Geophysics – Sustainable water in Erigavo, Somaliland

Background

The pastoralist community Af-Galmadow, located 40 km east of Erigavo, has limited access to water for parts of the year. Currently, water needs are transported by foot hours away, twice a week. A well field can ensure sustainable and continuous water supply, and in the future act as the corner-stone for a local dairy.

Geophysical investigations, especially resistivity soundings, have proven to provide valuable knowledge about the hydrogeological conditions.

For the hydrogeological mapping program near Erigavo, the Time-domain Electromagnetic (TEM) method has been introduced. Since TEM soundings are easy and fast to perform, dense spatial pseudo 3D mapping is possible. The state-of-the-art sTEM system from TEMcompany was used to collect soundings during three field days. The sTEM system provides high-quality soundings to a depth of approximately 200 m. The TEM soundings were spaced densely along a number of profiles to obtain a good resolution of the potential water barring structures. The following phase the geophysical results are used to identify the optimum site for a new production well.

The geophysical data were conducted by Peter Thomsen, NIRAS, Max Halkjær, Geophysical imaging Partners, and local geophysicist Ahmad Khalif. Client was Dairy without Borders with NGOs Iftin and Bayden as partners. The project is funded by the Ramboll Foundation.

Figure 1 The field crew collecting the TEM soundings

Results

During the three-day fieldwork, a total of 47 high-quality soundings were collected. The data were inverted with a 1D-resistivity model using the SPIA software from Seequent. The resulting models are imported to the software packages Workbench and presented on GIS and along model sections.

Based on the hydrogeological knowledge, the area is dominated by a thin package of sediment above limestone. The aquifers consist of a fractured zone in the upper parts of the limestone. From existing resistivity sounding, it is estimated that the fractured limestone making up the aquifers ranges in resistivity from 10 to 30 Ωm.

The location of the 47 TEM soundings, together with a model section perpendicular to the river, is shown in Figure 2. Low resistivities ranging from 10 to 30 Ωm indicate fractured limestone (aquifer), whereas higher resistivities greater than 300 Ωm reflect the presence of more undisturbed limestone.

Benefits of the survey

Based on the results from the sTEM survey, the most potential site for a well field is designated.

From the expected regional hydrogeological conditions, the aquifer is interpreted to be 20 to 50 meters thick. Compared to traditional geophysical resistivity surveys, e.g. VES, this sTEM has improved the resolution significantly, thereby minimizing the risk of drilling a dry well.

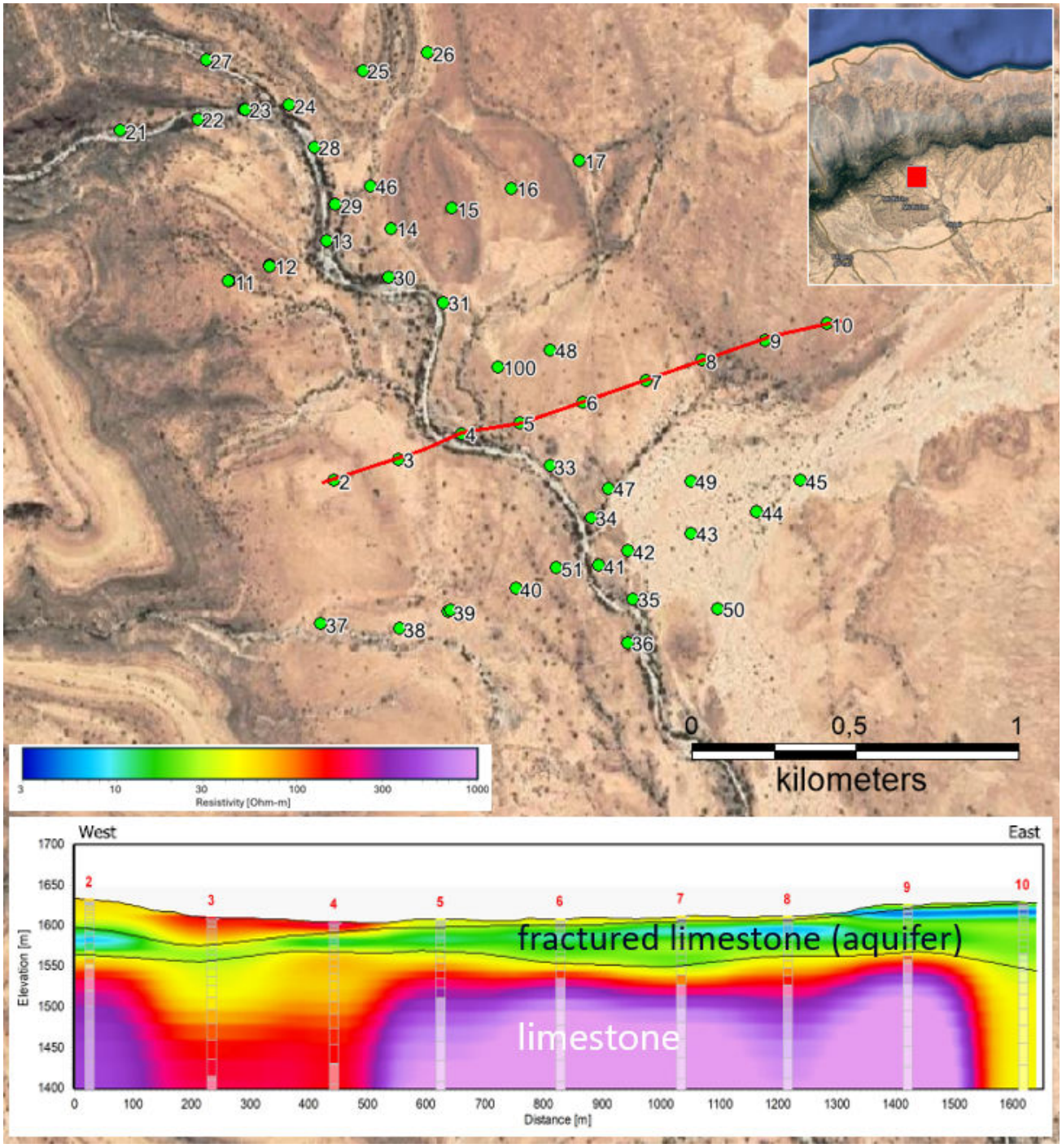

Figure 2 Location of the 47 TEM soundings, and a model section perpendicular to the river.