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بسم اللّه الرحمن الرحيم

مركز الشبكات وتكنولوجيا المعلومات

قسم التوثيق الإلكتروني

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جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم باللّه العظيم أن المادة التي تم توثيقها وتسجيلها

علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

Ain Shams University

Faculty of Engineering

Irrigation and Hydraulics Department

Assessment of Water Quality for River Bank Filtration in Egypt

A Thesis Submitted in Partial Fulfillment of the Requirements of the Degree of Master of Science in Civil Engineering (Irrigation and Hydraulics)

By

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This thesis is submitted as partial fulfillment of Master of Science in Civil Engineering (Irrigation and Hydraulics), Faculty of Engineering, Ain Shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Abstract

Egypt, like many other nations throughout the world, suffers water-related difficulties in addition to overpopulation where potable water distribution capacity is less than demand. The traditional water treatment plant could not work properly due to the surface water becoming more polluted, and problems of low water levels at intakes. As a result, it was necessary to look for an alternative to the traditional WTP and to find the best way to utilize water resources.

River Bank Filtration (RBF) is one of the techniques that can be used to treat water and provide safe and renewable drinking water at a lower cost than traditional treatment methods. Therefore, the holding company for water and wastewater has recently moved to use the RBF technology as an alternative to traditional methods in many areas that suffer from a shortage of potable water. This study aims to evaluate the hydraulic performance of the riverbank filtration system in west Sohag-Egypt. This will be achieved by building a numerical model to simulate the groundwater flow in the study area using MODFLOW and MODPATH under the GMS program. In addition to evaluating the water quality for conformity that the infiltrated water matches with Egyptian standard specifications for drinking water.

Water samples have been collected from the Nile River, and abstraction wells, in addition to measuring the water levels in the Nile River, abstraction, and observation wells and groundwater in the study area. Soil samples have been taken to obtain the hydraulic properties of the aquifer in the study area. The model has been applied for two different scenarios using different abstraction rates (10, 20, 30, 35, 40, 50, and 70 L/s). The first scenario: simulation of the hydraulic flow, by considering the absence of a clogging layer. The second scenario: simulation of the hydraulic flow, by considering the presence of a clogging layer at the river perimeter. Particle Tracking has been used to construct water paths around the abstraction wells and calculate the travel time. The percentage of the infiltrated water from the river to the abstraction wells was calculated using the Water Budget Tool.

The model results showed that the clogging layer has a significant effect on the infiltrated water. The RBF ratio is 40 % in the case of the clogging layer and 85 % without the clogging layer. This high ratio indicates that the Nile River and the aquifer in the study area have a strong hydraulic connection and the RBF system has good hydraulic performance. The abstraction rate has a significant impact on the infiltrated water. The most recommended

abstraction rate is 35 l/s. The analysis of water samples taken from the abstraction wells also showed a significant improvement in the water quality parameters and matches with the Egyptian standards of drinking water for all parameters except Mn, which enhances the effectiveness of using the RBF technology in the study area as an alternative to traditional water treatment methods. It is recommended to provide more details and studies about the clogging layer, soil properties and manganese.

Keywords: GMS; Hydraulic model; Nile River; RBF; Water quality; Sohag;

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