GEOTECHNICAL SITE INVESTIGATION

Assessing subsurface geological hazards for construction in Dubai

CASE HISTORY

Objective: To assess the likely subsurface geologic hazards such as shallow/deep cavities, unconsolidated weak zones, and soft-soil formations that exist under the proposed construction site of a 1m diameter Gravity Sewer Line along King Salman Road, Dubai.

Survey site: Dubai, United Arab Emirates

Instruments Used: The SuperSting™ R8/IP System, AGI 56 Electrode Passive Cables with 2m electrode spacing, and an AGI SwitchBox 56. A Pole-Dipole array was used for this survey.

Software Used: EarthImager™ 2D

BACKGROUND:

In this project in Dubai, there were some concerning geological hazards beneath the proposed construction site of a 1000mm Dia Gravity Sewer Line. A geotechnical investigation was made in order to evaluate the extent and spatial variability of such hazards. These hazards included shallow loose soils, soft-rock materials, air-filled and/or water-filled holes.

PROCESS:

Electrical Resistivity Imaging (ERI, also known as ERT) data was acquired in conjuction with Multichannel Analysis Surface Wave (MASW) in order to investigate geohazards beneath the proposed construction site.

For both methods of investigation, the client was looking for data corresponding to low shear-wave velocity, low resistivity values, and low SPT(N)/RQD percentage results.

A Pole-Dipole array was used in order to collect Electrical Resistivity data.

(Results on next page)

Pictured above: The SuperSting™ R8 and AGI Switchbox

Data & Survey Details courtesy of: Tatweer (TGSC)

RESULTS:

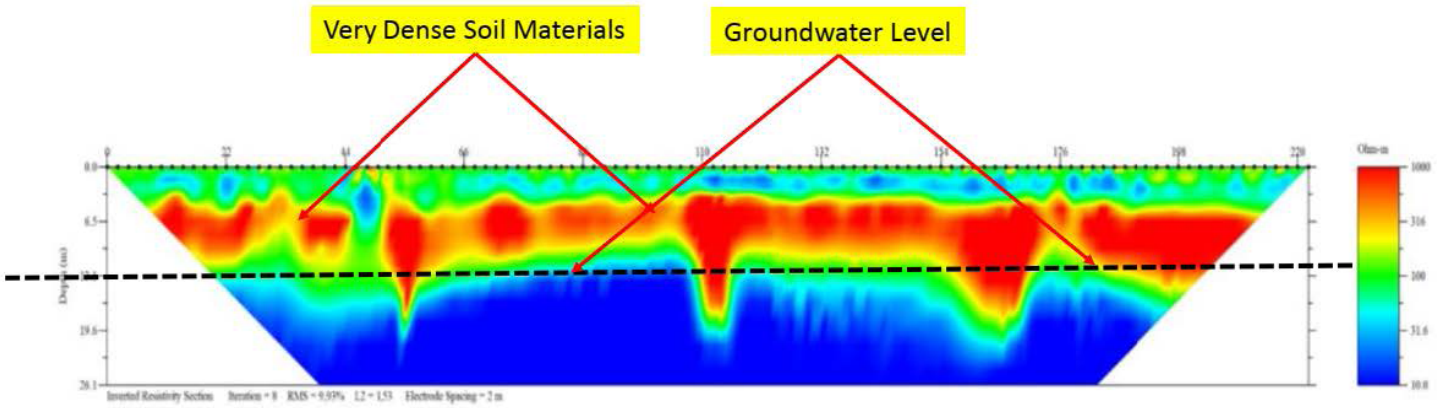


Figure 1: ERI Data detailing soil materials and groundwater levels

The ERI data above (Figure 1) shows the resistivity variation in the subsurface materials beneath the proposed construction site. It reflects a quite heterogeneous subsurface with large resistivity variations throughout the formation. The top layer is characterized with high resistivity values. Extremely low resistivity numerical values have been observed below the black line on the chart. This is at a depth between 15.0m and 20.0m, below natural ground surface. The low resistivity was due to weak and water-saturated content in the weathered/ fractured soft bedrocks. This bedrock was rich with fragments of conductive materials.

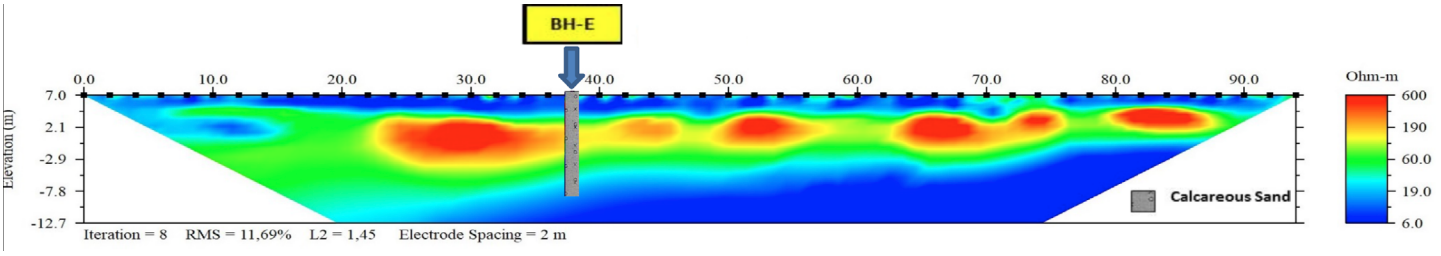
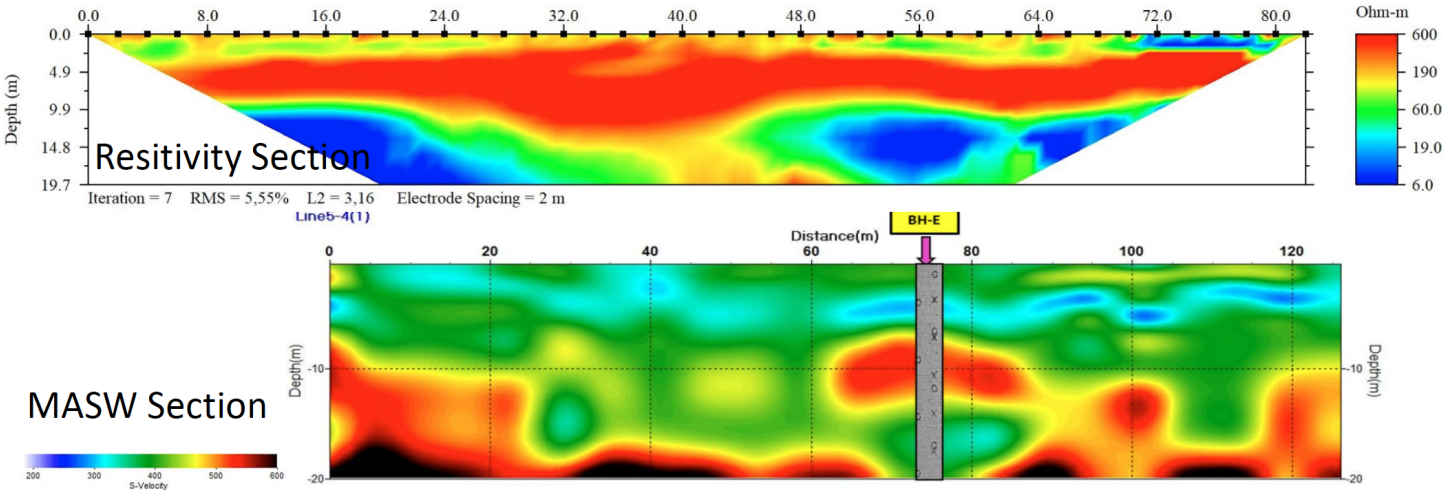


Figure 2: ERI Data inverted section with borehole

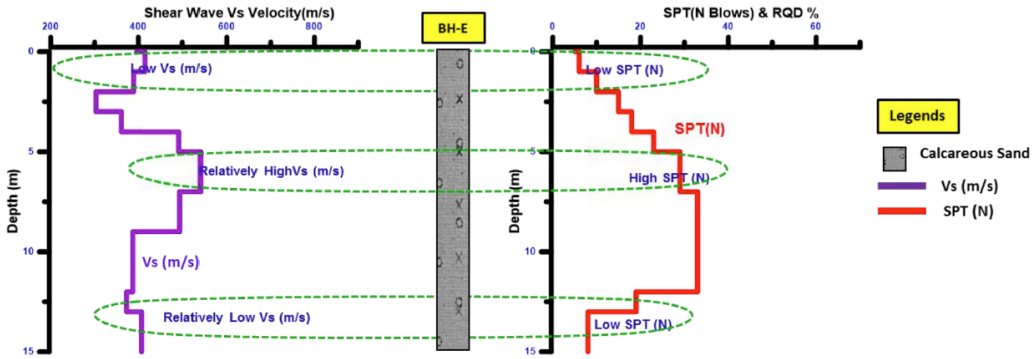
The inverted section above (Figure 2) showed a reasonable correlation between geotechnical results obtained from borehole BH-E and other resistivity values. Shallow blue colors are strong indications of saturated soil materials. The groundwater average level was traced from ERI images at shallow depths of about 7.0m from the natural ground surface.

(Results on next page)

RESULTS (CONT'D):



When the client did a comparison of the geophysical results with rock cores and borings, it allowed for the calibration of the geophysical data and improved interpretation.



The extremely low resistivity values observed along all ERI lines confirmed the presence of highly-saturated and dense soil materials. The ERI profile also assisted in the approximating the spatial variability amongst all of the geohazards crossing the area of the proposed construction of Alignment and Installation of 1000mm Dia Gravity Sewer Line.