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التوثيق الالكتروني والميكروفيلم

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التوثيق الالكتروني والميكروفيلم

AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
IRRIGATION AND HYDRAULICS DEPARTMENT

NUMERICAL MODELING FOR GROUNDWATER QUALITY CONDITIONS IN ARID AND SEMI ARID REGIONS

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STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Doctor of Philosophy in Civil Engineering.

The work included in this thesis was carried out by the author, at Ain Shams University, Faculty of engineering, Irrigation and Hydraulics Department from November 1997 to June 2000.

No part of thesis has been submitted for a degree or a qualification at any other university or institution.

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ABSTRACT

Groundwater is an important source of water supply, its uses in irrigation, industries, municipalities and rural districts continue to increase. So groundwater is necessary for the continuous demand for more and more water.

Mathematical models of groundwater flow have been used since the late 1800S. A mathematical model consists of a set of differential equations that are known to govern the flow of groundwater. The reliability of predictions from a groundwater model depends on how well the model approximates the field situation. Inevitably, simplifying assumptions must be made in order to construct a model because the field situation is too complex to be simulated exactly. Usually, the assumptions necessary to solve a mathematical model analytically are fairly restrictive- for example, many analytical solutions require that the medium be homogeneous and isotropic. To deal with more realistic situations, it is usually necessary to solve the mathematical model approximately using numerical techniques.

In this study, a numerical model has been developed to simulate the groundwater flow and contaminant transport through fractured and porous media. The developed model has been verified against the Strelstova -Adams (1978), Willson (1978) and Buss (1986) analytical solution in order to verify the capability of the model in simulating the different field situations in one- or two- or three-dimensions. The model has been applied, by using the finite element method, to a case study of karst aquifer of the Figeh system in the northwestern of Damascus City (Syria). The verification tests indicated good agreement in simulating the groundwater flow and pollutant transport in both fractures and porous media. Also, it was concluded that the model can be used successfully in simulating and predicting the fate of pollutants in aquifers.

It is recommended to impose a maximum security to limit development that could cause physical or chemical change, or cause pollution to access near surface solution cavities and rock fractures that are connected to the water in the aquifer.

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