TR20_116_118

11. Second Derwent Crossing Study: Seismic survey, Dowsings Point Alignment 5.

D.E. Leaman

Subsequent to the seismic and magnetic surveys in the Dowsings Point region (Leaman, 1977*b*) an engineering cost-design study of potential alignments suggested that an optimum siting compatible with planning and environmental considerations might be slightly north of the east Dowsings Point area (Area 1 in the previous report) and some 300-400 m north-west of the temporary bridge at Cleburne Point. An additional seismic survey was undertaken as close to the nominated alignment (designated as No. 5; grid co-ordinates at western end 525693mE, 5258909mN (516526ydE, 728134ydN); and at eastern end 525192mE, 5259676mN (517082ydE, 728967ydN)) as conditions permitted. The location of all spreads is shown in Figure 28.

The nature of the surveys undertaken in this area and the potential problems was fully described in previous reports (Leaman, 1977*a*, appendix; 1977*b*). Spreads were reciprocally fired with cable and shot locations surveyed from bench marks on shore.

A series of eleven spreads cover the general band of Alignment 5. Most are aligned approximately parallel to the alignment, but some are nearly at right angles to it, so as to provide control over lateral variations or to enable extended shots to be fired.

Each of the spreads is discussed below so that an appreciation of reliability or problems is possible. The general interpretation is provided in Figure 28 and a band of interpretative error is shown. The limits of the band are determined by the velocity assumptions made and the method of interpretation. Four methods; reciprocal, time delay, critical and ray-path, were used. The preferred interpretation is also indicated and is normally the interpretative minimum depth profile.

Spread 1. Although this spread was laid offshore in a region where the water is shallow and the silt cover thin a significant discrepancy exists in the interpretative conclusions. This appears to be largely due to the effect on reciprocal shots fired in the river where travel times are affected unpredictably by the low velocity silt. The influence of slope effects accentuates the problem which is general to all spreads.

Seismic velocities recorded in this region are high, in the range 3000-6000 m/s, indicating that the rock is in good condition. The rationalised velocity allowing for dip effects is 3700-3800 m/s.

Spread 2. Seismic velocity range 3000-3500 m/s.

Spread 3. Seismic velocity range 3700-6000 m/s. Rationalised velocity: 3750 m/s. The observation of very high velocities in mid-river was discussed in a previous report (Leaman, 1977*b*) and may indicate the presence of remnants of a basalt flow or small dolerite intrusions. Velocities in excess of 4500 m/s are most unusual for the quartz sandstone series present across the greater part of this area.

Spread 4. Seismic velocity range 3000-3800 m/s. Rationalised velocity: 3700 m/s.

Spread 5. Seismic velocity range 4000-4500 m/s. Rationalised velocity: 4200 m/s.

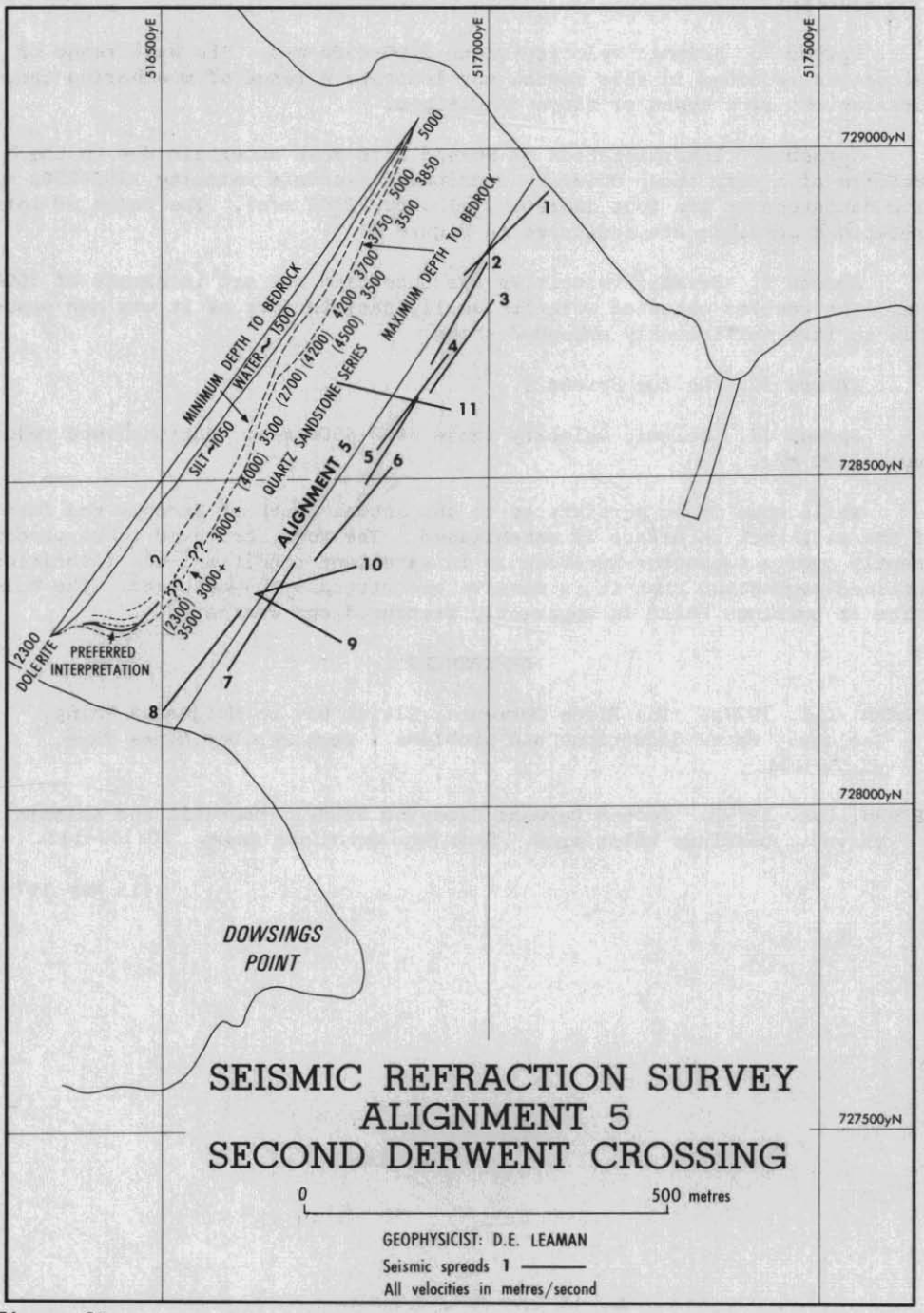
5 cm
516500yE
517000yE
517500yE
729000yN
728500yN
728000yN
727500yN
MINIMUM DEPTH TO BEDROCK
WATER ~ 1500
SILT ~ 1050
(4000) 3500 (2700) (4200) 4200 3700 3750 3500 3000 3850 5000
(4500) 3500
MAXIMUM DEPTH TO BEDROCK
QUARTZ SANDSTONE SERIES
ALIGNMENT 5
(2300) 3500 3000+
2300 DOLERITE
PREFERRED INTERPRETATION
DOWSINGS POINT
1
2
3
4
5
6
7
8
9
10
11
SEISMIC REFRACTION SURVEY
ALIGNMENT 5
SECOND DERWENT CROSSING
0
500 metres
GEOPHYSICIST: D.E. LEAMAN
Seismic spreads 1 ———
All velocities in metres/second

Figure 28.

Spread 6. Seismic velocity range 2700-4000 m/s. Rationalised velocity: 3500 m/s. The dip on the bedrock slope steepens markedly in the region of this spread and the increased thickness of silt has made the interpretation more doubtful.

Spread 7. Seismic velocity range 2200-4500 m/s. The wide range of velocities recorded in this region may indicate a range of weathering characteristics, rock types or slope conditions.

Spread 8. Interpretation of Spread 8 is most uncertain due to the presence of a very steep dolerite escarpment (seismic velocity 2300-2500 m/s) with sandstone at its foot (seismic velocity >2300 m/s). The range of interpretations possible are indicated in Figure 28.

Spread 9. Seismic velocities are uncertain but are in excess of 3000 m/s. The results obtained were not wholly satisfactory as it was not possible to fire sufficiently extended shots.

Spread 10. As for Spread 9.

Spread 11. Seismic velocity range 3000-4500 m/s. Rationalised velocity: 3500 m/s.

While some doubt persists as to the actual depth of bedrock the form of the silt-rock interface is established. The rock, believed to be predominantly quartz sandstone-mudstone is in excellent condition; the velocities obtained suggesting that it is massive and virtually unweathered. The dolerite at Dowsings Point is apparently fractured and weathered.

REFERENCES

LEAMAN, D.E. 1977*a*. The River Derwent: Elwick Bay to Macquarie Point. Geology: Facts deductions and problems. *Tech.Rep.Dep.Mines Tasm.* 20:85-101.

LEAMAN, D.E. 1977*b*. Second Derwent Crossing Study. Magnetic and seismic survey: Dowsings Point area. *Tech.Rep.Dep.Mines Tasm.* 20:102-115.

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