Palestinian National Authority
Palestinian Water Authority

السلطة الوطنية الفلسطينية
سلطة المياه الفلسطينية

Sustainable Management of the West Bank and Gaza Aquifers

UNIVERSITY OF NEWCASTLE

NERC British Geological Survey

Department for International Development
DFID

Hydrological Model of the Yarkon Tanninim Aquifer

By
Deyago Berger

January 1999
Mekeroth

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This is a Direct Translation from Hebrew to English of the above Report

Translated by:

SUSMAQ TEAM

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Disclaimer

This report is an output from the Flow Modelling and Hydrogeology Component, part of SUSMAQ project.

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The SUSMAQ Project

The aim of the project is to increase understanding of the sustainable yield of the West Bank and Gaza aquifers under a range of future economic, demographic and land use scenarios, and evaluate alternative groundwater management options. The project is interdisciplinary, bringing together hydrogeologists and groundwater modellers with economists and policy experts. In this way, hydrogeological understanding can inform, and be informed by, insights from the social sciences. The results of the study will provide support to decision-making at all levels in relation to the sustainable yield of the West Bank and Gaza aquifers.

The project runs from November 1999 to October 2004, and is a partnership between the Palestinian Water Authority, University of Newcastle and the British Geological Survey. The project is funded by the United Kingdom's Department for International Development (DFID).

The Flow Modelling and Hydrogeology Component is part of the SUSMAQ project

The Flow Modelling and Hydrogeology study focuses on the geology and hydrogeology of the Western Aquifer Basin (WAB), its inflows (recharge) and outflows (spring and well abstraction)
This is a direct Translation and Reproduction From Hebrew to English of the 1999 Mekeroth Report prepared by Deyago Berger.

Bibliographical Reference

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Feedback

The SUSMAQ and PWA teams will appreciate any feedback on this report. Feedback should be sent to the above contacts.

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National Water Company

Jordan Region Section

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A. Summary

1. Water supply in the state depends on 3 main resources: the Coastal aquifer, the Mountain aquifer (Yarkon Tanninim) and Tiberias Lake and they are all related to the National Water Carrier (Hamifoar) which enables their shared management. The basic task is to transmit water resources from the north to the south, to supply water to the connected consumers of the network, and to collect seasonal and the multi-year water crop of these three resources. These resources are different from each other in their hydrological and geological characteristics.

2. The work objective is to construct a system that coincides with decisions for the unified operation of the 2 basins, Tiberias Lake and Yarkon Tanninim (the mountain aquifer), through relevant knowledge and check different operating scenarios. The definition of operating scenarios is: Time scale illustration (monthly quantity) for abstraction and injection for all wells in the aquifer. It is believed in the future that there will be an increase of demand for knowing and set-up of the data for different subjects and visions to operate the basins.

3. In the first stage, a reconnaissance, definitions, knowledge of specific and important characteristics of each one of the water resources were executed for the purpose of characterization of the decision changes of each one of the water resources and the general changes (parameters) of the 3 basic networks. At the beginning of this stage, a hydrological model is to be set up for the Yarkon Tanninim aquifer for the purpose of illustration of the water level changes for each point of each possible running scenario. A special characteristic of the Yarkon Tanninim basin is that it is a natural under ground carrier with high importance. Accordingly, it is used as an effective tool for water distribution over different regions of the country and in addition it is used as a seasonal storage (storing about 360 mcm) and multi-year storage (storing about 600 mcm).

   The work included: Generation of maps for the aquifer (identification of confined and unconfined area), outcrops, springs, wells and rainfall distribution), the definition of boundary conditions, data collection for calibration (geological conceptualisation, water levels, abstractions, injection, springs discharge, and rainfall quantities). The model is based on solution of 2D flow equations of the isotropic confined aquifer. To calibrate the parameters of the aquifer, the geostatistical method was used, based on the belief that the transmissivity distribution is (expectation field). This method reduces the number of required parameters for the purpose of problem solution. The selected method uses temporarily Yarkon Tanninim water levels and transmissivities by using the co-Kriging method. A good match was obtained for the model for most of the aquifer areas.

   Also, graphical work was developed using programs to be easily handled. The development of a graphical tool enables the execution of the following works: -
   Viewing the run simulation (prediction) results simply and comfortably and then changing the model input data (Rainfall, Abstractions, Injections) for each run. Since Mekeroth wells are clustered, it is possible to define the operational scenario performance levels: from the group (clustered) to the individual well.
   For the purpose of calculating the natural recharge from rainfall, a model was developed to estimate the infiltrated water form the aquifer outcrops. The model depends on rainfall data calculations (20 years period) for 27 rainfall stations spread over the aquifer basin and the soil characteristics over each outcrop region.

   After selection of the operational scenario, it is possible to select the years to be contained in the attached input simulation data (rainfall) for each accepted structure from the database. The model enables the execution of simulations through all available years in the database for the attached rainfall data. In this case, one can get the output divided into minimum water levels in the representative wells.
   (The model simulation results are presented at the end of the report)

Full report/document is not available online