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# Pumping will harm the Upper Verde River

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At an April Prescott City Council meeting discussing the pipeline to import water from the Big Chino, I cited a U. S. Geological Survey report by Kyle Blasch and others (USGS Scientific Investigations Report 2005-5198) as a sound basis to conclude that importing water will reduce flow in the Upper Verde River.

One council member expressed doubt and the city's project manager for the Big Chino Water Ranch, James Holt, said the USGS report was a "conceptual" report and that a "predictive" model was under development and not yet available. His reference to conceptual versus predictive was correct, but he gave the impression it was impossible to draw a conclusion from the conceptual USGS report about the effect of importation on the Big Chino.

Before explaining this distinction between conceptual and predictive analyses, and why the conceptual report supports the harmful effects of importation, I need to provide some background.

The municipalities in the Prescott region plan to import groundwater from the Big Chino sub-basin to the north of Prescott. The Big Chino and the continually diminishing Little Chino sub-basins supply virtually all (94 percent to 100 percent) of the base flow to the Upper Verde River. Concerned citizens and organizations have said that exporting water from the Big Chino will decrease the flow in the Upper Verde by the amount of the exportation.

The conclusion about a near one-to-one effect comes from the determination that most of the natural groundwater discharge from the Big Chino is to the Upper Verde River. A relatively small amount also comes from transpiration from plants. Consequently, most of the water pumped from the Big Chino is water that otherwise would go to the Upper Verde River.

Representatives of the municipalities that plan to import water have not accepted the virtual one-to-one effect. They often say they are uncertain that importation will affect the Upper Verde and that we will know for sure only by actual pumping.

So, where is the scientific information to support the virtual one-to-one effect, and are the sources unbiased and authoritative?

In a 1994 report (Groundwater Study of the Big Chino Valley), the Bureau of Reclamation presented a hydrologic model based on the Upper Verde as the only outlet for the Big Chino. In a 2000 report (Verde River Watershed Study), the Arizona Department of Water Resources likewise presented a water balance with no outlet from the Big Chino other than the Upper Verde River.

More recently and more thoroughly, the USGS report I mentioned to the city council says groundwater in Big Chino valley flows southeastward toward Paulden eventually to discharge to the Verde River. The USGS bases that determination primarily on Arizona Department of Water Resources water level data from 2004. A contour map of these water levels is Plate 3 in the report, and the actual water level data

are in Appendix 5. This report's abstract succinctly states the conclusion as follows: "Ground-water outflow from the Big Chino Valley occurs only as base flow in the Verde River."

This USGS report is conceptual in providing an estimate of ground-water recharge; setting forth the geologic and the hydrologic frameworks, including flow system boundaries; and describing geologic units and hydraulic gradients.

A predictive or numerical model will add to the conceptual model and enable us to refine estimates of the hydraulic properties of the rocks underlying the Big Chino, thereby letting us predict the time it will take for hydrologic effects from pumping to occur. They can fit the numerical model to the conceptual model and will not introduce new flows or outlets for groundwater.

Therefore, the predictive model will not alter the determination that the Upper Verde is the only outlet for Big Chino groundwater and the conclusion that exporting groundwater from the Big Chino will, in time, result in a virtual one-to-one reduction in the flow of the Upper Verde.

The data are available; the sources are authoritative and unbiased. It is past time for the municipalities to accept that importation of groundwater from the Big Chino will affect the Upper Verde River and plan to mitigate before pumping begins.

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