

Numerical Modeling of One-Dimensional Steady-State Flow and Contaminant Transport in a Horizontally Heterogeneous Unconfined Aquifer with an Uneven Base

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Abstract

Algorithms and a short description of the D1_Flow program for numerical modeling of one-dimensional steady-state flow in horizontally heterogeneous aquifers with uneven sloping bases are presented. The algorithms are based on the Dupuit-Forchheimer approximations. The program permits evaluation of water table elevations, tracking streamlines, delineating bounds of contaminant plume, and estimating advective travel times. The D1_Flow program was tested against three types of analytical solutions, data from the Borden Landfill, and results obtained by the two-dimensional model used on the landfill previously. The program yielded results practically coinciding with each of these. With its flexible boundary conditions and rapid execution, the code can form a suitable basis for a plume diving calculation and be integrated into a site assessment.