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GROUNDWATER FLOW MODELING OF THE SOUTHEASTERN COLORADO PLATEAU TRANSITION ZONE WITH THE MIDDLE RIO GRANDE BASIN: QUANTIFYING THE EFFECT OF PUMPING AND THE CONTRIBUTION OF DEEP, SALINE GROUNDWATER ON THE FLOW OF THE RIO GRANDE IN NEW MEXICO

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ABSTRACT: We investigated groundwater flow between the southeastern Colorado Plateau and the Middle Rio Grande Basin for the New Mexico Interstate Stream Commission. Thus far six wells have been completed into aquifers entirely below 2,500 ft of the ground surface, outside of the jurisdiction of the New Mexico Office of the State Engineer (NMOSE). A further 576 state-wide well sites are listed in "notices of intention" filed with the NMOSE. We used revised stratigraphic sections, oil-and-gas well formation-top picks, and a revised compilation of the bottom of the Dakota Sandstone to construct a 9-layer groundwater flow model and analyze the effects of pumping from deep wells on the Rio Grande flow. The model incorporates two existing models; in the western half, lower layers correspond with the USGS model of the San Andres-Glorieta aquifer, and the eastern half corresponds with the USGS model of the Middle Rio Grande Basin (MRGB).

The model is elevation-based with mountain-front recharge, river cells, and layer elevations based on structure contour maps. Twenty-six pumping scenarios were determined from all notices of intention on record at the NMOSE. We simulated maximum pumping water levels of 70 percent of the water column. The amount of groundwater pumped varies taking into account pump limitations and pumping interference from many wells. Important to the model is the amount of recharge that is contributed to the MRGB by saline, deeper groundwater flow, and the amount of saline groundwater that seeps down ramps of Paleozoic- and Mesozoic-age aquifers into the MRGB. Ramps are cut by numerous young faults that change from groundwater flow conduits in bedrock to barriers in the MRGB.

Water quality modeling suggests deeper groundwater enters the MRGB in the Rio Puerco area, south of the Rio Puerco fault zone. Pumping on the order of 10,000 acre-feet/year will impact the Rio Grande in several hundred years as the saline, deep groundwater recharge is captured from the Rio Grande. Pumping interference is significant in all the planned wells and communities relying on such a resource to meet future demand will face potential hardship as supplies diminish.

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