

CASE STORY

Aquifer - Protection

| RESISTIVITY |

► Preservation of agricultural value during re-route of highway

CLIENT

Ramböll - Engineering, design and consultancy company founded in Denmark was assigned by The Swedish Transport Administration (Trafikverket).

Background - Increasing traffic intensity

The Swedish highway E22 is of great importance to the Swedish economy. The highway winds thru small villages on its way between the cities Malmö and Norrköping. The area is considered to have a natural, animal and agriculture value.

10 000 cars pass by every day – by 2040 the amount of vehicles will increase to 16 000. Since parts of the highway is quite narrow with limited possibilities to broaden the road, a new solution needed to be drawn up. After a pre-investigation, Trafikverket (the Swedish Transport Administration) decided to re-route 16 km of the highway to ensure the flow, safety and environmental values.

Challenge

In the area, a large aquifer supplies the surrounding municipalities with drinking water. This needed to be dealt with carefully to ensure the protection of the ground water. The geotechnical pre-investigations showed that 4.5 km of the 16 km stretch needed an improved water protection. But in order to get the full picture of the full stretch, the geotechnical investigation needed to be supplemented with geological mapping.

Solution

Taking the geological conditions and other requirements into consideration, the resistivity method was selected since it was the only method complying to:

1. Potential mapping of bedrock on 50-60 meters depth
2. Possible survey depth of 70-80 meters
3. The Geology mainly consists of till and clay (Illustration 1)
4. A possible 2D continuous profile along the new stretch of the route

The subsurface mapping of the 11.5 km road stretch was made with the resistivity system consisting of ABEM Terrameter LS with 4x21 cable system (Illustration 2). 5 meter spacing between the electrodes. The Aarhus Workbench was used for the data processing (Illustration 1). The roll-along methodology was used in order to create a long profile with the 400 meter long cable. To acquire more information about the geological conditions, partial-parallel profiles were also created to improve the basis for decision. D-GPS was used to measure the topography along the profile.

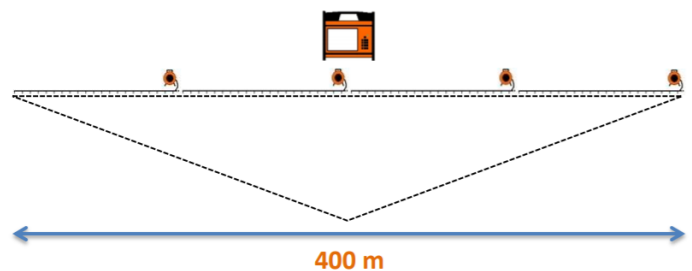


Illustration 2

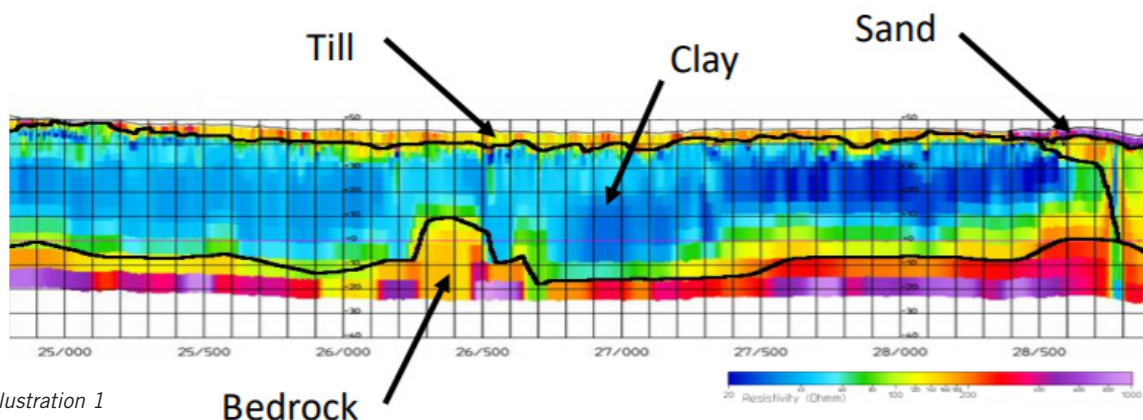


Illustration 1

RESULT

The outcome of the mapping of the subsurface resulted in positive results from both a financial as well as environmental perspective. The survey showed that a thick clay layer above the bedrock would act as protection for the underlying aquifer. For most parts of the 16 km potential road section, no additional protection was required. The outcome and analysis of the survey delimited the need for water protection work. The monetary saving was estimated to 50 MSEK (\$5.6) together with the environmental savings.

Acknowledgement

We would like to thank The Swedish Transport Administration (Trafikverket) and Ramböll AB for allowing Guideline Geo to use information, illustrations, photos etc. from their pre-investigations of the re-routing of the E22 highway.

We would like to underline that the geophysical investigations were correlated with existing geotechnical drilling logs. The resistivity survey was not the only source of data for the final geological interpretation.

PROJECT

- ▷ **Method:** Resistivity
- ▷ **Configuration/Solution:** ABEM Terrameter LS with 4x21 cable system (Illustration 2). 5 meter spacing between the electrodes. The roll-along methodology was used in order to create a long profile with the 400 meter long cable.
- ▷ **Inversion & Visualization SW:** Aarhus Workbench was used for the data processing