# 78 GDS Helpsheet

*World Leaders in Computer Controlled Testing Systems for Geotechnical Engineers and Geologists*

Hardware

CSWS

Geophone Hz Compared

## 1. Introduction

The effectiveness of depth penetration of the CSWS depends on 2 factors. These are the power of the vibrator and the natural frequency of the geophones. The heavier the vibrator the better the signal that will be picked up by the geophones and so the better the resolution. The geophones have natural frequencies. Near to these frequencies they will not operate satisfactorily. The lower the frequency the deeper the depth of penetration of the Rayleigh wave. The interaction of these factors can be studied using the following equations:

$v = \sqrt{(G/\rho)}$ and $v = f\lambda$

where G is shear modulus in Pa, ρ is dry density in kg/cu.m, v is velocity in m/s, f is frequency in Hz, and λ is wavelength in m. Remember that interpretation is on the basis of the factored wavelength method i.e. depth= λ/3.

Consider a stiff soil (G=700MPa). We could use the 4.5Hz geophones at say 10Hz i.e. well above their natural frequency. We could then expect the wavelength-factored depth to be λ/3=28m. In soft soil (say G=50MPa) at 10Hz we could expect λ/3=5m. Alternatively, using a 2Hz geophone would allow us to operate at say 5Hz whence λ/3=10m.