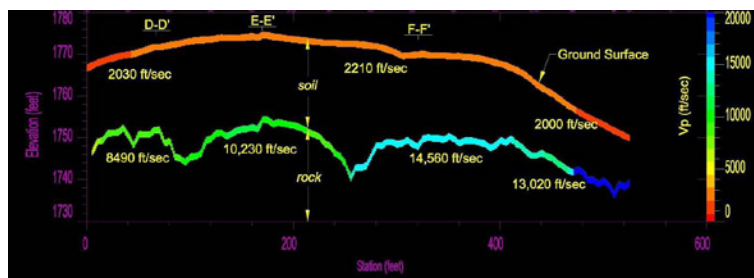


Seismic Refraction

Seismic refraction is the traditional and still the best geophysical means of mapping top of rock. The method is based on measuring the time for seismic waves to travel down to, along the top of rock, and then back to the surface. Different analytical methods use the travel-times to calculate layer velocities and depth to top of rock. Rock velocities derived from seismic refraction surveys can also provide insight into the relative ease or difficulty in ripping rock using heavy machinery by referencing The Caterpillar Tractor Company Ripper Charts. These charts relate ripping potential to dozer size, rock type, and rock velocity.

Quantum Geophysics (Quantum) conducts seismic refraction surveys using a Geometrics 24-channel StrataVisor seismograph and a Geometrics 24-channel Geode seismograph configured into a 48-channel recording system, Pro-Seismic spread cables, and 14-hertz vertical geophones. Seismic sources include a 12-pound and 16-pound sledge hammer and plate, and a Peg 40-kilogram accelerated weight drop. Quantum analyzes this data using the Interpex software program IXRefrax, which determines depth to rock based upon the generalized reciprocal method (GRM). GRM is the most robust treatment of seismic refraction data and is the only procedure that can delineate lateral changes in bedrock velocities.



Top of rock profile from the IXRefrax analysis of seismic refraction data



Programming the seismograph



Preparing to swing a 12-pound sledge hammer to create a seismic wave

Quantum uses Seismic Refraction to:

- Map top of rock
- Map faults
- Evaluate difficulty in ripping rock using heavy machinery
- Determine competence of bedrock
- Determine depth to other seismic velocity boundaries
- Conduct groundwater investigations
- Determine depth to the water table