CDM

Memorandum

To: Claudia Borchert, SDCW
From: Gordon McCurry and Matt Bliss, CDM
Date: August 6, 2007
Subject: Stream Depletions from 2005 and 2006 Pumping of Buckman Wells

This memorandum serves to document and present the results of stream depletion calculations using the Buckman wellfield pumping for 2005 and 2006. The stream depletion results included herein should be equivalent to those that the NM Office of the State Engineer (OSE) would compute. Depletions due to Buckman wellfield pumping were calculated for the Rio Grande, Tesuque Creek, Rio Pojoaque and at La Cienega Springs.

Buckman Pumping Rates for 2005 and 2006
Annual pumping rates for each well were computed from 2005 and 2006 Buckman wellfield production data. Production rates through December 31, 2006 for each of the 13 Buckman wells were provided by the City and are summarized in Table 1, in acre-feet (AF). 2004 production rates are provided for comparison purposes. There is no pumping after 2006.

Table 1: Buckman Wellfield Pumping (AF)

Well	2004	2005	2006
Buckman #1	27	5	20
Buckman #2	6	6	150
Buckman #3	73	105	247
Buckman #4	355	510	612
Buckman #5	4	1	8
Buckman #6	958	367	1077
Buckman #7	277	1223	238
Buckman #8	653	797	814
Buckman #9	6	2	54
Subtotal (Wells 1-9)	**2359**	**3017**	**3220**
Buckman #10	454	23	657
Buckman #11	711	368	825
Buckman #12	948	216	88
Buckman #13	1265	160	407
Subtotal (Wells 10-13)	**3378**	**767**	**1977**
Total Pumping (Wells 1–13)	**5737**	**3784**	**5197**

Stream Depletion Analysis

Depletions to the Rio Grande, Tesuque Creek, Rio Pojoaque and La Cienega Springs caused by pumping of the Buckman wellfield were calculated using methods equivalent to those employed by the OSE. Depletions due to post-1987 Buckman wellfield pumping were computed using the updated numerical groundwater superposition model developed by the OSE for the Santa Fe region (Barroll, 2005). This superposition model is an update and enhancement to the superposition model used previously by the OSE (Core, 1996), and has been determined by CDM to be acceptable for use in this type of application. Buckman wellfield depletions due to pumping prior to 1988 have been estimated and provided by the OSE, using an analytic model developed by the OSE based on the Glover-Balmer equation.

The results of the superposition model and the analytical model are summed to calculate the total depletions. Combining the numerical and analytical results is how the OSE determines stream depletions due to Buckman wellfield pumping. The analytical model predicts stream depletions due to Buckman wellfield pumping prior to 1988. The depletions predicted using the analytical model persist through 2013 on the Rio Grande, ended prior to 2005 on the Rio Pojoaque and Tesuque Creek, and were never calculated for La Cienega Springs.

The numerical model used for this analysis (Barroll, 2005) was modified by updating the annual well pumping files with actual pumping records through 2006 for the City of Santa Fe's Buckman wellfield. The other transient inputs (river stage and boundary fluxes) were kept constant over time for each annual stress period. In this analysis, in addition to the 2005 and 2006 actual depletions, stream depletions for 2007, 2008, 2046 and 2106 were calculated. The future depletion values represent the residual depletion that pumping through 2006 will have on the streams and springs and do not reflect any proposed future pumping scenario.

The calculated stream depletions for the Rio Grande, Rio Pojoaque, Rio Tesuque and La Cienega Springs based pumping through 2006 are shown in Table 2, reported in acre-feet/year (AFY). The simulated depletions do not consider pumping beyond 2006 and so future depletions are likely to be higher than shown due to continued pumping from the Buckman wellfield.

Table 2 Stream Depletions Due to Buckman Pumping Through 2006 (AFY)

Location	2005	2006	2007	2008	2046	2106
Rio Grande	2203.0	2203.1	2041.4	1286.8	195.7	84.0
Tesuque Creek	13.3	14.1	14.9	15.0	24.7	20.2
Rio Pojoaque	43.7	45.4	47.1	47.4	40.1	18.2
La Cienega Springs	0.7	0.8	1.0	1.2	5.3	10.2
Total	**2261**	**2263**	**2104**	**1350**	**266**	**133**

Conclusions

The City's water rights on the Rio Tesuque and Pojoaque were compared with the results shown in Table 2. It is assumed that the City holds 43.3 AFY of water rights on Tesuque Creek and 63.0 AFY of water rights on the Rio Pojoaque. Table 2 shows that the City has sufficient water rights to offset depletions on both tributaries through 2106 if there were no additional pumping from the Buckman wellfield after 2006. Model results were checked on an annual basis to ensure that depletions on the Tesuque and Pojoaque do not increase beyond the current water rights based on pumping through 2006. The maximum depletion due to pumping through 2006 on the Rio Tesuque is 25.4 AFY in 2056. On the Rio Pojoaque, the maximum depletion due to pumping through 2006 is 51.1 AFY in 2020.   However, future depletions will be larger due to ongoing Buckman wellfield pumping. The magnitude of the future depletions will be based on the amount and location of the Buckman wellfield pumping.

References

Core, A.B., 1996. Espanola Basin, Santa Fe Region modified McAda-Wasiolek model users manual. New Mexico State Engineer Technical Division Hydrology Report. 96-2, 10p.

Barroll, P., 2005. Memo to Tom Morrison, OSE Hydrology Bureau Chief, titled Santa Fe Model: Resolution of Discrepancy between Superposition and Calibrated Versions of the Model.