



# Implementation of ground penetrating radar and electrical resistivity tomography for inspecting the Greco-Roman Necropolis at Kilo 6 of the Golden Mummies Valley, Bahariya Oasis, Egypt



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**Abstract** Bahariya Oasis is one of the lately inspected spots in Egypt and has a long historical record extending from the old kingdom till the emergence of Islam. Since June 1999, the Valley of the Golden Mummies near Bawiti (at kilometer 6 on the road leads to Farafra Oasis) became significant due to the discoveries of amazing mummies of gilded faces. The archeologists believe that the Valley has more valuable tombs that still unrevealed. Also, the possibility that the Greco-Roman Necropolis extends to areas other than Kilo-6 is sustainable.

The ground penetrating radar and electrical resistivity tomography are two geophysical tools that have successful applications in archeological assessment. The two techniques were used in integration plan to assert the archeological potentiality of the studied site and to map the feasible tombs. Sum of 798 GPR profiles and 19 ERT cross sections was carried out over the study area. The results of them were analyzed to envisage these results in archeological terms.

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## 1. Introduction

Bahariya Oasis is a large, oval-shaped NE-oriented depression in the north-central part of the Western Desert of Egypt. It is one of seven major depressions in the Western Desert. It lies between latitudes 27°48' and 28°30'N, and between longitudes 28°30' and 29°10'E, at distance of about 300 km southwest of Cairo (Fig. 1). The average depth of the depression from the general desert plateau is less than 100 m (Said, 1962). It has

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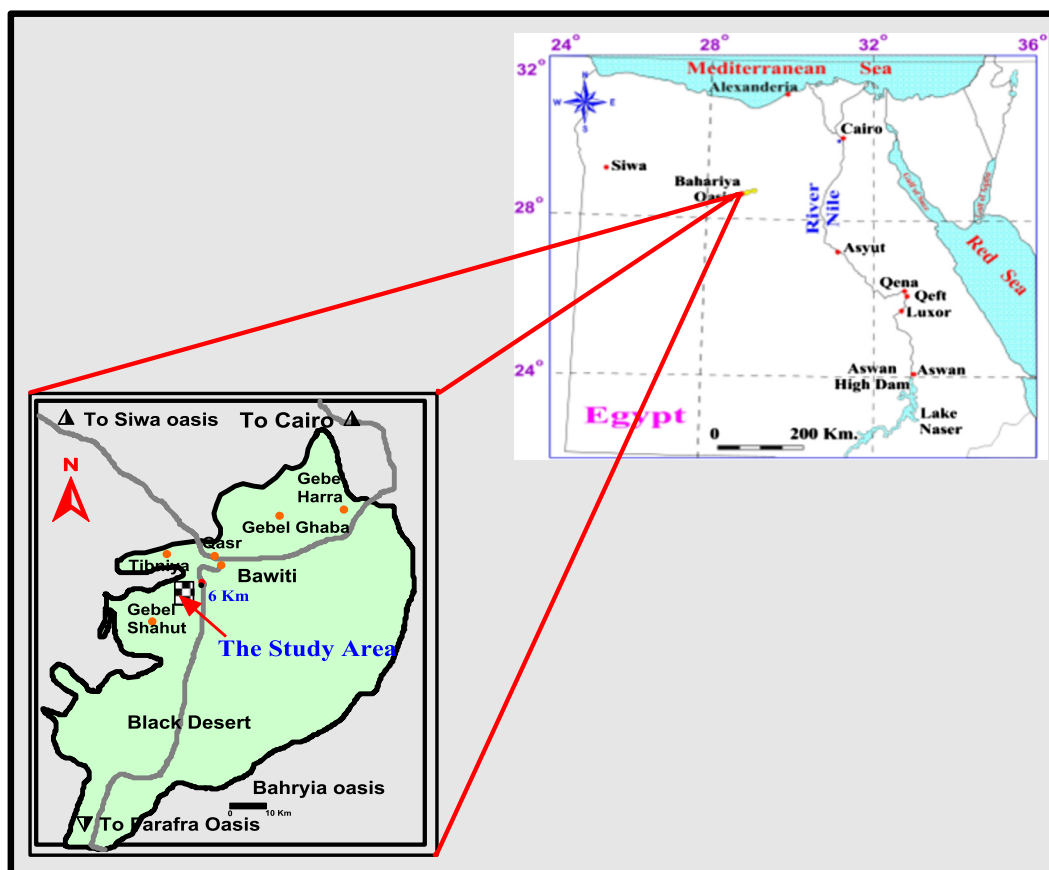


Figure 1 Location map of the study area at Bahariya Oasis.



Figure 2 The shape of one of the reference stations.

a surface area of about 1800 sq. km and is surrounded by plateaus at about 250 m above sea level (Moustafa et al., 2002).

The study area is located in Bahariya Oasis between latitudes  $28^{\circ}19'43.74639''$  and  $28^{\circ}19'51.7362''$ N, and longitudes  $28^{\circ}49'30.01850''$  and  $28^{\circ}49'42.8658''$ E.

The study area is divided into grids in order to apply the geophysical measurements. To allocate the grids in optimum precise, the Global Positioning System "GPS" is used which allows users to determine their location on land, sea, and in the air around the Earth.

The first stage has been to initiate three cement bases to fix three GPS devices (GPS 4000 SSI) on them as reference stations (Fig. 2). These bases are called Bases 1, 2 and 3. To compute the corrected coordinates of these bases accurately, we used the static survey model with interval time 30 s per epoch and left the device working for about 8 h.

The second stage of work was to divide the area under investigation into cells ( $50\text{ m} \times 50\text{ m}$ ) where we observed every cell uses the Stop and go technique using a very high resolution, an observation per two seconds. The topographic data

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