Journal of Environmental Hydrology

ISSN 1058-3912

Electronic journal of the International Association for Environmental Hydrology

On the World Wide Web at http://www.hydroweb.com

JEH Volume 8 (2000), Paper 16, December 2000 Posted December 18, 2000

NUMERICAL SIMULATION OF FLOW AND CONTAMINANT MIGRATION AT A MUNICIPAL LANDFILL

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ABSTRACT
The flow and transport characteristics of the Ano Liosia Landfill site in Athens, Greece, were simulated by numerical methods using groundwater flow and contaminant transport models. A methodology for modeling the water flow and the transport of chlorides in steady state groundwater flow is presented. The Strack theory, which describes the extension of a simulation domain from two to three dimensions, is applied. This theory was used to determine the streamlines and path lines in three-dimensional space. For most waste disposal systems, interpretations and assumptions regarding undefined field properties will always have to be made in order to render the problem tractable. In this study, synthesis of field-measured and literature values of field properties provided a framework for the validation. The hydraulic heads derived from simulation fluctuated between 7 and 9 m in the area of the disposal site. The mean velocity (mean Darcy velocity / porosity) was found to be 6.5x10 $^{-2}$ m/day. The pollutant transport was simulated for 30 years. The simulation gave a plume of chlorides that extends 1843 m in length and 92 m in depth northwestward from the landfill. This study has demonstrated that an accurate and efficient computation of three-dimensional transport under advection - dispersion dominated conditions is feasible through extension of a two-dimensional to a three-dimensional flow model domain. The possibility of errors that may escape attention is eliminated when a coupled flow-transport three-dimensional model is used.

Reference: Fatta, D., C. Naoum, P. Karlis and M. Loizidou; Numerical Simulation of Flow and Contaminant Migration at a Municipal Landfill, Journal of Environmental Hydrology, Vol. 8, Paper 16, December 2000.

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