Abstract

Uja area locates in the Jordan Valley, and characterizes with its fertile soil and available groundwater resources. These two factors make this area ideal for intensive agricultural activities. Two sources of water are available; these are Uja karstic spring that locates at the foot of the mountains, and groundwater boreholes which tape water from the shallow Plio-Plistocene aquifer system. The annual spring discharge varied between 1 MCM in dry hydrological year, and 12 MCM in wet year, depending on the annual rainfall in the mountain areas. The current total abstraction through boreholes is about 4 MCM, with electrical conductivity ranges between 2300 and 3050 µS/cm. The maximum spring discharge is in winter, and early spring months, and this condition does not cope with the highest agricultural water need during late spring and autumn. Lowering of water table within the Plio-Plistocene aquifer, and rising salinity are major challenges facing the sustainability of the agricultural sector. In the other hand the average annual discharge of the Wadi Al Uja (500 m from the well fields) is about 10 MCM of high quality flooding water, which flow eastwards toward the Jordan River.

The main goal of this study is to investigate and understand the hydrogeological setting of the Plio-Plistocene with a focus on the physical properties of the aquifer, and also to investigate the possible artificial recharge sites.

Field geological investigations in addition to thirty four geo-electrical resistivity measuring points distributed among three main N-S-profiles were conducted using Schlumberger method. Water samples were collected from operating wells where chemical analyses were carried out.

Fifteen groundwater wells with a depth ranged between 40 m in the east to 120 in the west were drilled during the sixties of the last century. Currently only 5 wells are in operation, with an average depth of 110 m, whereas all others boreholes in the central part (depth<100 m) were dried out. Chalk and Chalky-limestone layers of Senonian age border the western margin of the aquifer. Our field investigations showed that during the seventies of the last century and due to the annual damaged caused by flooding, village inhabitants dammed the northern branch of the Wadi, so since that time the majority of the shallow wells in the central part dried out, and water table dropdown from 40 m to 80 m under the ground. Also the chloride contents increase from 100 mg/L in the sixties to 700 mg/L in 2009.

Through the VES-measurements, three main lithological layers were identified, these are a 60 m thick gravel layer locates by 100 m depth, with an average hydraulic conductivity of 2600 m/d, three wells in the western part of the study area are taping water from this layer; and the electrical conductivity is 2300 µS/cm. The second layer overlaying the first one and consists of 90 m mixture of sand-gravel material. This layer extends eastwards, and become more sandy. The average hydraulic conductivity is 1581 m/d, and electrical conductivity is 3050 µS/cm, two wells are taping water from this layer in the southern part of the study are. The third layer consists of about 20 m sand-silt with average hydraulic conductivity of 645 m/d, and this layer is unsaturated with water.

Our investigation recommended Artificial bond in the east of the southern part. It locate in an area of between 150500N and 195500 E to 150500 N and 19688 E.New boreholes could be drilled around recommended artificial bond. Direct water injection in these new recommended boreholes is good approach to substitute the water shortage in Al Uja area.