Geoelectric Studies for Subsurface Void Detection in the Shahr-e Kord Area — 2025

Project Objective

The primary objective of this project was to identify ground subsidence and subsurface voids, including qanats, in the vicinity of the main petroleum product transmission lines. In this project, geophysical data acquisition was carried out using the IPRSw-888 device, approximately 10 kilometers north of Shahr-e Kord.

Methodology

In this project, geophysical surveys were conducted using the IPRSw-888 device, manufactured by Pishgam Tajhiz Bonyan Company (Figure 1). The equipment used in geoelectrical projects includes a current cable reel for injecting current into the ground, multi-electrode cable reels for receiving the return current, electrodes, a hammer, a switch box, a junction, and a laptop. The device connects wirelessly to the laptop via WiFi. The IPRSware software is used to record the operation data, which are saved in `.txt` format.

Figure 1- View of the IPRSw-888 Device

Survey Planning and Implementation

Based on field observations, geophysical objectives, and existing physical constraints, three survey profiles were designed (Figure 2). Considering an investigation depth of 30 meters and the need for high resolution to identify geological layers, an electrode spacing of 10 meters was selected for data acquisition using the electrical profiling method with a dipole-dipole array, as specified by the client. In these profiles, both resistivity and chargeability values were measured simultaneously. Upon completion of the data acquisition, the raw data were carefully corrected. The corrected data were then used for subsequent modeling.

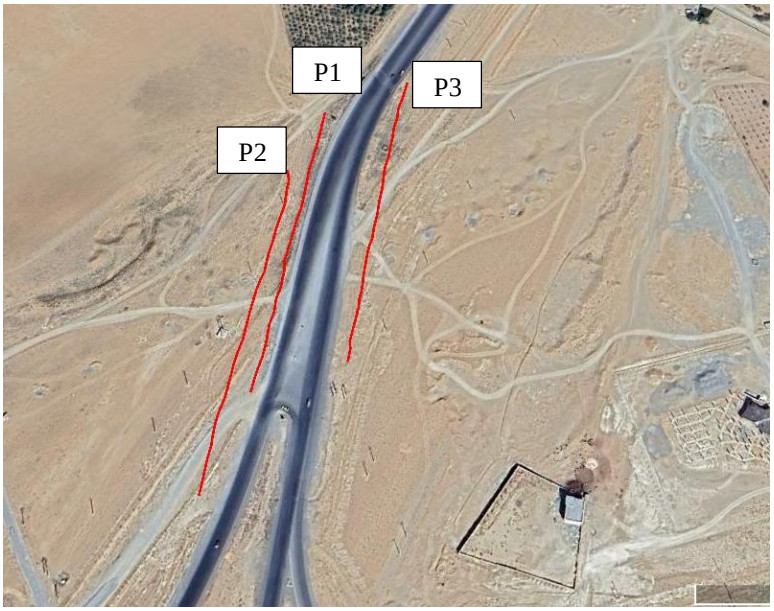

Figure 2- Layout of Survey Profiles on the Google Earth Map of the Area

Conclusion

In this study, geophysical methods were employed to investigate subsurface conditions. Data acquisition was carried out along three aligned profiles. According to the software output sections, certain parts of the profiles exhibit significantly higher resistivity values compared to the surrounding background, indicating either coarse-grained soil or the presence of subsurface voids. As observed in Profiles 1 and 3, anomalies are visible at depths of approximately 3 to 12 meters and 2 to 10 meters, respectively.

The anomaly detected in Profile 1 likely corresponds to the presence of a qanat shaft, while the anomaly in Profile 3 is associated with a buried pipeline channel, where potential erosion has

occurred, making the area prone to subsidence. The locations of these anomalies are presented in the accompanying table (Figures 3 and 4).

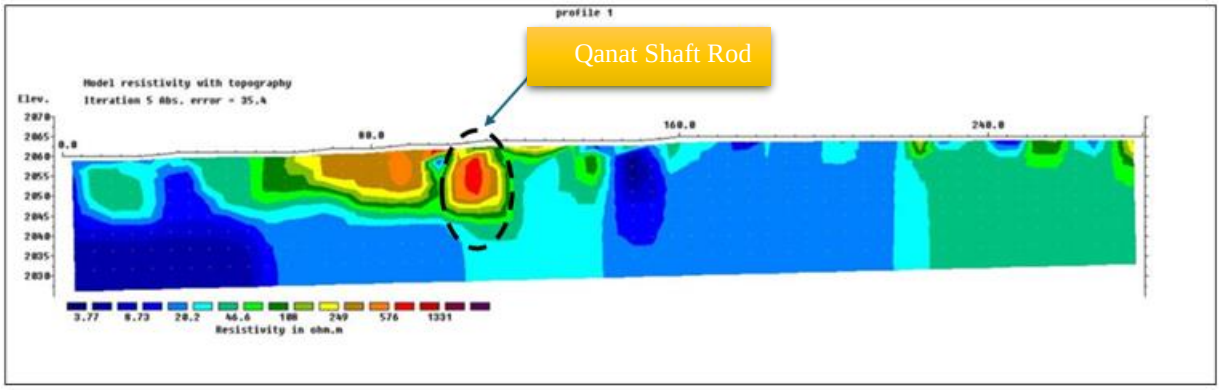

Figure 3- Cross-section of Profile 3

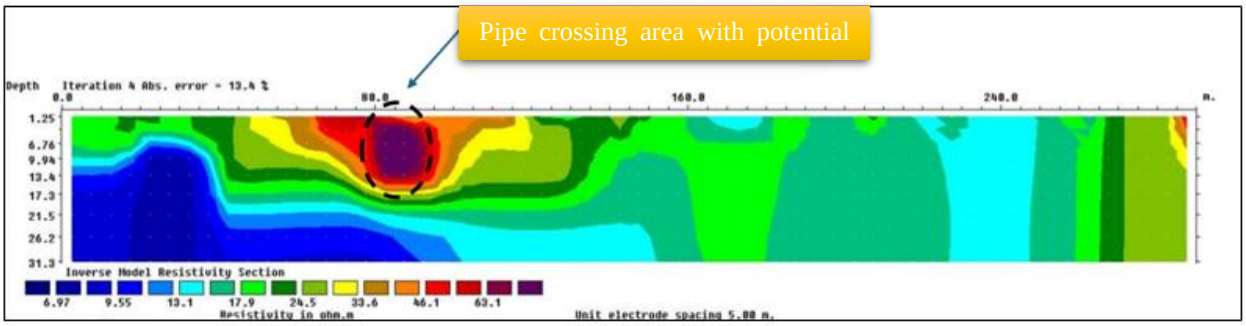

Figure 4- Cross-section of Profile 3