

UR1986\_51

1986/51. Foundation conditions of a proposed extension to the Burnie Technical College.

D. J. Sloane

Abstract

A proposed site for extensions to the Burnie Technical College is underlain by easily excavated topsoil, clay and extremely to highly weathered quartzite and mudstone. These materials are underlain by moderately weathered and jointed bedrock at depths of between 0.8 m and 3.2 m. The average seismic velocity of this weathered bedrock is 1775 m/sec in a direction parallel to the rock structure, and 1450 m/sec in a direction normal to it. These velocities indicate that the bedrock is rippable by heavy machinery to the required depths.

INTRODUCTION

At the request of Gutteridge, Haskins and Davey, foundation investigations were conducted at a site adjacent to Mooreville Road, Burnie [DQ060535]. This company was acting as consultants for the Department of Housing and Construction for earthworks associated with the foundations of a proposed extension to the Burnie Technical College.

The site-works include an excavation, up to five metres deep, in apparently soft quartzite. Several test pits had been dug but not to the full depth of the proposed excavation. A seismic survey was requested in order to assess the rippability of the bedrock to the required depth. Subsequently six seismic spreads were fired on the site (fig. 1).

GEOLOGY

The area is underlain by Proterozoic rocks of the Burnie Formation. These rocks consist of interbedded quartzite (quartzwacke) and slaty mudstone. The exposed bedrock can be seen in the road-cutting adjacent to the site on Mooreville Road. This exposure can be considered typical of the rock type and rock conditions which underly the excavation site.

The bedrock is weathered and closely jointed, with quartzite beds between one and two metres in thickness. The mudstone beds are highly to moderately weathered and fissile. Bedding is subvertical in dip and trends south-west to north-east, parallel to the small ridge which is present on the northern side of the area under investigation. Minor folding is also present. This rock structure is accordant with the regional structural trends in the Burnie area.

The test pits which had previously been dug were not open at the time the seismic investigations were conducted. Remnant rock fragments of quartzite and mudstone could be seen on the ground, indicating that the bedrock under the site is similar to that in the cutting.

GEOPHYSICAL SURVEY

The results of the seismic survey are presented in Tables 1 and 2. Spreads 1 and 2 were conducted using a geophone spacing of 2.5 metres. These spreads were used to provide an indication of bedrock seismic velocities where the proposed excavation is of maximum depth. In summary, topsoil and/or extremely weathered bedrock extends to depths of 0.9 m to 1.2 m from the ground surface at each end, and thickens to between 1.3 m and 1.7

m in the centre. A 0.5 m to 1.0 m step is apparent near the centre of Spread 1. This step may represent a more resistant quartzite bed. The seismic velocities of the weathered bedrock average at about 1775 m/sec and therefore this material should be rippable with heavy machinery. The spreads represent a simple two-layer case, and the seismic velocities have been measured in a direction parallel to the rock structure.

Seismic spreads 3, 4 and 5 were located normal to the ridge crest, on the south-eastern flank. In summary these spreads indicated that two layers were present at the upslope end and three layers at the downslope end. The upper layer of topsoil and extremely weathered rock extends to depths of between 0.6 m and 1.4 m from the ground surface. Below this layer, at the downslope end of the spreads, is a second layer of clay and/or highly weathered rock with a seismic velocity between 650 m/sec and 800 m/sec. This layer extends to depths of between 1.6 m and 3.2 m from the ground surface and may be thin or nonexistent at the north-eastern end of the slope. The third velocity layer, representing weathered and jointed bedrock, has velocities between 1330 m/sec and 1535 m/sec, and should be rippable by heavy machinery. Compared to the 1800 m/sec results from Spreads 1 and 2, these lower velocities were measured from spreads located normal to the rock structure. A seismic velocity of 3000 m/sec may be present at the northern end of Spread 4, at a depth of between 5.5 m and 7.1 m, indicating unweathered non-rippable bedrock (fig. 2).

All seismic spreads provided information to depths of at least eight metres. The measured seismic velocities are similar to those reported by Moore (1976) from similar rock types at Round Hill, Burnie.

CONCLUSIONS

The area is underlain by interbedded quartzite and mudstone. The rock bedding is subvertical in dip and trends approximately south-west to north-east. The average seismic velocities of moderately weathered and jointed bedrock are about 1775 m/sec parallel to the rock structure and 1450 m/sec normal to it. These velocities indicate that the bedrock is rippable by heavy machinery.

Unweathered bedrock with a seismic velocity of 3000 m/sec may be present at the north-eastern end of the site. The calculated depth indicates that this material is deeper than the proposed excavation.

The ability of machinery to excavate trenches at the base of the proposed excavation is uncertain.

REFERENCE

MOORE, W. R. 1976. Engineering geology and slope stability analyses of the Round Hill quarries, Burnie. *Unpubl. Rep. Dep. Mines Tasm.* 1986/31.

[25 August 1986]

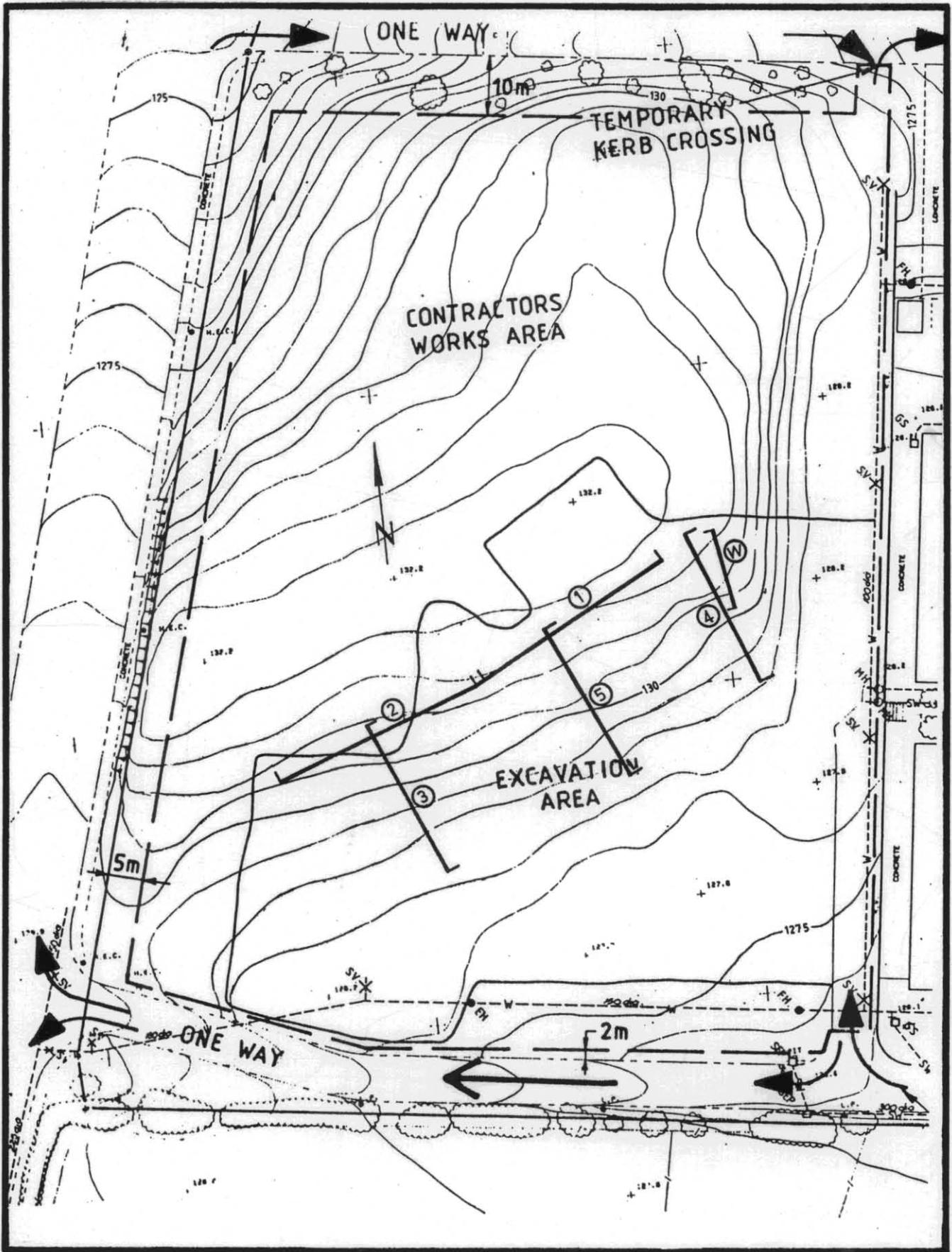


Figure 1. Location of seismic spreads.

5 cm

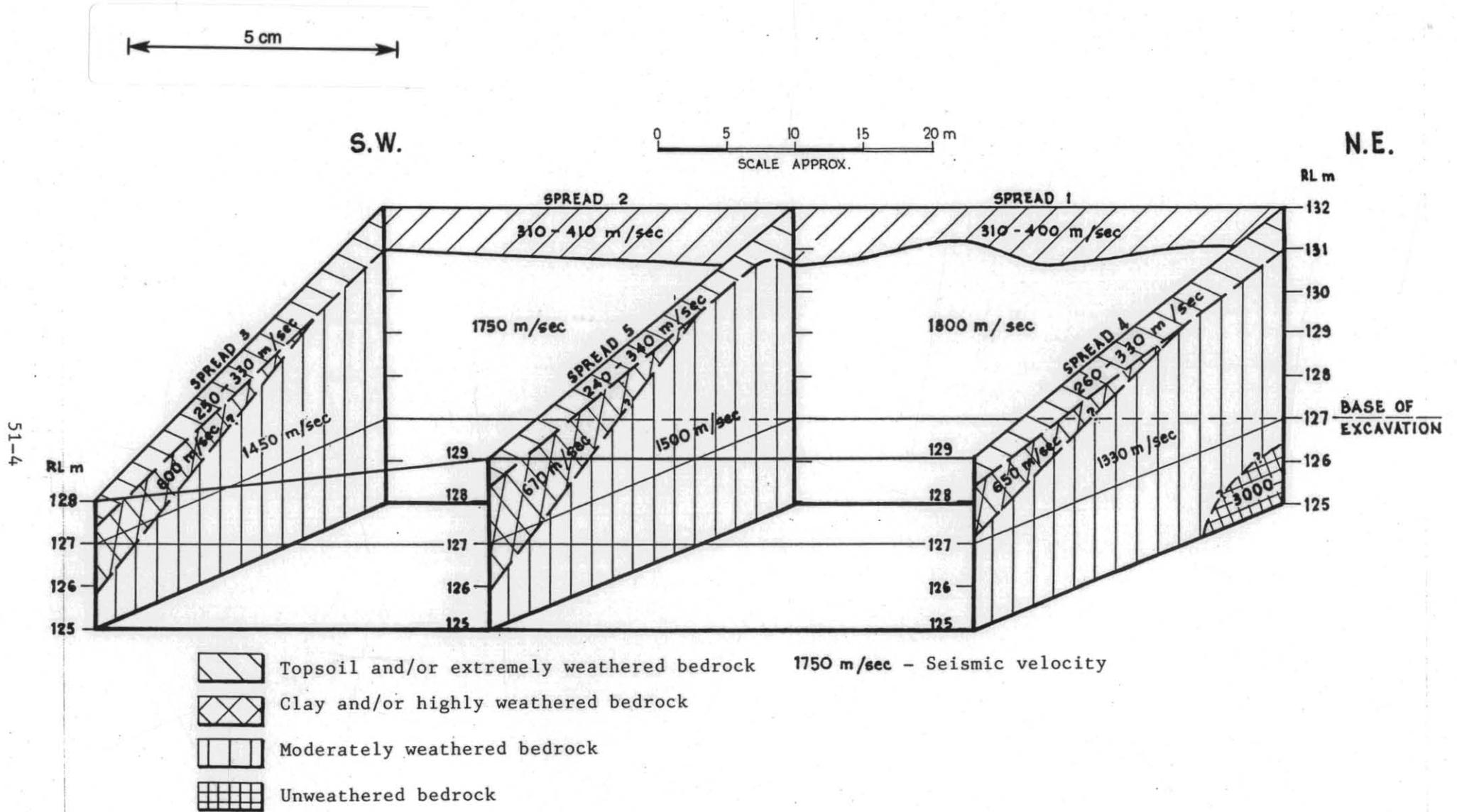


Figure 2. Proposed excavation - Burnie Technical College  
Diagrammatic presentation of seismic survey results

TABLE 1. SUMMARY OF SEISMIC SPREADS - BURNIE TECHNICAL COLLEGE

SPREAD NUMBER	TRACE SYMMETRY	SHOT POINT	LAYER VELOCITY m/sec	LAYER THICKNESS m	DEPTH TO INTERFACE m	REMARKS
1	Assymmetric Stepped	NE	1. 310 3. *1200	0.9-1.0	1/3 0.9-1.0	*Apparent velocities due to updip/down dip effects and 0.5-1.0m step near spread center. Average velocity= 1800m/sec
		MID SHOT	1. 220/280 3. 1200/ 2300	0.8-1.4	1/3 0.8-1.4	
		SW	1. 410 3. *2300	1.4-1.6	1/3 1.4-1.6	
2	Symmetric	NE	1. 410 3. 1700	1.3-1.7	1/3 1.3-1.7	Layer 3 average velocity= 1750m/sec
		SW	1. 310 3. 1800	1.0-1.2	1/3 1.0-1.2	
3	Slightly assymmetric	NW	1. 250 3. 1530	1.1-1.3	1/3 1.1-1.3	Layer 3 average velocity= 1450m/sec
		SE	1. 330 2. 800 3. 1370	0.6-1.0 1.0-1.8	1/2 0.6-1.0 2/3 1.6-1.8	
4	Slightly assymmetric	NW	1. 260 3. 1180	0.8-1.0	1/3 0.8-1.0	*Alternative if layer 2 & 4 not present= 1/3 1.1-1.4m
		SE	1. 330 2. * 650 3. 1480 4. *3000	0.6-1.4 1.1-1.3 4.0-6.0	1/2 0.6 2/3 1.4-1.9 3/4 5.4-7.4	
5	Assymmetric	NW	1. 240 3. *1000	0.8-1.0	1/3 0.8-1.0	*Apparent velocities due to updip/down dip effects. Average= 1500m/sec
		SE	1. 340 2. 670 3. *2000	0.6 2.3-2.6	1/2 0.6 2/3 2.9-3.2	
W	Symmetric	N	1. 285 3. 1500	1.0-1.2	1/2 1.0-1.2	Layer 3 average velocity= 1535m/sec
		S	1. 350 3. 1570	1.0-1.3	1/2 1.0-1.3	

TABLE 2.

SEISMIC VELOCITY LAYER SUMMARY  
Burnie Technical College

LAYER NO.	SEISMIC VELOCITY	INTERPRETATION
1.	220-400m/sec	Topsoil and/or extremely weathered bedrock.
2.	650-800m/sec	Clay and/or highly weathered bedrock. Easily excavated.
3.	1750-1800m/sec 1330-1535m/sec	Moderately weathered bedrock Rippable. Faster velocity parallel to rock structure.
4.	3000m/sec	Unweathered bedrock. Not rippable.

Bedrock is quartzite and slaty mudstone.