DETERMINATION OF INTERFACES WITHIN THE REGOLITH USING NEAR-SURFACE GEOPHYSICAL AND PETROGRAPHIC METHODS AT THE WHIRLING DERVISH GOLD PROSPECT, WESTERN AUSTRALIA

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Regolith covers a large percentage of the Australian continent and therefore covers a large number of ore deposits. Finding ore deposits beneath the regolith is often difficult due to the large variations in the composition of the regolith and the varying thickness of the layers within the regolith. If the regolith thickness was known and the depth and thicknesses of the layers within it could be determined, better geophysical and geochemical analysis may lead to greater exploration success. At the moment the determination of the interface between regolith layers and the interface between regolith and basement can only clearly be defined by drilling. The application of a combination of geophysical methods may reliably define the inner regolith interfaces and the regolith to basement interface.

The key objective of this work is to establish the effectiveness of geophysical methods for the resolution of layers within the regolith and between regolith and basement. Following a literature study to determine possible suitable methods, seismic and electromagnetic methods were chosen for the application on the Whirling Dervish prospect. In addition, data from geological borehole logging and density measurements from drill cores and drill spill were used to help correlate results.

A Bison S9000 unit was used to collect seismic refraction while a Nanotem system was used to collect EM data. The main focus was on the centre line of the Whirling Dervish prospect coinciding with a number of documented boreholes to assure the comparability of the results to known data.

The examination of the data indicates that Nanotem is able to map the saprock/saprolite interface and seismic refraction may be able to map horizons within the transported regolith.

RESULTS

A detailed geophysical regolith model at the Whirling Dervish gold prospect was developed using 50 x 50 m TEM with 60–70 m line spacing, resolving the main regolith components over the 10 parallel lines covering the Whirling Dervish prospect (Figure 1). The confirmation of some of the main regolith components based on geophysical properties was possible via Time domain Electromagnetic methods (TEM), refraction seismic and borehole conductivity. The bedrock/regolith interface was established using TEM inversion, whereas refraction only detected the colluvium base (Figure 2) using short offset.

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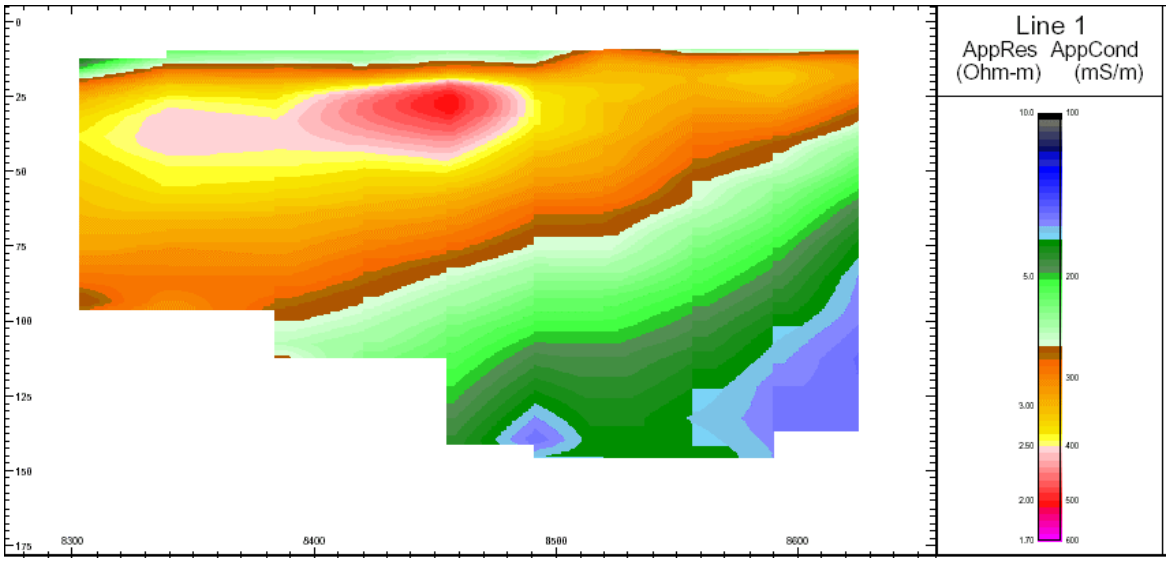

Figure 1: Apparent conductivity vs. depth (from 50 x 50 m TEM loops) depicting regolith structures at the Whirling Dervish prospect, WA.

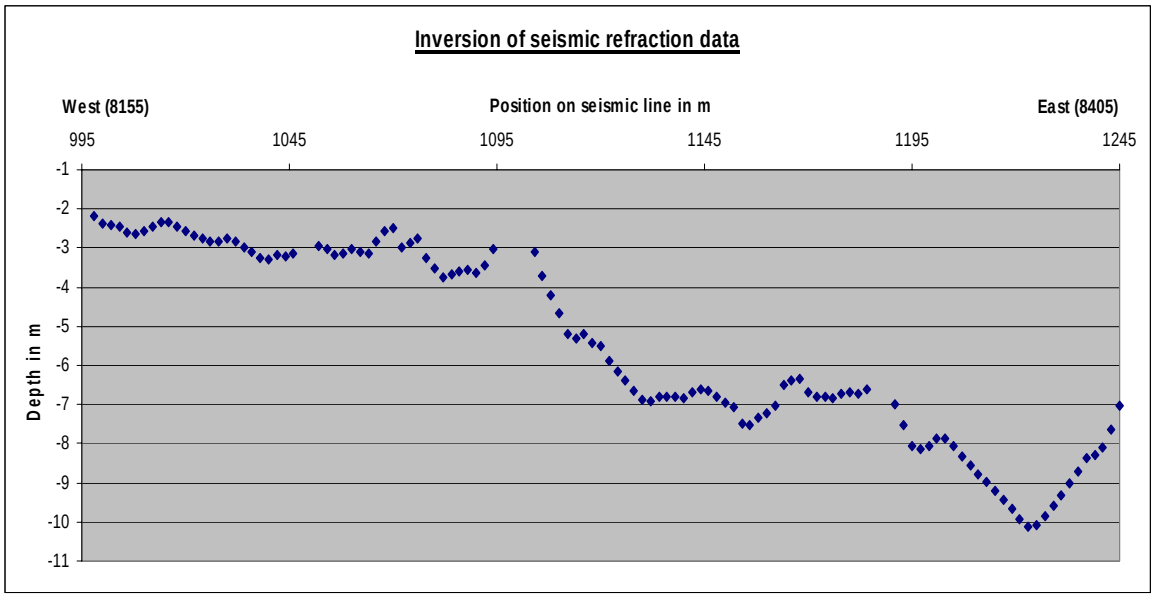

Figure 2: Seismic refraction survey line depicting the Colluvium base (centre transect).