

Hydrological and Hydrochemical Study of the Major Springs in Wadi Shu'eib Catchment Area

by

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M.Sc. in Geological Engineering, Istanbul University, 1976

Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science in Geology
Faculty of Science, Yarmouk University

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ABSTRACT

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This thesis deals with the hydrological and hydrochemical characteristics of the major springs in Wadi Shu'eib Catchment Area. The catchment area covers an area of about 185 km². The study area is dominated by the sedimentary rocks of the Belqa and Ajlun Groups which are underlined by the Kurnub Sandstone rocks exposed at the lower limit of the study area.

The average annual rainfall in the catchment area ranges from less than 200 mm in the South Shuneh to more than 600 mm at Salt station. The determination of runoff was done by applying the "Curve Number Approach" of the United State Soil Conservation Services. The calculated average volume of runoff is about 4.02 MCM, 5.3% of the average rainfall. The calculated direct recharge into the Upper Aquifer System using the "Water Budget Approach" is about 9.31 MCM/a. The infiltration rate ranges from 2.6% in the dry water years to about 18% of the rainfall in the wet water years.

The flow-duration techniques were used to differentiate the main ground water sources feeding the spring area. A one aquifer source appears in a semi-logarithmic plot as a single straight line (e.g Mahis Spring), while a spring of two aquifer source appears as two straight lines (e.g Baqouriyyeh). The calculated maximum amount of ground water recharge to the springs area, ranged from 0.02 MCM (e.g El-Hummar Spring), and 3.84 MCM (e.g Baqouriyyeh Spring).

Water samples representing springs issue from different aquifers were collected and subjected to a hydrochemical study. According to the chemical analyses, two types of ground water can be classified. Na'ur Aquifer (A1/2), and Hummar Aquifer (A4) are classified as, alkaline earth water with prevailing bicarbonate. Three samples of the Wadi Es-Sir Aquifer (A7) were classified as, an alkaline earth water with prevailing bicarbonate. Two samples were classified as, an alkaline earth waters with increased portion of alkalies and prevailing bicarbonate.

According to the microbiological analyses, the springs water can be divided into three categories: None polluted springs (e.g Hazzir, Tureim, and Jadour Fouqa Springs). moderately polluted springs (e.g Jadour Tahta, El-Jurban, and El-Hummar Spring), and highly polluted springs (e.g Mahis springs).

The concentration of the tritium in spring waters was found to be equal to that in rainfall, which indicates a short residence, and the recharging point is close to the springs area.