

John Williams
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Dyan Cushing
By email

Dear Dyan,

Here are some comments on the proposed expansion of cannabis cultivation on AP #105-071-006, which is just west of your property on Chambers Rd. The proposal contemplates increasing diversions from a well to 1,018,450 gallons per year. Unfortunately, there is no information on how the pumping will be distributed over the year, but presumably it will be concentrated in the summer.

I am commenting simply as a friend, and not as a paid consultant, but I do have some qualifications. I am not a groundwater hydrologist, but I have a Ph.D. in Physical Geography and worked for years as a surface water hydrologist. I am also generally familiar with groundwater from my time on the board of the Monterey Peninsula Water Management District, since groundwater issues in the Carmel Valley were of great concern in the district. On that account, I paid close attention to various well tests, and to monitoring the effects of pumping on riparian vegetation.

In short, I think you have good reason to be concerned that the proposed pumping will affect your well, which is used by a tenant for an organic truck farm that uses ~120,000 gallons per season. Your well, on parcel # 105-101-004, is about 250 ft. from the applicant's well, as estimated on Google Earth. Using that distance, and assuming that the pumping happens at a constant rate for 180 days, I used a simple calculator from the New Mexico Office of the State Engineer¹ to estimate that the applicant's pumping would lower the groundwater level at your well by between 1.3 and 1.9 ft., depending on the values entered for transmissivity and the storage coefficient. This is not a lot, but these calculations ignore pumping from your well, and the interaction of the cones of depression of the two wells. They also ignore the temporal distribution of pumping.

The calculations also assume that the aquifer is isotropic, or homogeneous in all directions. This is always more or less unrealistic, and is especially so in alluvial aquifers. Your land and the applicant's are on a terrace that was formed by the river depositing sediment about thirty thousand years ago, during a previous high stand of sea level (Merritts et al. 1994). (The high

¹ Available at <https://www.ose.state.nm.us/Hydrology/Theis/index.html>.

rate of tectonic uplift in the area accounts for your elevation of ~200 ft.) Rivers do not deposit sediments isotropically. Instead, there are usually ribbons of coarse grained channel deposits surrounded by finer grained overbank deposits. The coarse grained deposits have higher hydraulic conductivity, so the influence of a well will extend further along such buried channel deposits. Thus, depending on the unknown subsurface composition of the terrace, your well could be either more or less affected by the applicant's well than conventional estimates would suggest. However, since a line between your well and the applicant's well is roughly parallel to the general trend of the river, the potential existence of such a thread of high conductivity deposits between the two wells is cause for reasonable concern on your part.

So what could be done about it? A conventional well test using your well as the observation well would not be useful to generate a response, since such tests do not last long enough given the distance between the wells. Instead, another observation well closer to the test well would be needed. This would allow for a better estimate of the transmissivity of the aquifer, which would allow for more realistic estimates, but these would still not be definitive. If another well is to be drilled, it would make more sense for it to be another production well; given the shape of the applicant's property, the new well could be placed much farther from yours than the existing well. Or, the county could require the applicant to pay for an assessment of the situation by a qualified groundwater hydrologist that the county selects, with the understanding that the assessment would include appropriate recommendations for permit conditions. Or, you could ask for a permit condition requiring the applicant to provide your tenant with water, should your well not be able to. Since your well has held up through the current drought, it is clearly reliable under the status quo.

Sincerely,

John Williams

Merritts, D.J., K.R. Vincent, and E.E. Wohl, 1994, Long river profiles, tectonism, and eustacy: a guide to interpreting fluvial terraces. *Journal of Geophysical Research* 99 (B7):14,031-14,050.

