

ELECTRICAL CONDUCTIVITY & HYDRAULIC PROFILING TOOL

Gregg Drilling operates an Electrical Conductivity (EC) probe that can be coupled with the Membrane Interface Probe (MIP) and Hydraulic Profiling Tool (HPT). Any of the modules can also be combined with the Cone Penetration Test (CPT) for additional stratigraphic logging.

The probe measures soil electrical conductivity (EC) with a standard dipole array as well as measuring HPT injection pressure using a down-hole transducer to measure the pressure to inject small volumes of water into the formation. Using simple post-processing, hydraulic conductivity (K) and water table elevation can be estimated from the HPT data.

The probe can be advanced with Gregg's CPT equipment at a constant rate (when coupled with the CPT), or can be driven to depth using direct push methods. The direct push method is often useful in stiffer formations or when limited access equipment is preferable.

HOW IT WORKS

The Conductivity Module consists of a dipole array where a current is sent through the formation between two probe contacts. This current is measured along with the voltage that results. The conductivity is a ratio of current to voltage times a constant. The resulting reading is in milli-Siemens per meter (mS/m).

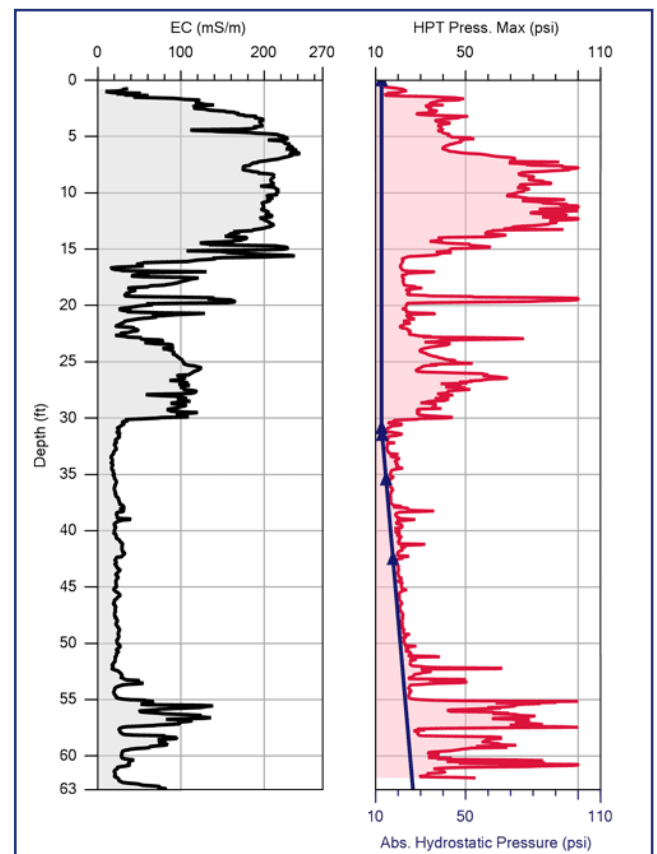
$$EC = C \cdot I / V.$$

C is a calibration factor which is defined by direct calibration of the measurement module. This calibration factor makes the result independent of the probe geometry, so it can be directly compared to results from other instruments. The conductivity module can measure EC in the range of 50 to 1500 mS/m with an accuracy of 5%.

The Hydraulic Profiling Tool is a logging tool that measures the pressure required to inject a flow of water into the soil as the probe is advanced into the subsurface. This injection pressure log is an excellent indicator of formation permeability. In addition to measurement of injection pressure, the HPT can also be used to measure hydrostatic pressure under the zero flow condition. This allows the development of a hydrostatic pressure graph for the log and prediction of the position of the water table.



Electrical Conductivity (EC) module with Hydraulic Profiling Tool (HPT).



Plot of electrical conductivity with depth (black) and HPT injection pressure with depth (red). Injection pressure can be correlated to soil permeability (K).



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