HYDROSPHERE
Resource Consultants

Date: August 21, 2003

To: Don Anderson, USFWS

From: John Carron, Ph.D.

Subject: (DRAFT) Assumptions for “first increment” depletions by Colorado

---

This memo provides a summary of the assumptions used in the development of a “first increment” impact of future Colorado water development projects. This work is based on our previous efforts to estimate the impacts of future Colorado water projects on peak flows in the Platte River. The objective of this analysis was to scale back our “worst case” estimates of future impacts to include only those new project demands and depletions that are likely to occur by 2020, which is a rough estimate of the end-date of implementation of the “first increment” of the Platte River Recovery and Implementation Program.

For this analysis, we use the previously developed analysis tools to estimate how the hypothetical Colorado water projects would impact Platte River flows under two “first increment” demand scenarios. Under the “worst case” futures scenario, we had estimated a total additional future demand of 350,000 acre-feet annually. For these two first increment demand scenarios, we used 121,000 af and 86,000 af. The original magnitude of the projects was scaled back to approximate the impact of these two lesser demands using the following assumptions for each hypothetical project:

- Aurora and Denver's RRFs. Because the availability of RRFs increased from essentially zero to a significant volume over the span of the 1947-1994 period, we did not want to simply reduce all RRF utilization by a fixed percentage. Instead, we took the maximum one-day value of RRF utilization over the entire simulation period, and weighted that value by the ratio 121/350 (or 86/350), to reflect the first increment demand. We use this value as a ceiling on the maximum daily usage of RRFs. The adjusted daily values were then computed as the minimum of the new "ceiling" value, and the previously computed daily values from the previous worst-case analysis.

- Secondary Reservoir impacts from RRFs. We used the same approach as before to compute the secondary impacts on downstream reservoir filling, except that we replaced the old RRF usage schedule with the new modified schedule to reflect the lower maximum usage under the first increment demand scenarios.

- Flow Reductions due to Denver Metro Pumpback at Kersey. In the original worst-case scenario, this pumpback capacity was set to 200 cfs. We simply scaled this value down by the appropriate ratio to get a new maximum capacity.

- Flow Reductions due to Tributary Reservoir Development. Previously, we estimated this reduction as 11 percent of the historical gaged flow at Kersey. For this exercise, we simply scaled this percentage back to reflect the first increment demands (i.e., 11% x [121/350]).

- Flow Reductions due to Reservoir Development upstream of Denver. In the original study, we used a combination of a simple mass-balance reservoir model and Denver's PACSM model to estimate the impacts of a hypothetical 400 Kaf reservoir upstream of Denver. The original model showed a firm yield of about 21,000 acre-feet. For this first increment exercise, we assumed that the project size would remain the same, but that the demand – as defined by the project firm yield - would be scaled back by the (121/350) ratio. This essentially created a lagre reservoir that, once full, stayed quite full for the duration of the simulation period, due to its reduced first increment demand.

- Poudre Project Impacts. Because we do not have the model use to estimate these impacts, we had to make some gross assumptions about how the system would operate. We have daily data for the 1970-1994 period, for each of three hypothetical model components (the Mainstem (Upper) Poudre, the North Fork Poudre, and the Lower Poudre/South Platte). For these data, we assumed that the annual diversions would be scaled back by the first increment ratios. We also assumed that the daily diversions would remain the same, starting each October 1, until the project had diverted its new scaled-back annual demand. This approach made fall, winter, and early spring impacts identical to the previous analysis, but once the new annual limit was reached, no further impacts were seen until the system started to "re-fill" the next October 1. For the pre-1970 period, as before, we estimated monthly data from a regression of modeled project depletions to the USGS Cache la Poudre near Greeley gage. These monthly data were distributed uniformly over each day in the month. Also, we did not have specific information for the various components (North Fork, Mainstem, etc.), and so we treated the entire project as a single lumped diversion. As with the daily data, we computed a new annual volume, and diverted up to that volumetric limit starting each October 1.

All of the other components of this analysis were unchanged. We continued to limit the total impacts by constraints including South Platte calls and minimum flows derived from the point flow analyses.