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A Modeling Approach To Address Spatial Variability within the Culebra Dolomite Transmissivity Field

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ABSTRACT

Spatial estimates of transmissivity, which are essential input to a groundwater flow model, are usually developed from a limited number of transmissivity measurements and therefore associated with an uncertainty. In an attempt to assess the spatial variability of the unmeasured transmissivities within the Culebra Dolomite near the Waste Isolation Pilot Plant (WIPP), a multiple realization approach is employed. An innovative aspect of the methodology is the generation of an ensemble of conditional simulations of the transmissivity field, which preserves the statistical moments and spatial correlation structure of the measured transmissivity field and honors the measured values at their locations. Each simulation is then calibrated, using an iterative procedure, to match an exhaustive set of steady-state and transient pressure data. A completely automated inverse algorithm using pilot points as parameters of calibration was employed. The methodology was applied to the transmissivity fields for the Culebra Dolomite aquifer, and 70 conditional simulations were produced and calibrated. Based on an analysis of the calibrated transmissivity fields, additional data in a region east and north of the H-3 borehole would help to more accurately characterize the transmissivity of the region and reduce the uncertainty in calculating groundwater travel times. Progress in these areas would, in, turn, reduce the uncertainty in the prediction of concentrations at the accessible environment boundary.

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