydrographs.

A.4. The scope and purpose of Phase 2 of CRWAS should be reviewed to verify that the original intent remains appropriate.

Further, if Phase 2 proceeds, the alternate climate information should not be used, or to a lesser extent, but the hydrology reflected by the "Modeled Study Period" and "Extended Historical Hydrology" is the basis of further study.

A.5. Given the many models used to develop the results of the study, what is the potential error range of stacking the various models? Does the variability range of each model accumulate as opposed to negating?

A.6. SWCD does not have enough knowledge about the global climate models to comment specifically. Theoretically, the downscaling is logical but whether it is accurate is yet to be seen. If there is sufficient concern about the possibility of climate change, a program to collect climate data to monitor critical information should be designed and implemented by the State. Simply

monitoring existing weather stations is not adequate because the stations move and/or instruments change. The program should utilize weather stations that are located at exactly the same location for the study period and the accuracy of the instruments are continually being verified.

A.7. The "Variable Infiltration Capacity" (VIC) model is critical to the integration of the climate models and Statemod but is not well described. The VIC model is apparently first calibrated to the historic natural flow derived using Statemod. Then a separate VIC model run is made incorporating the climate adjusted precipitation and temperatures for each of the five climate scenarios. The assumptions used to estimate the area of various types of natural vegetation and the consumptive use of the natural vegetation is not explained. Each of the five climate scenarios are compared to the historic VIC output and used to determine the "Average Monthly Modeled Streamflow".

The VIC model apparently assumes that the natural vegetation of the river basin is the same in 30 years with higher temperatures and the change in the forest cover due to fires and beetle kill. It would seem that the natural vegetation would self-adjust to the new climate conditions and the assumption that the existing vegetation would remain is not appropriate. It would seem the likely adjustment in the types of natural vegetation is a critical component to the VIC model, yet this impact is not included in the modeling for reasons stated in section 2.5. This is a further example of the uncertainty and variability in the alternate climate analysis.

A.8. Table 3-1 shows the projected increased temperature. A column showing the average annual temperature at each weather station would be helpful to understand the increased temperature is as a percentage of the average temperature. The precipitation tables (3-2 and 3-3) include this information. As with stream flow gages, the error in measurement can be plus or minus 10%; therefore, if the projected temperature or precipitation change is less than 10% it may be within measurement error. Also a statement of whether, or not, the selected weather stations have been at the same location for the entire 55 years period would be helpful in understanding the reliability of the historical and projected data.

A.9. A clear and prominently placed disclaimer statement describing how the information in the report should and should not be used is recommended. For instance: (1) are the hydrographs and data of adequate quality for use in water rights applications, by the proponent and/or opponents? Or (2) the data and hydrographs should not be used in compact curtailment analysis? Or (3) In what manner should the data be used in other State Agency studies and evaluations?

A.10. A further concern with the reliability of the alternative climate scenarios is the physical setting of the southwestern Colorado. The San Juan Mountains have the highest average elevation of any mountain range in the Rocky Mountains which greatly impacts the monsoon rains in the late summer and fall. The altitude will affect how much moisture falls as snow and the melting period (storage) which will affect the stream flow graphs and the ability to utilize the available moisture. If more moisture falls in the winter months, this could have a significant impact on snowpack predictions. This situation is extremely difficult to appropriately incorporate in the general circulation models.

B. Suggested for Changes to the Report

The Districts recommend that the report be modified to address these comments because they are critical to the results of the study. Publishing of the data and hydrographs currently in the report will not provide an accurate indication of the basin water supplies and may result in mis-representations being used in CRWAS Phase 2 and other future reports.

B. 1. The method for operation of McPhee and Vallecito Reservoirs used in the CRWAS is not correct in assuming that irrigated land can "pull" water from the reservoirs based on the crop consumptive use. These reservoirs are Reclamation facilities and as such have contracts and operational criteria that restrict the amount of water that can be provided to each acre of irrigated land served by the reservoirs. For each of these reservoirs, a maximum amount of water is assigned to specific acres of irrigated land according to Reclamation law. For example:

- Vallecito allocates the non-Indian water by multiplying the maximum reservoir content by $5/6^{th}$ then dividing by 45,000 PRID Acres. When there is a full reservoir, there is approximately 2.2 AF per PRID Acre. The CRWAS modeling does not recognize the 2.2 AF per PRID Acre limitation. The model allows lower priority ditches to pull as much water as necessary to fulfill their irrigation crop demand (with global warming the crop demand is much larger as shown on Table 3-4). The result is that Vallecito is shown to fluctuate much more in the future than the past with the implication that it is mostly attributable to global warming. In reality the fluctuation has more to do with how the reservoir is operated in the CRWAS modeling. This should be corrected by coordinating with Hal Pierce the PRID manager.

- The CRWAS modeling also allows irrigators to draw water from McPhee based on irrigation crop demand, not the contracts between the project users that establishes a maximum annual water supply for each user. With the model, the irrigation water demand for all of the Dove Creek, MVIC, and Tribal acres is drawn from the reservoir until it is empty. In actual operation each of irrigation entities have a maximum water supply that cannot be exceeded and currently all irrigators are drawing their maximum water supply in most years. The model shows much more water being withdrawn from McPhee than could actually occur which results in the fluctuation of the reservoir content in Figures G-7 and G-8 being too large. Also, the flow downstream of McPhee at Bedrock shown in Figure E-30 and F-30 is less than would actually occur. The flow below McPhee in the Dolores River is a major issue in numerous ongoing studies and the flow under global warming scenarios should be as accurate as possible. The operation of McPhee Reservoir should be corrected by coordinating with the DWCD Manager and Engineer, Mike Preston and Ken Curtis respectively, and Bureau of Reclamation.

- Jackson Gulch and Lemon Reservoirs are also Reclamation reservoirs and are assumed to be operated in a similar manner to Vallecito and McPhee. CWCB should contact the entities operating these reservoirs for the appropriate operation criteria.

B.2. The comparison of the "2040 Average Monthly Modeled Streamflow" and the "2040 Average Monthly Water Available to Meet Future Demands" does not appear to be appropriate for streams in southwest Colorado. The difference in flows between the two scenarios are very large for the gages for Carracas, Los Pinos, Florida, Animas, and LaPlata Rivers; minor for Mancos River and McElmo Creek; and are very similar for the Dolores @ Bedrock and the San

Miguel River @ Naturita gages which are not in the San Juan Basin. For example, comparing the flows for the San Juan River at Carracas; Figures E-21 shows an annual flow range of 274,300 AF to 484,300 AF for the Modeled Streamflow and Figure F-21shows a flow range of 18,000 AF to 271,600 AF for the available water to meet future demand.

There should be no difference between the two flows because Carracas is immediately upstream from Navajo Reservoir and there are essentially no diversions and no CWCB instream flow water rights downstream to be met. Apparently the reason for the difference is CRWAS uses the endangered fish flow recommendations in the San Juan River downstream of the City of Farmington as downstream demand (last bullet on page 4-2).

Based on the purpose of the San Juan Recovery Program to allow water development simultaneously with recovery of the endangered fish and the fact that the flow recommendations are NOT fixed flow requirements, the use of the flow recommendations as a downstream demand is not appropriate for "2040 (and 2070) Average Monthly Water Available to Meet Future Demands" in the San Juan River basin. The "2040 Average Monthly Modeled Streamflow" and the "2040 Average Monthly Water Available to Meet Future Demands" should essentially be equal for the gages in southwest Colorado in the San Juan River Basin.

The Districts believe that using the endangered fish flow recommendations as a downstream demand is a major policy decision that requires active discussion and agreement by the CWCB Board and stakeholders. Further we recommend that the use of the flow recommendations as a downstream demand should be removed from the "2040 (and 2070) Average Monthly Water Available to Meet Future Demands" analysis.

In order to address the flow recommendations, a footnote could be added to explain that flow recommendations are not firm downstream demands such as CWCB instream flow water rights but could impact the available developable water for specific projects and should be considered on a case-by-case basis.

B.3. The McElmo Creek natural flow estimates for 2040 and 2070 (Figures D-43, D-86, D-129) are not correct. McElmo Creek is naturally a very small drainage with a small amount of water that runs off early in the spring (e.g. March and April). The flows have been supplemented by water imported from the Dolores River by Montezuma Valley Irrigation Company (MVIC) since the late 1800's. The analysis in the report appears to include the imported water as if it were natural flow as indicated by the second runoff peak in June/July in Figures D-43 and 86. Though this is not a critical aspect of the study, it needs to be corrected to accurately reflect the McElmo Creek natural flow.

Please contact Steve Harris (970-259-5322 or steve@durangowater.com) if you have any questions concerning the comments.

Sincerely,

John Porter

John Porter, President
Southwestern Water Conservation District