Drawdown Calculations for 35 Gallons per Minute Well in Chowchilla Area

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This technical memorandum provides a calculation of the expected drawdown in groundwater levels that would be expected from continuous pumping of a 35-gallon-per-minute (gpm) well in the Chowchilla area.

Method

Using data from input files for the U.S. Geological Survey (USGS) Central Valley Groundwater Model (CHVM), estimates of the aquifer properties over a 15-square-mile area centered on the City of Chowchilla were obtained. Details of this model are presented in USGS paper *Groundwater Availability of the Central Valley Aquifer*.[1]

The aquifer properties used are tabulated below:

Layer	Top Elevation(ft)	Thickness(ft)	Kh(ft/d)	Kv(ft/d)
1	254.86	61.24	89.74	0.08
2	193.62	1.00	0.01	1000.00
3	192.62	40.41	73.81	0.08
4	152.21	6.79	0.49	360.00
5	145.42	6.79	0.49	360.00
6	138.64	198.00	16.76	0.04
7	-59.36	250.00	7.33	0.02
8	-309.36	300.00	5.60	0.01
9	-609.36	350.00	2.66	0.01
10	-959.36	400.00	2.08	0.0016
bottom of model	-1359.36			

Kh = Horizontal Hydraulic Conductivity

Kv = Vertical Hydraulic Conductivity

Parameters used for this analysis were a storativity of model layer 1 of 0.1 and a specific storage for the other layers as 2e-6/foot.

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[1] Faunt, C.C., ed. 2009. *Groundwater Availability of the Central Valley Aquifer, California.* U.S. Geological Survey Professional Paper 1766, 225 p.

Drawdown was computed using the Multi-Layer Unsteady state (MLU) program (see http://www.microfem.com/products) to evaluate the slug test data.

MLU is a Windows application that can be used for drawdown calculations and inverse modeling (aquifer test analysis) of transient well flow in layered aquifer systems and stratified aquifers. MLU can also estimate selected aquifer parameters based on a best–fit, semi-analytical solution to measured time-distance-drawdown data. The automatic curve-fitting algorithm computes final optimized aquifer parameter data. Unlike other aquifer test analysis software, often supporting a wide variety of different solution types (for example, Theis, Hantush, Neuman, Boulton, Papadopulos, and Moench, etc.) for only one aquifer (or sporadically two), MLU is based on a single hybrid analytical-numerical solution technique for well flow.

For this calculation, the inverse modeling capabilities of MLU were not used. Drawdown was calculated using the aquifer properties presented in the table above. The MLU run was set up assuming a 10-layer aquifer. The pumping well was assumed to be 300 feet deep and screened from 100 to 300 feet. For the MLU run it was assumed that the well pumped from model layer 6.

Results

Simulated drawdown in the pumped aquifer is shown in the graphs below.
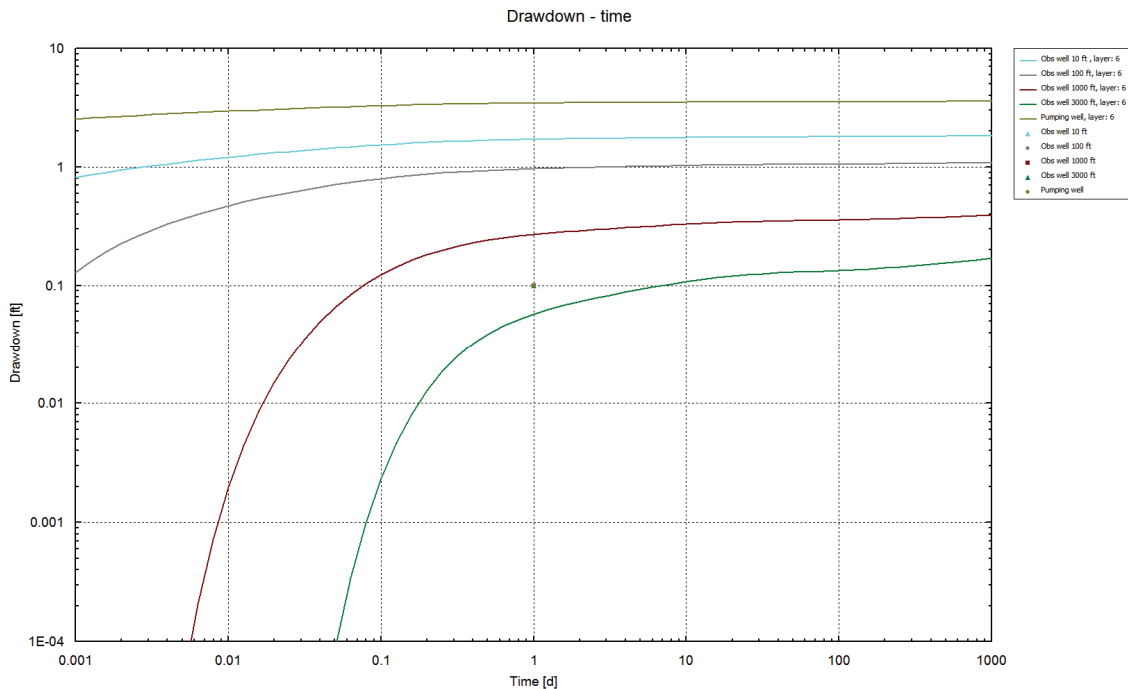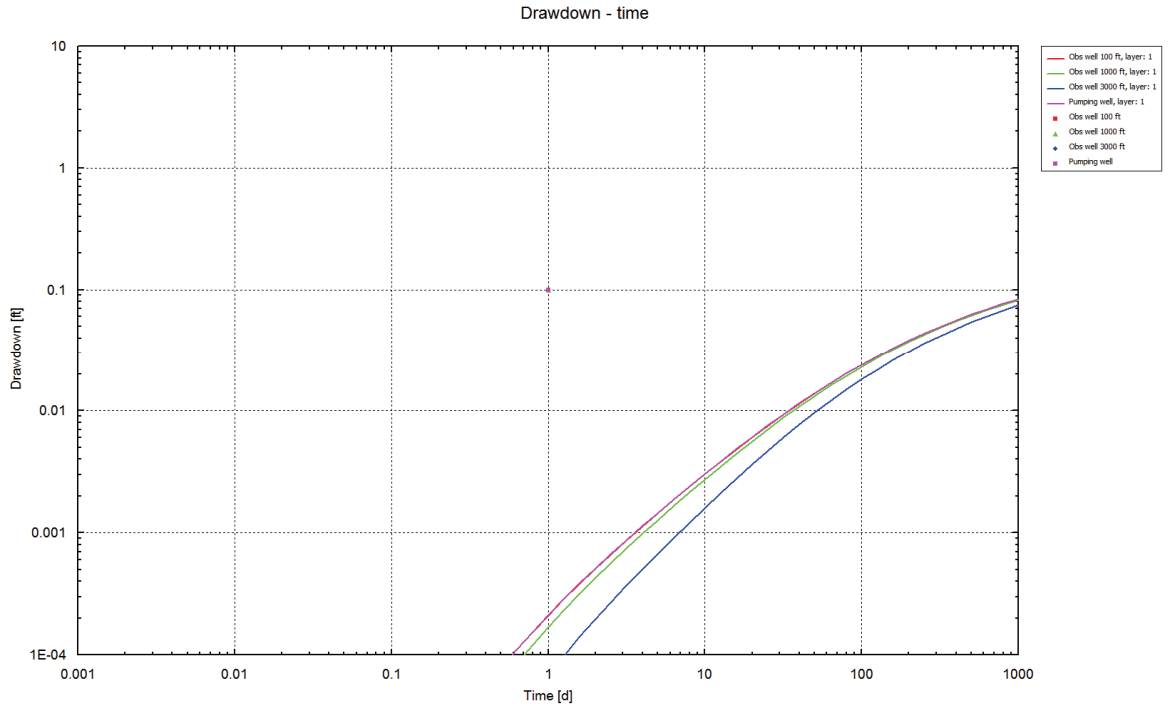
Results from the MLU simulation show that there will be minimal drawdown caused by this well. Drawdown in the pumped aquifer will be less than 2 feet at a distance of 100 feet from the well. In the shallow aquifer, drawdown will be less than 0.1 foot.