Ain Shams University
Faculty of Science

GEOPHYSICAL CONTRIBUTION TO EVALUATE THE CONDITIONS OF GROUNDWATER OCCURRENCE IN TUSHKA AREA – SOUTH WESTERN DESERT- EGYPT.

A Thesis from

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ABSTRACT

The present studies deal with the integration between two different types of the geophysical methods which are Land magnetic and Electrical surveys to evaluate the conditions of groundwater occurrence. The investigated area is located in south eastern part of Western Desert of Egypt. It lies between latitudes 22° 15`& 22° 57` N and longitudes 31° 12` & 31° 54` E. It is bounded by Wadi Halfa road to the west and Tushka Canal to the east. The area under study covers about 2500 km^2. This area is accessible through Cairo – Aswan –Abu Simble asphaltic Road and Owinat-Tushka Road.

The geomorphologic features in the area are, Aswan High Dam Lake, Wadi Kurkur Pediplain and Tushka Depression.

Geologically the subsurface sequence in the area is basement rocks followed unconformable with Nubian sandstone intercalated with clay and silt and covered unconformable by Quaternary deposits in area of study. and the structural elements represented by Fault system.

The present study aims to evaluate the conditions of groundwater occurrence by identifying vertical and horizontal extensions of the sedimentary succession, especially water bearing formations and the structural elements (fractures and faults) which affected on water bearing formation.

The surface of the study area according to the result of remote sensing applications formed from seven classes. These are surface water in Lake Nasser, plant cover, dry channels, Nubian Sandstone on the floor or covered by sand sheets, Nubian Sandstone as hilly lands or mountains, basalt and Nubian sandstone affected by hydrothermal solutions.

Integrated geophysical methods were carried out using Land magnetic survey, geoelectrical methods such as one-dimensional (1-D) resistivity (Vertical Electrical Sounding),

two-dimensional (2-D) imaging with different configurations and three dimensional (3-D) surveys.

Generally, the magnetic study reveals; the basement relief, depth to the basement and the subsurface structures. Also the one-dimensional resistivity reveals; the subsurface sequence and its horizontal and vertical extensions, the water bearing formations and their horizontal and vertical extensions, subsurface structures especially which affected on the groundwater occurrences. The results are represented in magnetic profiles, geoelectrical cross sections and maps.

The interpretation results of the modeled land magnetic profiles were used in construction of depth to the basement surface and level of the basement contour maps. These maps revealed that the depth to basement ranges from zero meters in the north and west parts to about seven hundred meters in the middle part around Abu Simbel road. This variation is due to the effect of structural faults which lead to a formation of a group of horests and grabens. These faults have more or less NE-SW and NW-SE. the basement relief around Khor Tushka and Lake Nasser is less than +150m and it is less than the maximum (180m) and minimum (164m) surface water level.

The interpretation of the resistivity sounding led to the detection of five main geoelectric units in the south of khor Tushka area, the fourth one is the confined water bearing formation. On the other hand, three main geoelectrical units are detected in the north of khor Tushka area, the third one is the free water bearing formation.

The thickness of the water bearing sandstone as detected from integration between the geoelectrical and geomagnetic results and reach to 440m increases at the middle and decrease to east and west due to basement rising. The resistivities of the water-bearing formations showed the similarity in some parts with salinity map of the study area and gave high resistivity

values. These high values appear as a result of hydrothermal solutions that cause the rock more massive, and consequently decreases its permeability i.e. decreases its hydraulic conductivity. The result of 2-D modeling showed that there is a shallow aquifer in some parts of the south of khor Tushka.

Finally, the priority map was formed to identify the best regions for drilling water wells in the future and evaluate the state of drilled wells.

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