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A reflection seismic survey at Boobyalla

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Geophysical work by the Department in the Gladstone–Boobyalla area has indicated a deep basin filled with Tertiary sediments (for a summary of work to December 1971 see Leaman, 1973). More recently seismic refraction surveys have been undertaken in the region of the Delta mine (577720 mE, 5471220 mN) and the junction of the Old Port, Boobyalla and Waterhouse roads (577000 mE, 5470200 mN) (Moore and Leaman, 1974). On the basis of the gravity survey (Leaman, 1973) a stratigraphic bore hole was sited at the above-mentioned road junction. The bore hole is no more than 400 metres from granite outcrop. When drilling finished at 504 metres no definite bottom to the clay/boulder bed material had been reached and it was decided to attempt a reflection seismic survey using the borehole. As the sediment was made up of boulders of dolerite and granite in close contact with some interspersed clay it was anticipated that considerable dispersion and energy dissipation would occur.

The equipment used employed standard 14 Hz geophones and the Geospace GT2A refraction unit. This equipment is not well suited to reflection work and has no automatic gain control or filtering. Only by adjustment of the motor mechanism could sufficient recording time, up to two seconds, be obtained. The geophones were placed in pairs at 45, 60, 75, 90, 105 and 120 metres from the borehole. Unfortunately due to thick mud in the hole all shots fired were shallow, the deepest being 15 metres. The charges used were equivalent to 30–45 kg gelignite. Several shots were fired in order to compare results with various gain settings. A definite reflection was recorded at 900 ± 10 m/sec. No earlier clear reflections are visible on the records.

As no deep shots were fired it is not possible to give a definite value for the vertical component of the velocity. Shallow tests show it to be in excess of 1200–1400 m/sec. Such tests could be influenced by the weathering layers (see Moore and Leaman, 1974). The refractor velocity is 1800–2400 m/sec.

On the basis of these results it may be concluded that the depth to basement is a minimum of about 550 to 610 metres and a maximum of 1100 metres.

Any future holes should be pre-tested with small charges to determine up-hole velocities.

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