A Numerical Investigation for the Optimal Contaminant Inlet Positions in Horizontal Subsurface Fllow Wetlands

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A numerical treatment of flow and contaminant removal in porous media is presented. Emphasis is given to horizontal subsurface flow constructed wetlands, which are recently a good alternative solution for small settlements in order to treat municipal wastewater. The purpose here is to find their optimal design characteristics as concerns the contaminant inlet positions, in order to maximize their removal efficiency and keep their area and construction cost to a minimum. First the mathematical modelling is presented, leading to a boundary-initial value problem. Next, for the numerical simulation, the Visual MODFLOW code, based on the finite difference method, is used. Further, the numerical procedure is applied for the simulation of pilot-scale units of horizontal subsurface flow wetlands. The above pilot-scale units were constructed and operated in the Laboratory of Ecological Engineering and Technology, Department of Environmental Engineering, Democritus University of Thrace, Xanthi, Greece.