GAM Run 04-20

by Ian C. Jones, Ph.D., P.G.
Texas Water Development Board
Groundwater Availability Modeling Section
(512) 936-0848
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REQUESTOR:

Mr. Zan Matthies on behalf of the Middle Pecos Groundwater Conservation District.

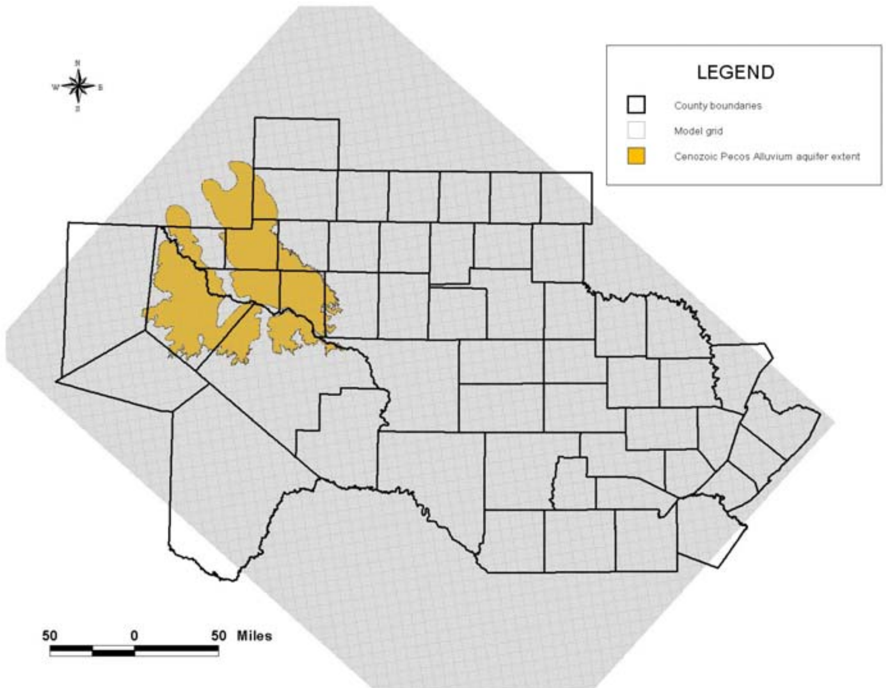
DESCRIPTION OF REQUEST:

A power company has begun development of a 7.2 billion cubic foot salt cavern gas storage project in eastern Reeves County, 1½ mile from the Pecos County line in Sections 15 & 16, PSL Survey, Block C-3 in Reeves County along the intersection of FM 1450 and County Road 101 (Figure 1). It is believed that this project will utilize Cenozoic Pecos Alluvium aquifer groundwater for the washing out of the cavern. It is reported that approximately 200 million barrels of groundwater water will be used over the course of approximately five years.

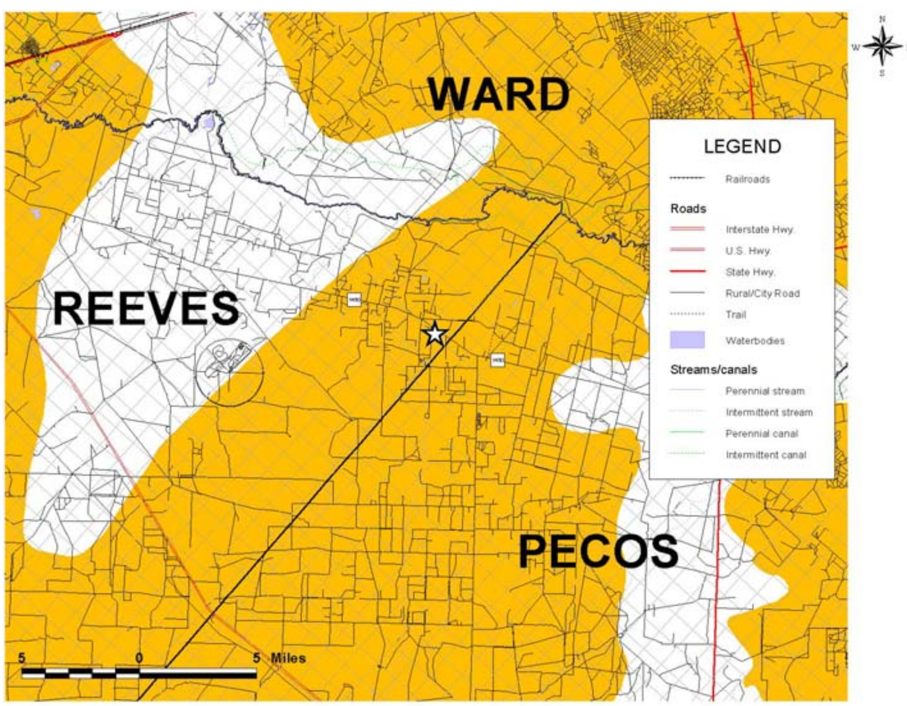
The question to be addressed by the model run is: what will be the effect on the Cenozoic Pecos Alluvium aquifer by pumping 200 million barrels of groundwater over five years under drought-of-record conditions?

METHODS:

To address the request, we added pumping to the Groundwater Availability Model (GAM) for the Edwards-Trinity (Plateau) and Cenozoic Pecos Alluvium aquifers (Anaya and Jones, 2004) to a cell in the model that corresponded with the location of the project site and we used the 1980 to 2010 predictive model run. In this model run, the period 1980 through 2000 represents the historic simulation while the period 2001 through 2010 represents the predictive simulation. In the predictive simulation, average recharge is applied during the period 2001 through 2003 and drought-of-record conditions during the period 2004 through 2010. Average recharge is based on average annual precipitation for the period 1971 to 2000 while the drought-of-record is based on precipitation for the 1951 through 1957 drought-of-record.



A.



B.

Figure 1. Location of study area in eastern Reeves County. The star in map B indicates the location of the project site.

PARAMETERS AND ASSUMPTIONS:

The effects of the Reeves County project is simulated by additional pumping (40,000,000 barrels per year or 615,342 cubic feet per day) during the last five years of the predictive simulation (2006 through 2010) from the cell that coincides approximately with the project site location in the model grid (column 98, row 185). Simulated water-levels were compared to: (1) Year 2000 simulated water levels, and (2) simulated water levels from a model run that did not include the project. It was assumed that all pumping related to the project occurred within the same model cell and groundwater inflow from the underlying Dockum aquifer is insignificant. It should be noted that simulated drawdown: (1) may be affected by the number and spatial distribution of wells, and (2) does not represent the effects of individual wells and, because this is a regional-scale model, drawdown is factored over 1-mile by 1-mile model cells. Consequently, an analytical model or a more detailed numerical model could be employed to evaluate potential impacts of pumping when more details of the project are known.

40,000,000 barrels per year × 5.615 = 224,600,000 cu. ft. per year

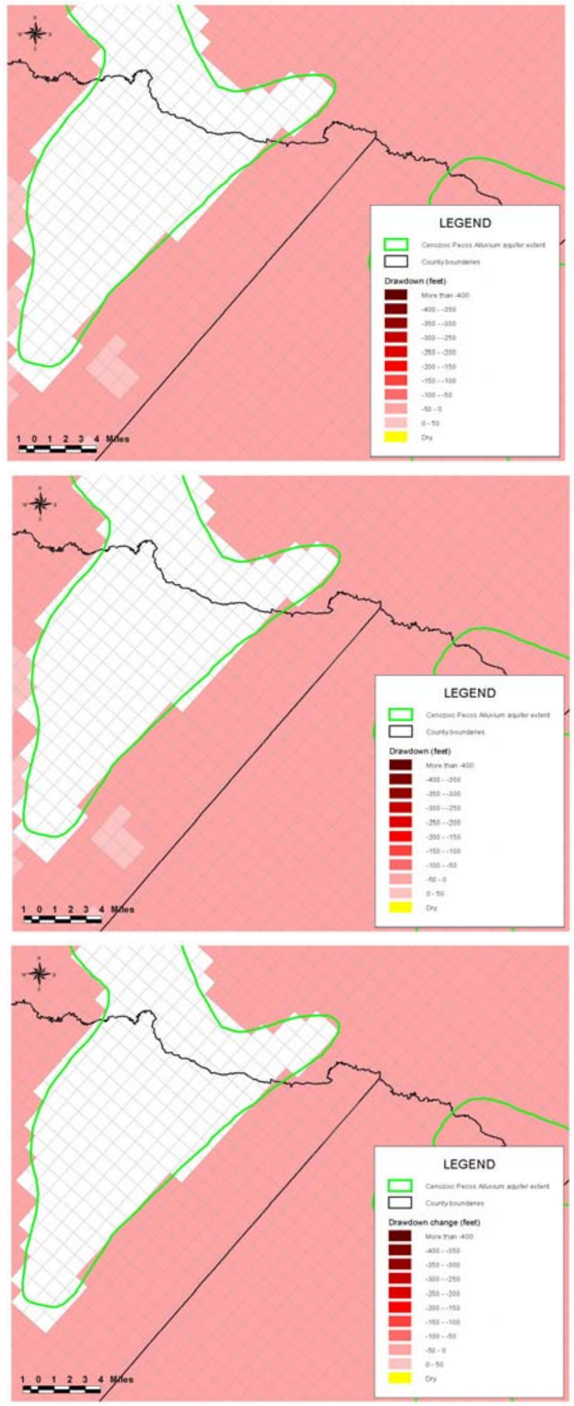
224,600,000 cu. ft. per year ÷ 365 = 615,342 cu. ft. per day

RESULTS

Figures 2 to 6 show drawdown relative to 2000 water levels with and without the project, as well as the water-level difference between the two scenarios. The water-level difference represents drawdown due to the project. The model run indicates that maximum drawdown due to the project increases from about 20 feet in during the first year of pumping (2006) to 50 feet in the fifth year (2010) (Figure 7). The aquifer thickness is approximately 450 feet at the project site. Without the additional pumping, the GAM predicts a very small water-level change during a drought-of-record. After five years, projected drawdown exceeding 50 feet due to the project only occur immediately adjacent to project site. In other words, the drawdown effects of the project decrease quickly away from the project site, and consequently, the effects of the project predicted by the GAM will be minimal beyond a few miles from the project site.

REFERENCES:

Anaya, R. and Jones, I. C., 2004, Groundwater Availability Model for the Edwards-Trinity (Plateau) and Cenozoic Pecos Alluvium Aquifer Systems, Texas: Texas Water Development Board GAM report, http://www.twdb.state.tx.us/gam/eddt_p/eddt_p.htm, 208 p.

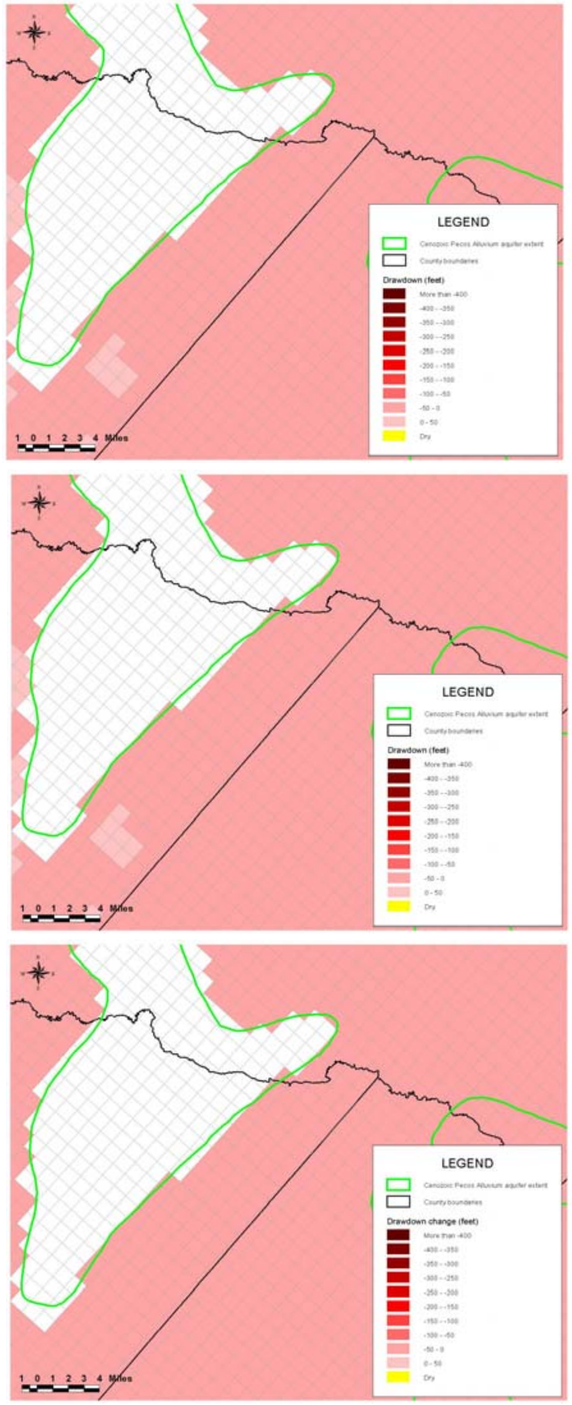


A.

B.

C.

Figure 2. Water-level changes for the period 2000-2006. A. Drawdown without well-field pumping. B. Drawdown with well-field pumping. C. Additional drawdown due to well-field pumping (water-level differences between scenarios A and B).



A.

B.

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Figure 3. Water-level changes for the period 2000-2007. A. Drawdown without well-field pumping. B. Drawdown with well-field pumping. C. Additional drawdown due to well-field pumping (water-level differences between scenarios A and B).

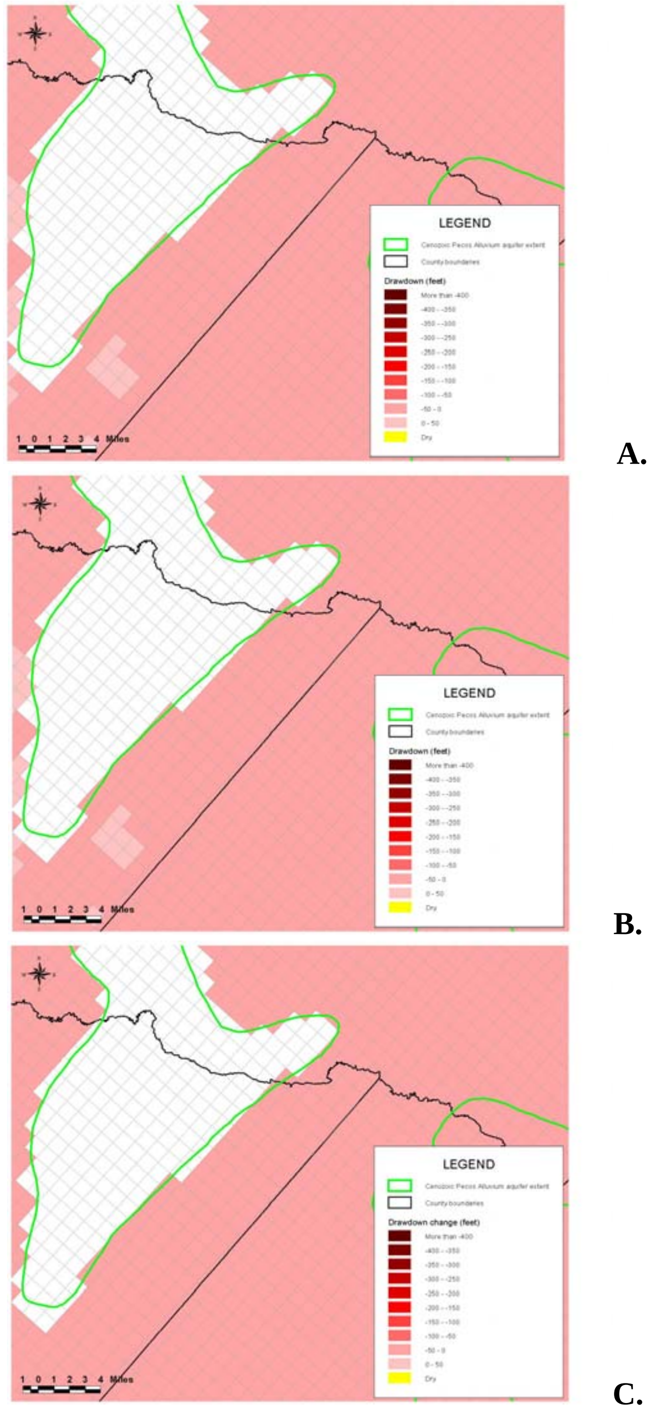
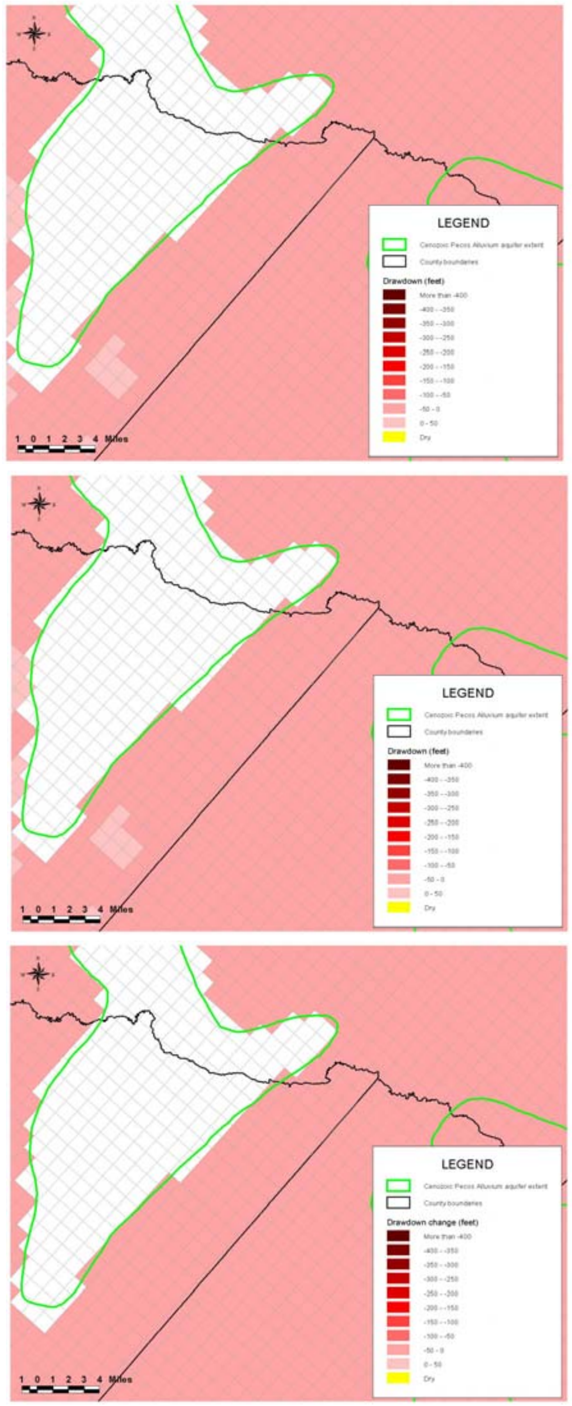


Figure 4. Water-level changes for the period 2000-2008. A. Drawdown without well-field pumping. B. Drawdown with well-field pumping. C. Additional drawdown due to well-field pumping (water-level differences between scenarios A and B).

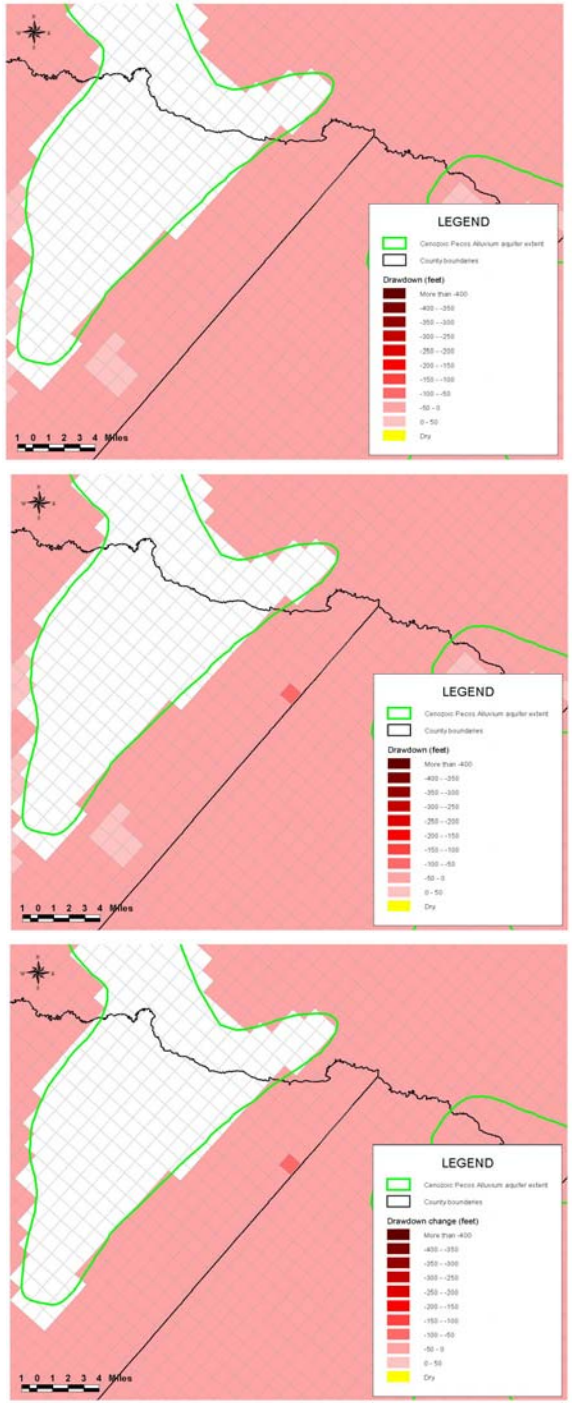


A.

B.

C.

Figure 5. Water-level changes for the period 2000-2009. A. Drawdown without well-field pumping. B. Drawdown with well-field pumping. C. Additional drawdown due to well-field pumping (water-level differences between scenarios A and B).



A.

B.

C.

Figure 6. Water-level changes for the period 2000-2010. A. Drawdown without well-field pumping. B. Drawdown with well-field pumping. C. Additional drawdown due to well-field pumping (water-level differences between scenarios A and B).

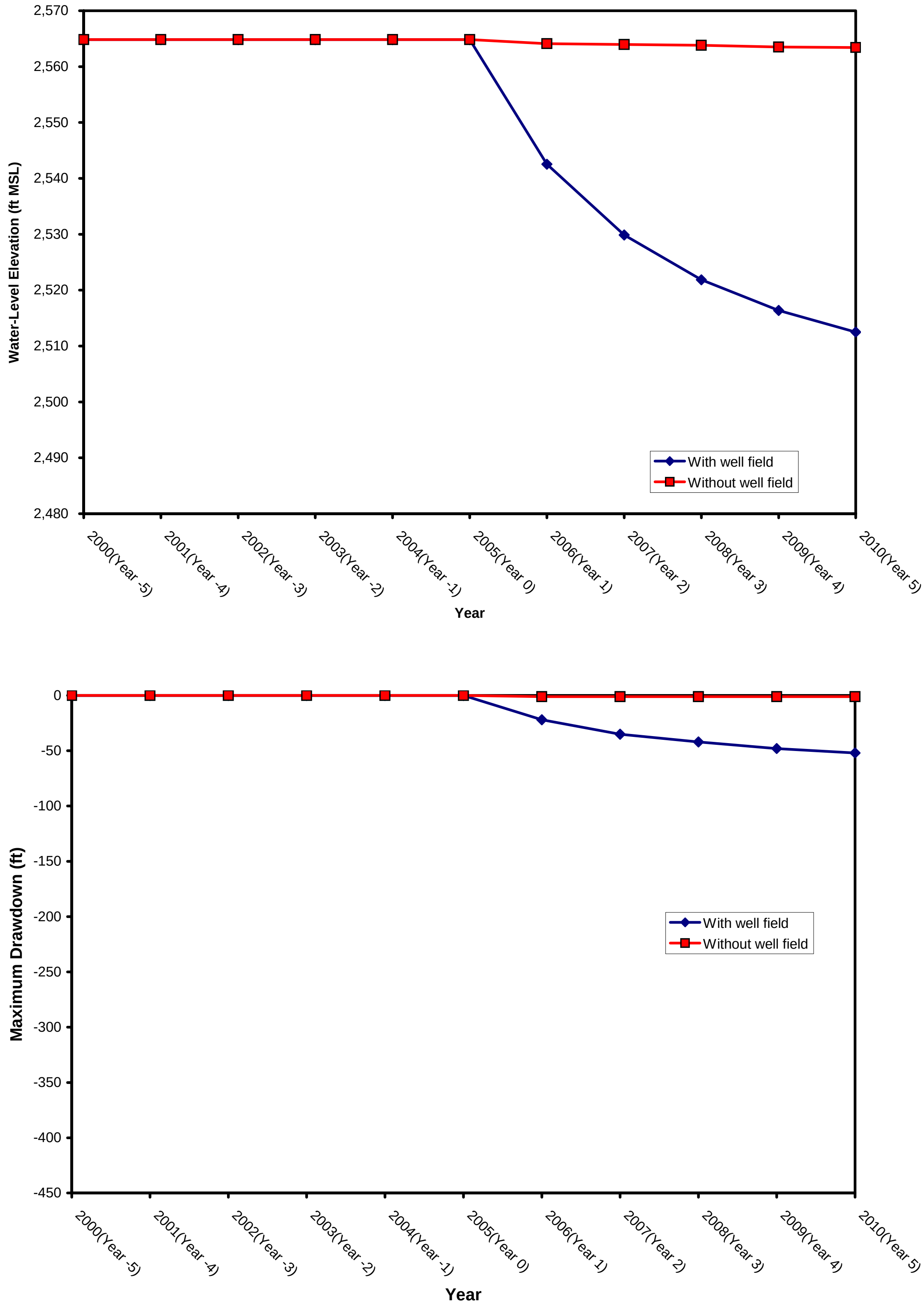


Figure 7. Water-levels and maximum drawdown associated with the well field