Description of aquifer tests for the Rolling A well.

Single-well step-drawdown and constant rate tests of the well were conducted by TEC, Civil Consulting Engineers of Reno, Nevada. Data were supplied in electronic format by Tim Donahoe (TEC Engineering, 2008). Results of the aquifer tests will be used in the development of a numerical ground-water flow model in Carson Valley, project # 9705-BPS01. Specifically, the estimated transmissivity will be used to develop a relation between transmissivity and specific yield. The relation will then be used with data from driller's logs to develop a preliminary distribution of transmissivity for the model.

The well is located at 39.28036 N, 119.527306 W, NAD 83, and is completed in the basin-fill aquifer of the Carson Plains subbasin of the Dayton Hydrographic area, about 4.7 miles northeast from Dayton, Nevada; NWID site ID 391649119313801. The well is completed in a basin-fill aquifer to a depth of 200 feet below land surface (see attached Nevada Driller's Log # 95284 for construction details).

Prior to the step and constant rate tests the well was swabbed and airlifted for 12 hours, followed by installation of a vertical shaft turbine pump set at 140 feet below land surface. The well was then pumped and surged for 12 hours. The step-drawdown tests began an unknown length of time after pumping and surging on October 7, 2004 and ended at 6 PM. The pump rate was varied from 1,500, 2,000, 2,500, 3,000, and 3,500 GPM for 2-hour periods during the step-drawdown test. The constant-rate test was begun October 13, 2004 with a rate of 3,244 GPM for a 72- hour period. Static water levels at the start of the both tests were about 16 feet below land surface. The methods of water-level and flow-rate measurements, location of the discharge of pumped water, and trends in pre-test water-levels are not known.

Time-drawdown data were analyzed using an Excel spreadsheet program (Halford and Kuniansky, 2002). The Cooper-Jacob analysis was used for the constant rate tests. The step-drawdown data were analyzed by plotting the drawdown (s) divided by the discharge at each step (Q_{NSTEP}):

s/Q_{NSTEP} , against the summation of the log of elapsed time (t_i) since the beginning of each step multiplied by the change in discharge at the beginning of the step (Q_i), divided by the discharge of that step (Q_{NSTEP}):

$^{NSTEP}\Sigma_{i=1} (\mathrm{Log}(\Delta t_i)\Delta Q_i)/Q_{NSTEP}$, from Lee (1982).

Transmissivity (T) is estimated with a straight line fitted to the plots for each step and calculated by the equation:

$T = (2.3/4\pi)\ (1/m')$, where m' is the slope of the fitted line (Halford and Kuniansky, 2002, p. 24).

Results of the step-test analysis provide estimates of the hydraulic conductivity of the annular space between the well casing and face of the well bore ($K_{annular}$), and Skin, a

term that combines the effects differences in hydraulic conductivity between the formation and the annulus, and the effective diameter of well bore damage (Halford and Kuniansky, 2002, p. 24).

Results of the step-drawdown test indicate a hydraulic conductivity and transmissivity of about 200 ft/day and 36,000 ft^2/day, respectively, whereas results of the constant-rate test indicate a hydraulic conductivity and transmissivity of 100 ft/day and 30,000 ft^2/day, respectively. An average of the two transmissivity estimates, 33,000 ft^2/day, will be used for development of a specific capacity/transmissivity relation.

References Cited

Halford K.J., and Kuniansky, E.L. 2002, Documentation of spreadsheets for the analysis of aquifer pumping and slug test data: U.S. Geological Survey Open-File Report 02-197, 54 p.

Lee, John, 1982, Well testing: Society of Petroleum Engineers of AIME: New York, 159 p.