EXHIBIT 122

United States Department of the Interior

U. S. GEOLOGICAL SURVEY

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April 19, 2013

David Yardas
Director, SW & Interior Programs
National Fish and Wildlife Foundation
1133 15th Street N.W. Suite 1100
Washington, DC 20005

Dear Mr. Yardas:

I reviewed Exhibit 355 titled "Supplemental Data in support of the Walker River Paiute Tribe & National Fish and Wildlife Foundation MOU Exhibit 1 – Program Water Conveyance Accounting Protocol for Pending Application 80700" for protested application 80700 hearing. Exhibit 355 was prepared by Dwight L. Smith and C. Eugene Franzoy on behalf of the Walker River Paiute Tribe and summarizes streamflow conditions and losses along the lower Walker River from Wabuska gage to Little Dam gage (figure 1KKA).

This review mainly focuses on evaluating the defensibility and merit of the reconstructed streamflow data at the Cow Camp gage and analysis of streamflow losses for reaches of the Walker River (figure 1KKA) between the Wabuska (10301500) and Cow Camp gages (10301600), and between Cow Camp and Little Dam gages (10301745) presented in Exhibit 355. This review also discusses the potential problem with the concept of using a single average loss rate for assigning losses to National Fish and Wildlife Foundation (NFWF) program water.

Figure 1KKA. Location of streamgages along lower Walker River.

Evaluation of the reconstructed streamflow data for Cow Camp gage

The authors of Exhibit 355 estimated streamflow losses for the Walker River between gages using all available streamflow data collected at gaging stations. One of these stations, the USGS Cow Camp gage, underrepresents actual streamflow because unmeasured bypass flow occurs. The authors recognize this bypass flow condition and address it by adjusting (or reconstructing) the Cow Camp streamflows. Cow Camp streamflows, for the period 1994-2011, were reconstructed using the Wabuska gage streamflows when flows were greater than or equal to 1,300 cfs. Simple linear regression was used to establish a relation between Wabuska and Cow Camp flow data during the period from 1978 through1982, the period identified by the authors as not having the bypass flow issue. The U.S. Geological Survey (USGS) concurs that streamflow at the Cow Camp gage underrepresents actual streamflow. However, the most critical assumption of the regression model is bypass flow conditions only occur when flows at Wabuska are greater than or equal to 1,300 cfs. This assumption was justified by "... the data suggest that the Cow Camp gage is still reasonably accurate until flow conditions … exceed 1,300 cfs at Wabuska". However, an analysis of the validity of the 1,300 cfs flow threshold in Exhibit 355 to support or demonstrate this claim was limited to presentation of a scatterplot, regression relation, and coefficient of determination of the paired data in figure 2 of Exhibit 355.

Alternatively, the bypass flow problem at Cow Camp and effectiveness of reconstructed flow data can be evaluated using a relatively straightforward and simple approach of comparing the accumulation of streamflow between sites. Streamflow accumulation curves are constructed by accumulating (or summing) the flow volume that has passed a site over the time period of interest. For this analysis, streamflow accumulation for Wabuska is compared with Cow Camp and Little Dam+. Little Dam+ is the streamflow accumulation at Little Dam plus Canal 1 and Canal 2 plus changes in storage in Weber Reservoir. Figure 2KKA shows streamflow accumulation curves for Wabuska, Cow Camp, and Little Dam+ and demonstrates the occurrence of bypass flow at Cow Camp. The accumulated streamflow volumes, from largest to smallest, are at Wabuska, Little Dam+, and Cow Camp gages. This indicates a large loss between Wabuska and Cow Camp, and then a substantial gain between Cow Camp and Little Dam+. The large loss followed by large gain substantiates the bypass flow condition at Cow Camp and is a result of the volume of bypass flow being greater than losses between Cow Camp and Little Dam+. If bypass flow condition were not present or were less than losses between Cow Camp and Little Dam+, accumulated flows would decrease downstream.

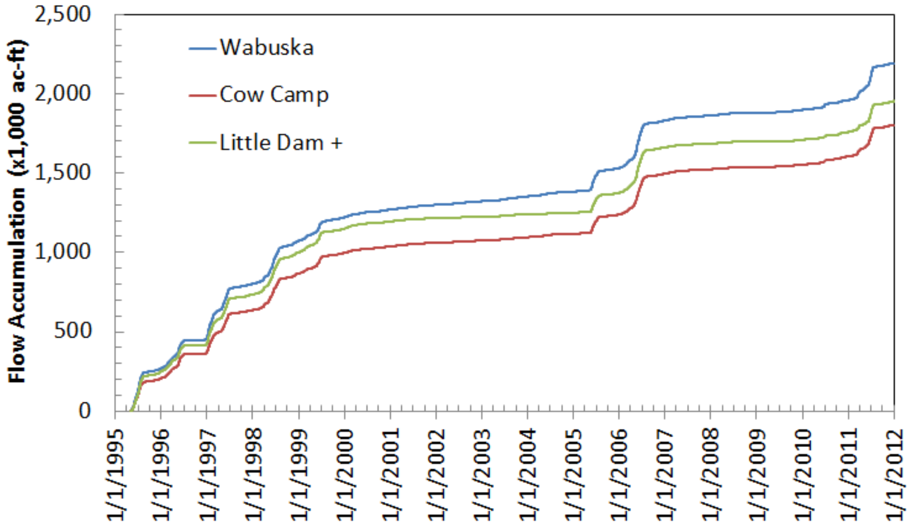

Figure 2KKA. Streamflow accumulation curves for all available paired data for Wabuska, Cow Camp, and Little Dam+.

Streamflow accumulation curves can be used to evaluate flow threshold assumptions by accumulating flows only below selected threshold values. It is generally recognized that during low flow conditions, the bypass problem at Cow Camp is minimal. This is demonstrated in figure 3KKA which only accumulates paired flows for a threshold of less than 50 cfs at Wabuska gage. This shows accumulated flows decrease in downstream direction, as expected; and if bypass condition is present, is smaller than the losses between Cow Camp and Little Dam+.

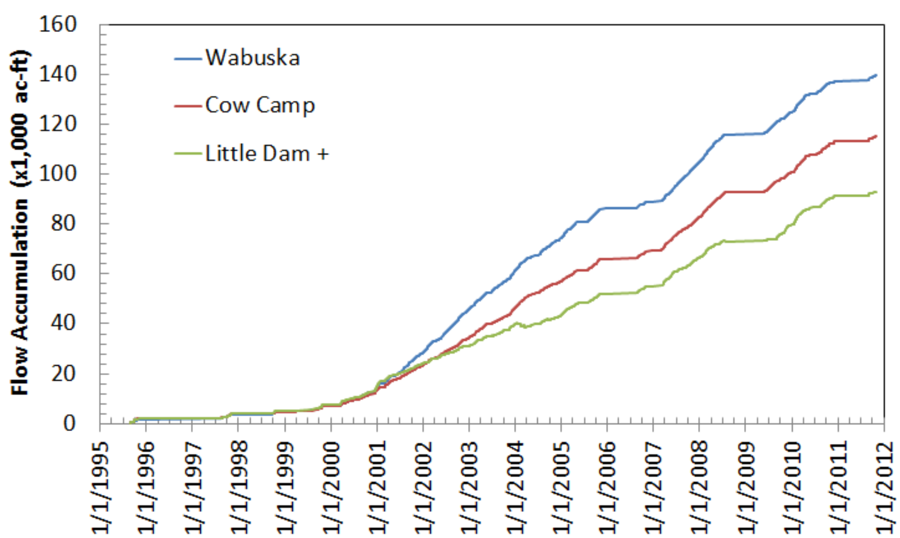

Figure 3KKA. Streamflow accumulation curves for all available paired data for Wabuska flows less than 50 cfs for Wabuska, Cow Camp, and Little Dam+.

Figure 4KKA tests the Exhibit 355 assumed flow threshold by accumulating paired flows less than 1,300 cfs at Wabuska and demonstrates the bypass flows at Cow Camp at this threshold are greater than the loss between Cow Camp and Little Dam+, suggesting that the assumed threshold in Exhibit 355 is too high. This invalidates the assumption and suggests flow adjustments at the Cow Camp gage need to be made at streamflows less than 1,300 cfs at Wabuska.

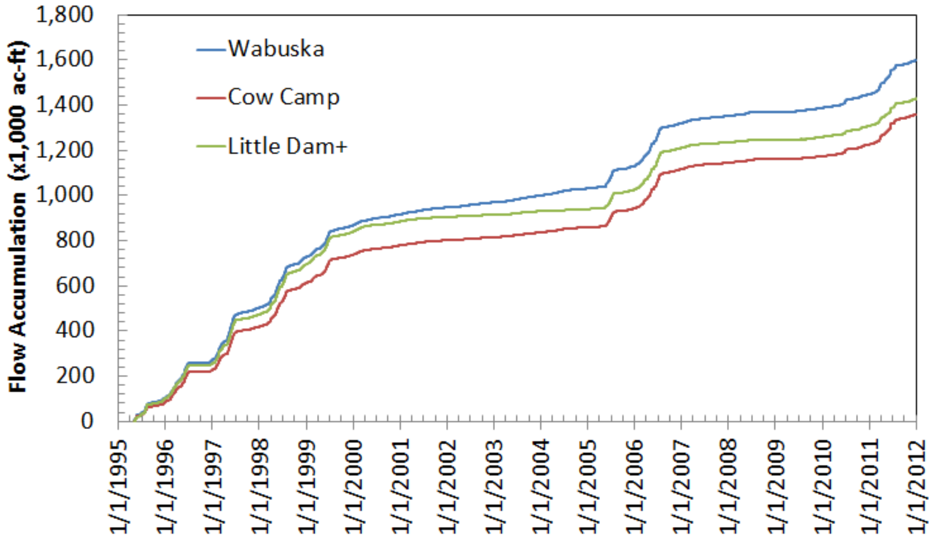

Figure 4KKA. Streamflow accumulation curves for all available paired data for Wabuska flows less than 1,300 cfs for Wabuska, Cow Camp, and Little Dam+.

Figure 5KKA tests the effectiveness of the Cow Camp flow reconstruction of Exhibit 355 (Cow Camp – reconstructed) by substituting Cow Camp flows in figure 2KKA with Cow Camp – reconstructed flows. If Cow Camp flow reconstruction were sufficient, then accumulated flows would decrease downstream. However, figure 5KKA shows that although the apparent gain between Cow Camp and Little Dam+ has decreased, the apparent gaining condition is still present indicating the reconstruction only partially corrects the bypass problem.

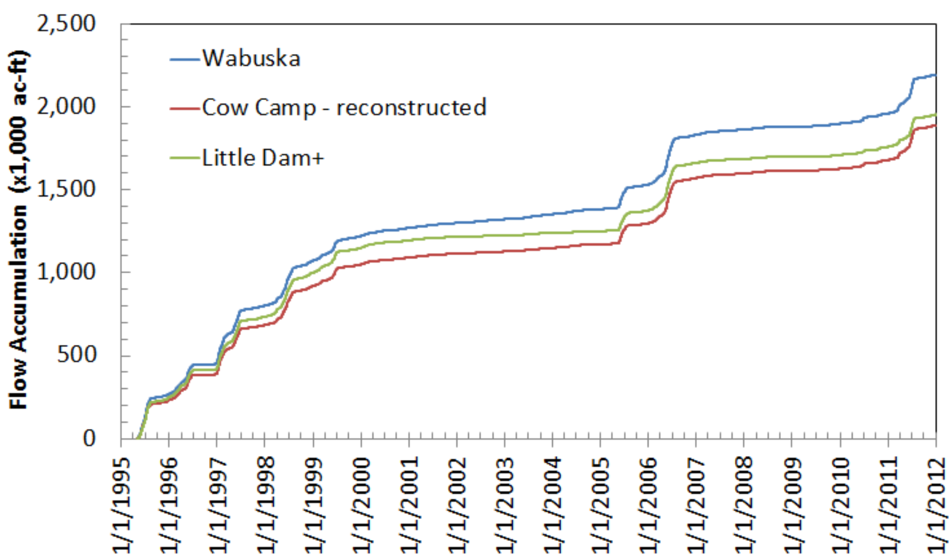

Figure 5KKA. Streamflow accumulation curves for all available paired data for Wabuska, Cow Camp-reconstructed, and Little Dam+.

Failure of the method to adequately correct Cow Camp streamflow data invalidates the Exhibit 355 analysis that is based on the reconstructed data, resulting in computation of highly biased losses between Wabuska and Cow Camp gages.

Evaluation of the method and analysis of calculated streamflow losses between Wabuska, Cow Camp, and Little Dam gages

Figure 10 in Exhibit 355 visually demonstrates the losses between Cow Camp and Little Dam (which includes Canal 1 and Canal 2 flows) gages, for the period 1995 through 2010, as difference in flow between the two sites, but differences are erroneous. Flow difference data for 1995 and 1996 show typical gage differences (very noisy and centered around zero); all subsequent years show major flow losses. These flow losses display similar patterns to inversion of the Cow Camp streamflow data shown in figure 3 of Exhibit 355. These similarities indicate that the computation of flow differences since 1996 likely excluded Little Dam flows from the formula. The authors recognized the change in flow characteristic presented in figure 10 of Exhibit 355 but did not consider computational error as the source of flow differences depicted. The authors explained these patterns resulted from higher than normal precipitation in 1995 and 1996 (wet years); it should be noted that 1997 and 1998 were also wet years.

As a result of the pervasive problems with bypass flows at the Cow Camp gage, it is more appropriate to focus on losses between Wabuska and Little Dam gages. Table 4 of Exhibit 355 provides an analysis of streamflows and losses between Wabuska and Little Dam gages and concludes an average annual loss rate of 30.7% for the irrigation season (April 15 – October 15). However, an analysis using total accumulated flow volumes for all available paired data indicate an annual loss rate between Wabuska and Little Dam+ gages of 11.0%, and an annual irrigation season loss rate of 12.3%.

The reason for large discrepancy between annual losses determined in Exhibit 355 and determined from flow accumulation analysis is a result of the approach used to summarize average annual loss in table 4 of Exhibit 355. The authors' approach calculated percentage loss each year, and then averaged the yearly loss rates over the full period. The appropriate method for calculating the average annual loss rates over the period of interest is to calculate flow-weighted averages. A hypothetical case is presented to demonstrate this method.

Suppose two years of flow data are available, one wet year (Wabuska flow of 200,000 acre-ft) with a 10% loss (loss of 20,000 acre-ft) and one dry year (Wabuska flow of 20,000 acre-ft) with a 50% loss (loss of 10,000 acre-ft). The loss over the two year period is 30,000 acre-ft. The method used in table 4 of Exhibit 355 would summarize the average loss as 30% [(10+50)/2], and if applied to the wet and dry year would result in losses of 60,000 and 6,000 acre-ft respectively, with losses for the 2-year record equaling 66,000 acre-ft. Using the flow-weighted averaging approach, [(10%*200,000+50%*20,000)/(200,000+20,000)] the average loss is 13.6%. If this percentage is applied to the wet and dry year flows, the resulting losses are 27,200 and 2,720 acre-ft, respectively, with losses for the 2-year record equaling 29,920 acre-ft, less than half of the losses calculated without flow-weighting.

Total annual and irrigation season flows at the Wabuska gage listed in table 4 of Exhibit 355 are inconsistent with streamflow data from the USGS National Water Information System (NWIS) database as shown in table 1KKA. Total annual streamflow at the Wabuska gage are consistently greater in table 4 of Exhibit 355 by about 2-3 percent, possibly a result of unit conversion; whereas, irrigation season flows in table 4 of Exhibit 355 are much greater (about 10-26%) inflating the flow entering the lower Walker River at Wabuska during irrigation season by nearly 18%.

Table 1KKA. Comparison of Wabuska annual and irrigation season flows between gage data and table 4 of Exhibit 355.

Year	Wabuska Total Annual Flow (AF) - Gage data	Wabuska Total Annual Flow (AF) - Table 4 of Exh 355	Percent difference	Wabuska Flow - April 15th to October 15th (AF) - Gage data	Wabuska Flow - April 15th to October 15th (AF) - Table 4 of Exh 355	Percent difference
1995	--	Not used	--	--	Not used	--
1996	216,620	220,730	1.9%	124,607	157,575	26.5%
1997	343,835	352,655	2.6%	148,934	180,272	21.0%
1998	270,892	275,722	1.8%	194,264	226,252	16.5%
1999	147,146	151,515	3.0%	95,788	107,859	12.6%
2000	51,947	53,024	2.1%	20,968	25,473	21.5%
2001	30,187	30,967	2.6%	17,464	20,661	18.3%
2002	22,919	23,422	2.2%	14,670	16,861	14.9%
2003	30,181	30,826	2.1%	19,287	22,125	14.7%
2004	30,564	31,158	1.9%	18,297	21,061	15.1%
2005	147,711	150,581	1.9%	129,814	150,313	15.8%
2006	300,103	305,964	2.0%	227,902	278,828	22.3%
2007	31,393	32,357	3.1%	12,201	14,324	17.4%
2008	24,772	25,181	1.7%	15,357	18,721	21.9%
2009	24,075	24,523	1.9%	12,692	15,551	22.5%
2010	60,989	62,291	2.1%	37,486	41,950	11.9%
2011	243,700	247,873	1.7%	169,629	186,836	10.1%
Total	1,977,033	2,018,789	2.1%	1,259,360	1,484,662	17.9%

Use of a single average loss rate could impact surface water resources to Walker River Paiute Tribe

While the idea of a single average loss rate for conveyance of water through Walker River Indian Reservation is conceptually desirable due to simplicity of implementation, a single rate could ultimately impact available flows for the Walker River Paiute Tribe (WRPT). Although Exhibit 355 does not state or recommend the single average annual irrigation season loss rate be used for conveyance of NFWF program water, a general word of caution should be given to discourage consideration of its use. A single loss rate could impact the resources of the WRPT because year-to-year fluctuations in the loss rate would not 'average out' over time largely due to limited storage capacity along the lower Walker River and the lack of need for additional water by the WRPT during wet years. The use of a single average loss rate would result in the WRPT receiving less flow during dry years when it is most needed, and not be offset during wet years, when storage is full and additional water is not needed.

Sincerely,

Kip K. Allander
Hydrologist
U.S. Geological Survey