HOT SPRINGS REVISITED: A REVIEW OF DATA FROM THE C. V. THEIS STUDY “THERMAL WATERS OF THE HOT SPRINGS ARTESIAN BASIN”

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In 1939 Charles V. Theis, George C. Taylor, Jr., and C. Richard Murray investigated the thermal waters of the Hot Springs, NM (now named Truth or Consequences) to determine how much development of the hot mineral water can take place without lowering the temperature or reducing the flow of water. Their work included two pumping tests which were analyzed with curve matching methods, and show variations in the transmissivity of the aquifer depending on the direction between the pumping well and observation well. These variations were described as having maximum transmissivity parallel to the strike line of the thermal water bearing Magdalena limestone formation and are aligned to the grain of the formation.

This study reanalyzes the published data from these pumping tests using the Hantush-Jacob method to verify the directional sensitivity of transmissivity and investigate the cause of this directionality. The conclusion is that there is systematic variation in the computed transmissivity of the Hot Springs Thermal Aquifer. This study considers it highly significant that the direction of maximum transmissivity is perpendicular to the isopotential lines of the piezometric surface, therefore, in the direction of groundwater flow, but is at a 30° angle to the strike line. It was considered that variation results from horizontal flow within the aquifer distorting the cone of depression of the pumped well, but a MODFLOW analysis suggests that the transmissivity represents actual variations in the conductivity of the water bearing formation. The alignment of peak transmissivity with the direction of flow could result from piping as the heated water dissolves rock and enlarges channels as it flows towards an identified point of high natural discharge. Additional pump testing from a different location is suggested for a conclusive determination.


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