COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1964/130

GINNINDERRA FARM SEISMIC TEST SURVEY,

CANBERRA, A.C.T. 1964

by

E.J. POLAK and L. KEVI

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ILLUSTRATION

SUMMARY

A seismic refraction test survey was made on the CSIRO Ginninderra Farm, A.C.T. to supply information about the depth and character of the overburden and bedrock.

The results show that the depth to the bedrock ranges between 28 and 48 ft. Seismic velocities in the unweathered bedrock were found to range between 14,000 to 17,000 ft/sec, indicating very low porosity.

1. INTRODUCTION

The Geological Branch of the Bureau of Mineral Resources put down three drill holes on the Ginninderra farm of the CSIRO, Canberra, A.C.T. The object of the holes was to investigate the safe water yield and to provide water for agricultural experiments. To obtain further information the Geological Branch requested the Geophysical Branch to make seismic tests.

Seismic tests were made on 23rd March 1964 by a geophysical party comprising of E.J. Polak (party leader), L. Kevi (geophysicist), and J.P. Pigott (geophysical assistant).

2. GEOLOGY

The geology of the area is described by Burton and Wilson (1959), who give geological logs of three drill holes, viz. Belconnen No. 6, 7, and 8. Gamma-ray and resistivity logs were made of the drill holes (Wiebenga and Jackson, 1960).

Under a thin layer of clay and soil Belconnen No. 6 entered weathered porphyry at four feet, hard porphyry with weathered joints at 23 ft, and hard porphyry at 48 ft. The top of the fresh porphyry is very uneven. The depth to the fresh porphyry is 18 ft at Belconnen No. 7 and 50 ft at Belconnen No. 8.

3. METHODS AND EQUIPMENT

The seismic refraction method was used. The method is described by Hawkins and Stocklin (1956).

An SIE 24-channel seismic refraction equipment was used with TIC geophones of natural frequency 20 c/s.

4. RESULTS

Plate 1 shows the arrangement of the geophysical traverses and the interpretation of the seismic work.

Seismic velocities

Table 1 gives seismic velocities recorded in the area.

Table 1.

Seismic velocity (ft/sec)	Rock type
1000	Soil
3000	Clay, decomposed rock
6500 - 8000	Weathered to jointed rock (weathering on joints)
14,000 - 17,000	Unweathered rock

Velocity anisotropy is clearly shown in weathered and fresh rock. The velocities measured along Traverse D ranged between 15,000 and 17,000 ft/sec, whereas the velocity measured along Traverse E was only 14,000 ft/sec. This indicates that the direction of Traverse D is nearer to the strike of joints than the direction of Traverse E.

The seismic velocity in a rock formation depends on its lithological composition, porosity, and water content. Increase in porosity results in a decrease of velocity. During the survey for the Koombooloomba dam site, Queensland (Polak and Mann, 1959) seismic velocities of 15,000 to 20,000 ft/sec were recorded in unweathered jointed porphyry with joints closed. Laboratory investigation on 10 samples from the dam site gave an average porosity of 0.9 per cent. Wiebenga and Manganwidjoyo (1960, Fig. 5) give porosities of less than one percent and 17 percent for rocks in which the velocity is 17,000 and 6500 ft/sec respectively.

Depth to the bedrock

The depth to the bedrock ranges between 28 and 48 ft. The error in the depth determination is considered to be less than ±20 per cent. This estimate is based on experience of results in other areas where comparable geological conditions exist.

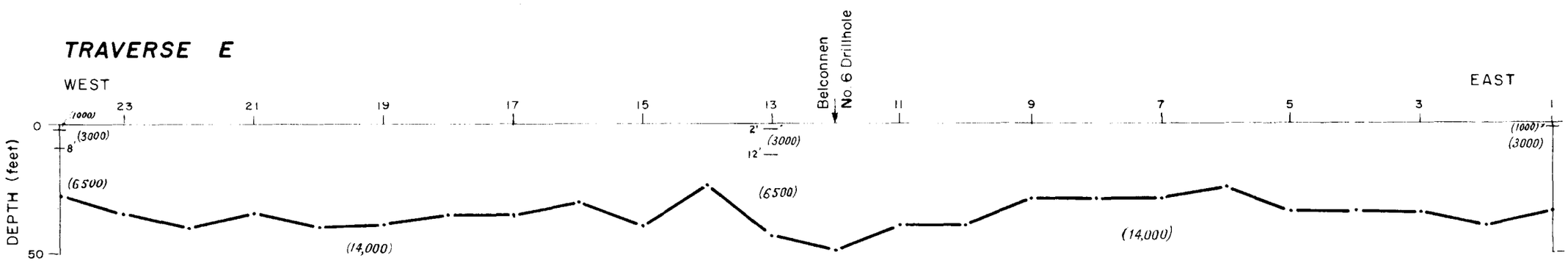
5. CONCLUSIONS

The thickness of the overburden in the area of the seismic traverses ranges between 28 and 48 ft. High seismic velocity in the bedrock indicates that the porosity in the fresh rock is very low; in weathered rock the velocity is much lower, corresponding to an increase in porosity.

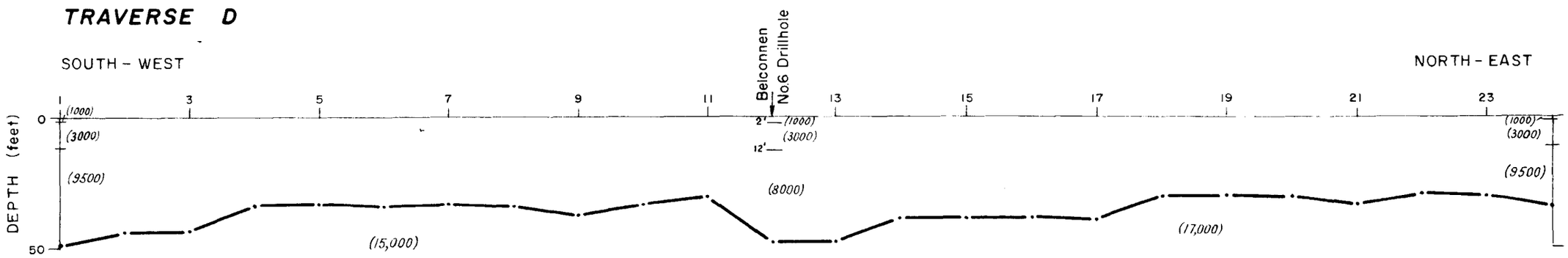
6. REFERENCES

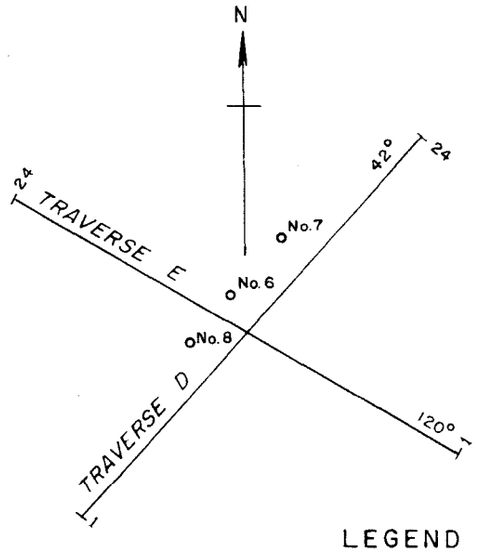
BURTON, G.M., and WILSON, E.G.	1959	Bureau of Mineral Resources experimental water bore drilling, Canberra 1958. Bur. Min. Resour. Aust. Rec. 1959/53. (unpubl.)
HAWKINS, L.V., and STOCKLIN, A.	1956	Seismic survey of the eastern abutment of Dam Site B, Upper Cotter River, A.C.T. Bur. Min. Resour. Aust. Rec. 1956/124. (unpubl.)
POLAK, E.J., and MANN, P.E.	1959	Geophysical survey at the Koombooloomba dam site near Ravenshoe, Queensland. Bur. Min. Resour. Aust. Rec. 1959/126. (unpubl.)
WIEBENGA, W.A., and JACKSON, N.D.	1960	Canberra bore logging, A.C.T. 1958. Bur. Min. Resour. Aust. Rec. 1960/89. (unpubl.)
WIEBENGA, W.A., and MANGANWIDJOYO, A.	1960	Some correlations between rock parameters derived from Wuerker's annotated tables of strength and elastic properties 1956. Trans. Amer. Inst. Min. Engrs. 217, pp. 377-380.

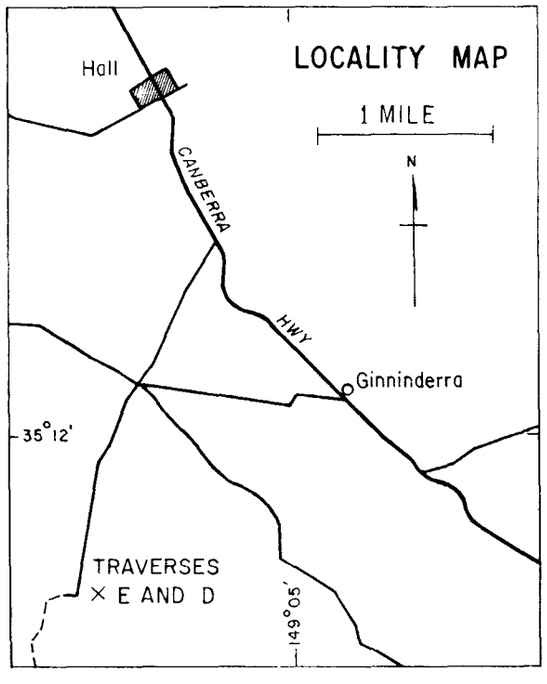
TRAVERSE E

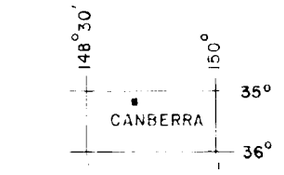


TRAVERSE D









REFERENCE TO AUSTRALIA STANDARD MAP SERIES

GINNINDERRA CSIRO FARM
CANBERRA A.C.T.
TRAVERSES E AND D
SEISMIC CROSS-SECTIONS

LEGEND

No.6	Drillhole Belconnen No. 6
(3000)	Seismic velocity (ft/sec) in formation
2'	Depth to formation with different seismic velocity
•——•	Unweathered bedrock boundary

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