

TR13-89-92

11. SEISMIC SURVEY - COLLEGE OF ADVANCED EDUCATION - MT NELSON

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INTRODUCTION

At the request of the Public Works Department, a seismic survey was carried out at the side of the College of Advanced Education, Mt Nelson.

GEOLOGY

Outcrops on the site and in adjacent trenches indicate that dolerite probably underlies the site. Forty eight shot holes drilled to a depth of 5'6" were logged and these showed blue dolerite in all holes except Nos. 6, 7, 8, 16 and 17. Holes Nos. 6, 7 and 8 showed baked mudstone indicating that the top of the dolerite sill has just been exposed by weathering. Holes Nos. 16 and 17 were in brown clay and showed no dolerite. As the dolerite in this area belongs to the upper contact zone of a sill rapid cooling occurred during emplacement and close jointing is expected.

GEOFYSICS

Method and Equipment

The seismic equipment used was a portable 12 channel refractor seismograph type G.T. 2 manufactured by Geospace Corporation, Houston, Texas, and Hall Sears X2 model K geophones with a natural frequency of 14 cycles/second. As little overburden and dolerite which would have seismic speeds in excess of 20,000 feet/second was expected the equipment was modified to record intervals of 0.1 milliseconds.

The site was covered by 17 spreads in a SW-NE direction, 7 spreads on a SE-NW direction and one weathering spread. The SW-NE spreads consisted of 12 geophones spaced 10-11 feet apart and made up traverses A to F, K and L (see fig. 16). The SE-NW spreads consisted of 12 geophones 5 feet apart and made up traverses G, H, and J while the geophones in the weathering spread were one foot apart. Charges in drill holes 5 feet deep were detonated 10 feet away from each end of the longer spreads and 5 feet away from each end of the shorter spreads. A small charge was detonated one foot from one end of the weathering spread. Shot point numbers are shown on both the locality plan and the profiles. All spreads were overlapped and cross spreads were used on each building site for greater control (see fig. 16).

Results

The velocities of the longitudinal seismic waves observed are:—

Rock Type		Seismic Velocity (Feet/Second)
Recent	Soil	1,150
Recent	Clay with dolerite boulders	1,500
Permian	Baked mudstone	16,000
Jurassic	Dolerite with weathered joints	up to 4,000
	Fresh dolerite (dependant on degree of jointing)	11,000-21,000

The seismic results are shown as profiles on cross sections A to L inclusive. All heights shown are based on State datum.

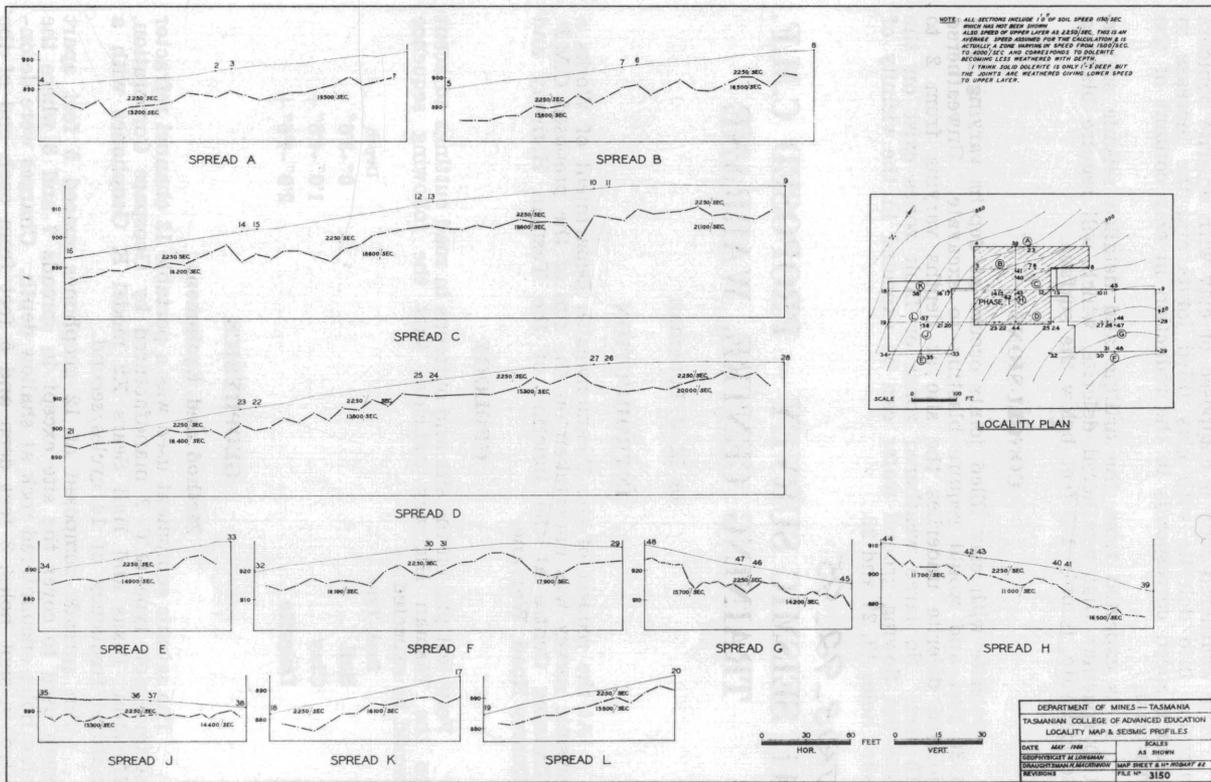
Interpretation of the results is difficult as—

- (a) the amount of soil cover varies throughout the site.
- (b) the seismic velocity varies randomly throughout the weathered zone although it increases in depth.
- (c) the seismic velocity of the layer contrasts greatly with that of the overlying material.

Due to the variability of the weathered zone the depths to solid rock shown on the cross sections must be taken as a maximum and the boundary may be up to 50% shallower than indicated.

The jointing in the solid dolerite is shown as inhomogeneous by the variation in seismic speed with the direction of spread e.g., at the intersection of spread C and H the corresponding seismic speeds are 19,000 feet/second and 11,000 feet/second indicating the dolerite is more jointed parallel to spread C and less jointed parallel to spread H

Figure 16.



The weathered zone is composed of clay with dolerite boulders merging into dolerite with clay filled joints and the increase in seismic speed corresponds to the reduction in clay content of the material.

It is expected from the drilling and detailed seismic section (1'0 spacing) that weathered dolerite, which will require blasting to excavate, is only 1-3 feet below the surface.

CONCLUSIONS

Dolerite with clay filled joints occurs at depths varying from 1-30 feet and would require blasting to excavate. Unweathered jointed dolerite underlies the site at depths varying from 2 to 18 feet. No large weathered zones or fault zones exist on the site but flowing ground water can be expected in the vicinity of shot holes 13, 27 and 28.