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**TITLE:** Radial flow towards well in leaky unconfined aquifer

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**ABSTRACT BODY:** An analytical solution is developed for three-dimensional flow towards a partially penetrating large- diameter well in an unconfined aquifer bounded below by a leaky aquitard of finite or semi-infinite extent. The analytical solution is derived using Laplace and Hankel transforms, then inverted numerically. Existing solutions for flow in leaky unconfined aquifers neglect the unsaturated zone following an assumption of instantaneous drainage due to Neuman. We extend the theory of leakage in unconfined aquifers by (1) including water flow and storage in the unsaturated zone above the water table, and (2) allowing the finite-diameter pumping well to partially penetrate the aquifer. The investigation of model-predicted results shows that aquitard leakage leads to significant departure from the unconfined solution without leakage. The investigation of dimensionless time-drawdown relationships shows that the aquitard drawdown also depends on unsaturated zone properties and the pumping-well wellbore storage effects.

**KEYWORDS:** [1829] HYDROLOGY / Groundwater hydrology, [1828] HYDROLOGY / Groundwater hydraulics.

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