KG15-0288



TO: Ralph Kalfayan

FROM: Jordan Kear, P.G., C.Hg. Kear Groundwater PO Box 2601 Santa Barbara, CA 93120-2601

DATE: July 21, 2015

SUBJECT: On the Value of Metering Wells in Antelope Valley Los Angeles County, California

Dear Mr. Kalfayan,

This letter provides a summary of Kear Groundwater's ("KG") opinions regarding the value of metering wells throughout the Antelope Valley Groundwater Basin. Our efforts are conducted a your request and are based on our experience in working with groundwater management agencies, our understanding of the Sustainable Groundwater Management Act of 2014, the roles and responsibilities of the Groundwater Sustainability Agencies and other matters. We have also reviewed select documents pertinent to the Antelope Valley Basin adjudication, including "Groundwater Usage Analysis of Antelope Valley Groundwater Basin Small Pumper Class," dated July 2015 prepared by GSI Water Solutions, Inc. (GSI).

The GSI Report focuses on the methods to quantify groundwater production by the Small Pumper Class. Of the 3,459 Class Members, well production of 86 respondents was included (Participating Class Members {PCM}). This is a very small sample size, representing 2 percent of the class. The data reportedly indicate that median groundwater use by the participating class members was approximately 1.2 acre-feet per year (AF/yr). Of the 86 PCM, the pumping of 29 class members was estimated to be greater than 3 acre-feet per year in 2012, and averaged 6.4 AF per year. The ratio of 29 to 86 is a percentage of over 33 percent. If the same ratio and use rates are applied to the 3,459 class members, then 1,141 members would be pumping over 3 AF/yr, and averaging 6.4 AF/yr. On average, this would represent production of 7,302 AF/yr to the larger pumpers of the Woods Class. If the remainder of class members (67 percent, or 2,318 members) produced the reported median of 1.2 AF/yr, then 2,782 AF/yr would be pumped by the smaller pumpers of the Woods Class. This would represent a total of 10,084 AF/yr, or a significant percentage of the Native Safe Yield of the Basin. This quantity of water is too large to allow to be inaccurately measured. In addition, 10 class members participated in a well sharing arrangement and 19 class members contain multiple households of single parcels. This further exemplifies the need for accurate pumping quantification through metering.

KEAR GROUNDWATER

P.O. BOX 2601• SANTA BARBARA, CALIFORNIA • 93120 TELEPHONE: (805) 512-1516 JORDAN@KEARGROUNDWATER.COM CALIFORNIA REGISTERED PROFESSIONAL GEOLOGIST N. 6960 CALIFORNIA CERTIFIED HYDROGEOLOGIST N. 749



Ultimately, it is our opinion that the flow metering of each well within the basin is the optimal means to quantify groundwater production from the Basin. The use of other means and methodologies to estimate groundwater use appear to be based on several assumptions and provide significant error. Four data types were presented for evaluation by GSI: 1) utility electrical records, 2) flow meter data, 3) generator or solar power usage, and 4) crop irrigation; the simplest, most direct, most accurate, and most reliable method is the use of flow meter data. A discussion of each of the methods follows.

Electrical Meter Data

While widespread as the primary source of power for the majority of wells in the area, electrical records require much mathematical conversion to equate to acre-feet of water used. The conversion requires determination of Total Displacement Head (also known as Total Differential Head, both TDH) and facility efficiency. Both of these requirements are constantly changing in a hydrologic (as water levels rise and fall) and well environment (as wells age), so maintaining accurate ratings of such parameters would require added levels of detail to accurately convert electrical usage to acre-feet of water. This would be a labor-intensive process and likely result in broad assumptions to attempt simplification at the expense of accuracy. Other problems would include separation of power for well use from other uses on the properties and unreported alternative energy sources (wind, solar, generator, etc.) used to pump groundwater.

Tables in the GSI report indicate an oddly higher amount of estimated groundwater production for pumpers using the electrical meter method of water use estimation. By observing the pumpers who report "indoor use only" an unexpected high range of estimates is provided on Table 3. The estimates presented such as for Deckert (SP-1506) provide an example of either unreasonable water use (at over 7 AF/year per household) or a testament to the potential errors of using the electrical meter method.

Flow Meter Data

Provided as a direct documentation of groundwater use, flow meter data provide the most accurate and reliable data for pumping quantification. Given the reported sizes of pumps in class wells, a typical meter would likely cost between \$300 and \$600 to furnish and install. In addition to providing quality data, the self-reporting nature of the method can increase water use awareness and provide key insight into well performance, alerting well owners to potential problems or other well issues before becoming unpreventable. While calibration and upkeep are potential issues, the simplicity of the direct measurement is usually worth the need to spot-check and maintain meter recordation. Values presented in Table 4 of the GSI Report appear reasonable for the uses described.

Generator or solar power usage

Usage of "off-the-grid" power sources to estimate water use provides similar problems to utility

KEAR GROUNDWATER



data methods, with the added factors of questionable records and power source data sets. A similar discrepancy, with high ranges of estimates of use for "domestic only" pumpers appears on Table 5, with Poposo (SP-6562) reporting at 3.54 AF/year for domestic only use and Bovee (SP-065) estimated at 0.04 AF/yr. This two-order of magnitude discrepancy speaks to the unreliability of the estimation method.

Crop factor methods

Using the crop factor method to estimate water use is inaccurate and tends to overestimate water use. Only one class member is presented in Table 6 of the GSI Report, and curiously the two values in consecutive years are identical. 2011, being slightly wetter than 2012 regionally, likely would require less water to maintain an equal crop load than the following year. Maturing of crops, rotating of crops, weather variability, and other factors would require ratings shifts of crop factors to improve accuracy. In basins where crop factors have been replaced by flow meters as measurement methods, the trend is a more accurate and lower water use at each well head.

Our recommendation is to require flow meters at every well head and at every split to a single service connection (or household) where more than one entity is served by a single well. When (or if) this method is not available due to maintenance or calibration, alternative factors could be used for a short time with comparable history of use to estimate via different methods. To account for seasonal fluctuations in demand, we recommend quarterly extraction reporting to the Watermaster or appointed agency.

Please do not hesitate to contact me with any questions.

Best Regards,

Jordan Kear Principal Hydrogeologist Professional Geologist No. 6960 California Certified Hydrogeologist No. 749

KEAR GROUNDWATER