

Geophysics for Agronomy and Precision Farming



As greater focus is placed on healthy soil sustainability, precision farming techniques are becoming commonplace. The use of geophysical techniques in the scope of land management and precision farming is well established and is rapidly becoming fundamental to the sustainability model.

“The electrical conductivity of soil, measured using electrical resistivity and electro magnetic induction (EM) is among the most useful and easily obtained spatial properties of soil that influences crop productivity” – D.L. Cormin & S.M. Lesch - 2003

Today soil conductivity in the root zone can be measured in a quick, reliable and cost effective manner using a variety of EM and resistivity techniques. LandScope Engineering has extensive experience with the leading EM and resistivity instrumentation and considers that the Geonics EM38 (shallow) and EM31 (deeper) provide the optimum solution to this particular application. EM surveying is a rapid, cost efficient method of generating information that, together with follow up ground truthing, can provide accurate maps of soil type differences and distribution. Resultant maps are used to identify trends within the survey area and to target locations for further soil investigations to determine the nature of the variability. The correlation of EM data with additional information such as remote sensing, yield mapping or other geo-referenced data, is a rapid and cost effective method for identification of production or management zones.



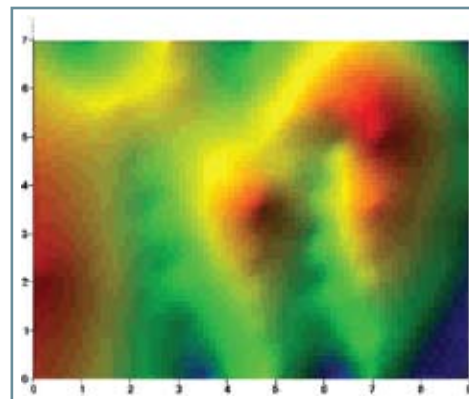


The secret to the cost effective application of geophysics is the approach taken in data acquisition. It is critical that large amounts of quality data are collected quickly over large areas so that the cost per unit survey is kept attractive. To this end LandScope has invested in the latest available positioning and data recording equipment so that all data is accurately geo-referenced in real time and formatted in such a way that survey results – digital model / plot – are output immediately upon completion of survey data acquisition. Both the EM31 and EM38 instruments may be rigged to a Quad bike – these sensors may be operated simultaneously if required – and interfaced with a high accuracy GNSS and integrated navigation and logging system. LandScope Engineering operates Trimble Real-Time Kinematic (RTK) GNSS systems which provide continuous positioning to the 10-20mm order in both horizontal and vertical. A useful by-product therefore of a geophysical acquisition campaign is a high order digital terrain model (DTM) – which may be utilised in irrigation planning, run-off modeling or even the production of an accurate boundary map. Installed on the quad bike LandScope Engineering utilises Trimble Hydro-Pro as the integrated navigation system (INS). Originally developed for the offshore geophysics market – hence the name – the laptop PC based system provides the quad driver with prescribed survey steerage lines (output from survey design) and simultaneously logs all data from all systems - RTK GNSS, EM31 and EM38 etc etc.. All acquired data is time referenced facilitating subsequent data processing and map production.

Clearly other data sets – e.g. derived from soil sampling and analysis – may also be geo-referenced and displayed in map format. LandScope Engineering uses AutoDesk Civil 3D as its primary data processing and map production tool which enables the reading, manipulation and output of data in a multitude of formats and facilitates model production, volume analysis, surfacing, contouring, DTM production etc.

Subsequent geophysical campaign results may be easily compared and contrasted to understand how the soil conductivity profile is changing with time.

With deployment of our high end technology, i.e. the cost of data acquisition and processing per hectare is kept to an absolute minimum – even considering the high capital value of equipment. This is possible given the sophistication of equipment interfacing and automated data management developed by LandScope Engineering – all in the name of efficient productivity.



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