
FILE MEMORANDUM

TO: [ANONYMOUS]
FROM: P. BALLEAU & DISTRICT STAFF
SUBJECT: COMMENTS RECEIVED AUGUST 5, 2019
DATE: AUGUST 12, 2019

**** COMMENTS MODIFIED TO REMOVE PERSONAL REFERENCES AS REQUESTED ****

As requested, we have prepared these notes as perspective on [the] email message of August 4, 2019. [The] comments on the model residual are sound. For his area of interest near four wells in the Ninnescah Basin, from Wellsford to about 5 miles north, the model report figure 43 shows that residual errors in simulated initial water level range up to several tens of feet higher in the model than reported in the Wizard well data.

He suggests re-calibrating the model to reduce the residuals. It would not be practical to try to improve the residuals model-wide, but if focused on his area, then it is reasonable to expect that residuals could be reduced locally, perhaps to the range of a few feet as he suggests. The local area is one of high topography in the headwaters of the N and S forks of the Ninnescah and the Medicine Lodge/Turkey Creek basins. Areas of internal drainage to local playas raise the recharge rate locally. The model is calibrated to 4.51 inches of annual recharge in this zone, where aquifer properties are based on the good productivity of local wells. Recharge rate is a parameter that might be adjusted downward to lower the model water levels and improve the residual. However, even if that error in initial water level is corrected, then the location of Zone A is not likely to change. The residual is not a sensitive factor in [the] apparent concern about the Zone A delineation. The well (...24101) is in a section included in the fringe of Zone A and might be thought to be subject to change by recalibration. But the impact of wells on flow at Zenith gage (which defines Zone A) depends on the aquifer properties, and time and distance to the live reaches of Rattlesnake Creek, not on initial water levels. The drawdown and depletion effects of a pumping well are superimposed on otherwise prevailing aquifer conditions such as they may be, whether in the field or in the model. For example, the natural variation of well water levels in dry and wet periods does not alter the definition of Zone A. The overriding factor for delineating the Zone A boundary in the Ninnescah basin is the relative distance from the nearby perennial reaches of other streams that constitute the greater source to Ninnescah wells, and the greater distance to Rattlesnake Creek that becomes the lesser source at a level of 10 percent. That geometry of water features would not change in a recalibrated model, so the associated delineation of Zone A probably would not change.

The model run for that delineation is made by KDA using their rationale for unit stress and timing. They would be able to re-run a revised recharge rate and tell if Zone A by their methods changed to become larger or smaller, but there is no reason to anticipate that it would change either way. Still, there is a separate consideration that would alter the delineation appreciably, which is the matter of time in the definition of Zone A. The KDA uses history in their calculation which implies that the wells to be included are those that caused impacts in the past. We have discussed with you whether an alternative (future) baseline could be applied to include a different set of wells in the Zone that would best benefit the stream in the future. A different Zonation results from the forward look. The wells of interest to [him] might be excluded in that case.

On his questions regarding collecting new measurements of the two wells 4 and 5 miles north of Wellsford, you might have a view on the practicalities, but we see no impact on the definition of Zone A from collecting that new data. More data is, of course, generally helpful for future management.

To summarize, *[the]* comments are on point that the model water levels in his area of interest are generally higher than observed. The more significant point is that the water levels have little or no functional relationship regarding the delineation of Zone A. Stream depletion depends on other factors, most importantly the distance of a subject well from the affected surface-water sources, especially in relation to live reaches above Zenith gage location.

P. Balleau