

## Characteristics of Geophysical Methods

From: Environmental Site Investigation Guidance Manual, American Society of Civil Engineers, 1996. p 72-73

Method	Response Characteristic	Mode of Measurement	Depth of Penetration	Resolution	Raw Data Format
Ground Penetrating Radar (GPR)	Complex Dielectric Constant of soil, rock, pore fluids, and man-made objects	Continuous Profile .4 kM/hr. detail, 8 kM/hr. reconnaissance (Ground contact not necessary)	One to ten meters typical-highly site specific. Limited by fluids and soils with high electrical conductivity and by fine grain materials.	Greatest of all six geophysical methods.	Picture-like graphic display. Analog tape, digital tape.
Electromagnetics (EM)	Bulk electric conductivity of soil, rock and pore fluids (pore fluids tend to dominate)	Continuous profiles to .5 to 15 m depth. Station measurements to 15 to 60 m depth. Some sounding capability (Ground contact not necessary)	Depth controlled by system coil spacing .5 to 60 m typical.	Excellent lateral resolution. Vertical resolution of 2 layers. Thin layers may not be detected.	Numerical values of conductivity from station measurements. Stripchart and/or magnetic recorded data yields continuous profiling.
Resistivity Sounding (RES)	Bulk electrical resistivity of soil, rock and pore fluids (pore fluids tend to dominate)	Station measurements for profiling or sounding (Must have ground contact)	Depth controlled by electrode <sup>1</sup> spacing. Limited by space available for array. Instrument power and sensitivity become important at greater depth.	Good vertical resolution of 3 to 4 layers. Thin layers may not be detected.	Numeric values voltage current and dimensions of array. Can plot profile or sounding curves from raw data.
Seismic Refraction	Seismic velocity of soil or rock which is related to density and elastic properties.	Station measurement (Must have ground contact)	Depth limited by array <sup>1</sup> length and energy source.	Good vertical resolution of 3 to 4 layers. Seismic velocity must increase with depth--thin layers may not be detected.	Numeric values of time and distance. Can plot T/D graph from raw data.
Magnetometer (MAG)	Magnetic susceptibility of ferrous metals	Continuous total field or gradient measurements. Many instruments are limited to station measurements. (Ground contact not necessary)	Single 55 gal drum up to <sup>2</sup> 6 m. Massive piles of 55 gal drums up to 20 m.	Good ability to locate targets.	Non-quantitative response from audio/visual indicators. Quantitative instruments provide motor or digital display (may record data

1. Depth is also related to equipment capability.
2. Depth is very dependent on instrument used.