WHY BIG CHINO PUMPING THREATENS THE VERDE

by

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May 6, 2007

An often-repeated view is that the extraction of approximately 8,700 acre-feet per year (af/y) of ground water by Prescott and Prescott Valley from the Big Chino Water Ranch will have little if any effect on the springs that feed the upper Verde River. This optimistic view gained support from the report of Prescott's hydrologic consultants, who suggested that ground water from the Big Chino Valley may supply little if any of the ground water that feeds these upper Verde River springs.

In contrast, two recent reports by the U.S. Geological Survey—one by Laurie Wirt and colleagues, the other by Kyle Blasch and colleagues—show that the vast majority, if not all, of the ground water that enters the upper Verde River from these springs—an average of 17,900 af/y over the 14 years from 1990 through 2003—comes from aquifers in the Big and Little Chino watersheds, with most of it (somewhere between 14,300 af/y and 15,400 af/y) coming from the Big Chino watershed, including Williamson Valley. Further, these reports show that perennial (continuous) flow (also known as base flow) in the upper 22 miles of the river is dependent upon the ground water that issues from these springs. Should the springs go dry, the Verde River above Perkinsville will be dry or nearly so except at times of storms or snowmelt. In addition, the amount of perennial flow that enters the Verde Valley above Clarkdale will be reduced by about 30 percent.

Ground water within the Big and Little Chino watersheds moves by gravity toward the Verde River and eventually discharges to the river. Withdrawal of water by wells in these watersheds understandably reduces the amount of ground water that ultimately reaches the river. The critical concept is that pumping from an aquifer that discharges to a stream will ultimately reduce the discharge of ground water to the stream by an amount equal to the pumpage as long as the rate of pumpage does not exceed the natural discharge. In the latter case (when the pumping rate exceeds the natural discharge) the natural discharge will be reduced to zero and the aquifer will be overpumped. This concept, which has been well established in the literature of hydrology for many decades, explains both why pumpage from the Prescott Active Management Area from about 1939 to 1999 reduced natural discharge from Del Rio Springs by about half and why the Arizona Department of Water Resources has predicted that Del Rio Springs will cease to flow by about 2025. Indeed, the current rate of pumpage within the Prescott Active Management Area will eventually eliminate all ground-water

discharge from the Little Chino basin to the Verde River, thereby reducing current baseflow from about 17,900 af/y to about 15,400 af/y.

The major use of ground-water in the Big Chino watershed is for irrigation of agriculture. Blasch and others estimated the average annual net withdrawal from the watershed for all purposes for the years 1990 through 2003 at about 4,140 af/y, far below the value for average annual recharge to the watershed—approximately 23,420 af/y—that was estimated by these authors. Assumptions made by Blasch and others in estimating recharge could result in the actual value being several thousand acre-feet above or below 23,420 af/y, but nevertheless their estimate is still within the normal range for estimating this value.

In addition to the 8,700 af/y of ground water that Prescott and Prescott Valley plan to import from the Big Chino Water Ranch, state law entitles the municipalities of Prescott, Prescott Valley, and Chino Valley to import approximately another 9,900 af/y of ground water representing retired historic irrigation rights in Big Chino Valley to support their present and future water demands. Thus, the total amount of legally exportable ground water is about 18,600 af/y, an amount that substantially exceeds the current baseflow contribution of the Big Chino watershed to the Upper Verde River.

Not only would the withdrawal of 18,600 af/y from the Big Chino watershed eliminate the current baseflow contribution of the Big Chino Valley to the Upper Verde River, it would also leave only a small amount of water (23,420 minus 18,600 af/y or about 4,820 af/y) available for perpetual use in the Big Chino watershed itself. This amount roughly equals current net usage of ground-water in the Big Chino. Even if agricultural usage is reduced due to selling of water rights associated with historically irrigated lands, there is would still be very little water available to meet new demands in the valley without exceeding safe yield.

Only large-scale importation of water from outside of the Big and Little Chino watersheds can support both a healthy upper Verde River and expected development in the Big and Little Chino watersheds.