COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1970/106

Barry Drive Seismic Refraction Survey, Canberra 1969

by

R. J. Whiteley

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SUMMARY

Selected sites along the proposed Barry Drive were tested by seismic refraction to determine the degree of consolidation of near-surface material. Large thicknesses of heavily weathered material were indicated; it should be readily removable for the construction of the road.

1. INTRODUCTION

The National Capital Development Commission is considering the construction of an expressway to link Canberra City with the suburb of Belconnen.

The Geological Branch of the Bureau of Mineral Resources as consultant to the NCDC requested the Geophysical Branch to conduct a seismic survey at selected sites along the proposed road to determine the degree of consolidation of near-surface material.

A geophysical party consisting of R.J. Whiteley (geophysicist), S. Hall (field-assistant) and three field-hands provided by the Department of Works completed the survey in August 1969.

2. GEOLOGY

Black Mountain Sandstone forms the bedrock in the area. This is generally a fine-grained quartzose sandstone with rare thin shaly beds ("Opik, 1958). The sections of road investigated are on the northeastern slopes of Black Mountain, where outcrop is scarce and the sandstone is overlain by soil and talus.

3. SEISMIC REFRACTION METHOD

A 24-channel S.I.E. (Dresser - S.I.E. Company) refraction seismograph and 20-Hz geophones (Technical Instruments Co.) were used.

The location of the traverses is shown on Plate 1. Two seismic traverses (A and B) were run between pegs 6700 and 7100 and a third (C) between pegs 8000 and 8200. Along these sections of the road it is proposed to remove up to 15 feet of material.

As detailed near-surface information was required, 9 shots per traverse were fired and a geophone spacing of 10 feet was used.

4. RESULTS

The seismic results are shown on Plate 2. The layers encountered can be conveniently grouped according to velocity (Table 1).

The Reciprocal Method (Hawkins., 1963) was used in interpretation. Depths to refractors encountered were calculated at each geophone and reproduced as a continuous profile (Plate 2).

TABLE 1

VELOCITY	ROCK TYPE
2000 ft/s	Soil or dry talus
5000 ft/s	Saturated talus or completely weathered bedrock.
8500 - 10000 ft/s	Weathered bedrock.

On traverses A and B the 2000 ft/s velocity forms the surface layer, whereas on traverse C it is too thin to be observed.

On all three traverses the seismic velocity increases very gradually with depth to velocities indicative of weathered bedrock at considerable depth. It is probable that the 5,000 ft/s material is completely weathered bedrock rather than saturated talus. The completely weathered bedrock probably contains considerable clayey material; the gradual increase in velocity with depth is largely due to increasing moisture content and hydrostatic pressure.

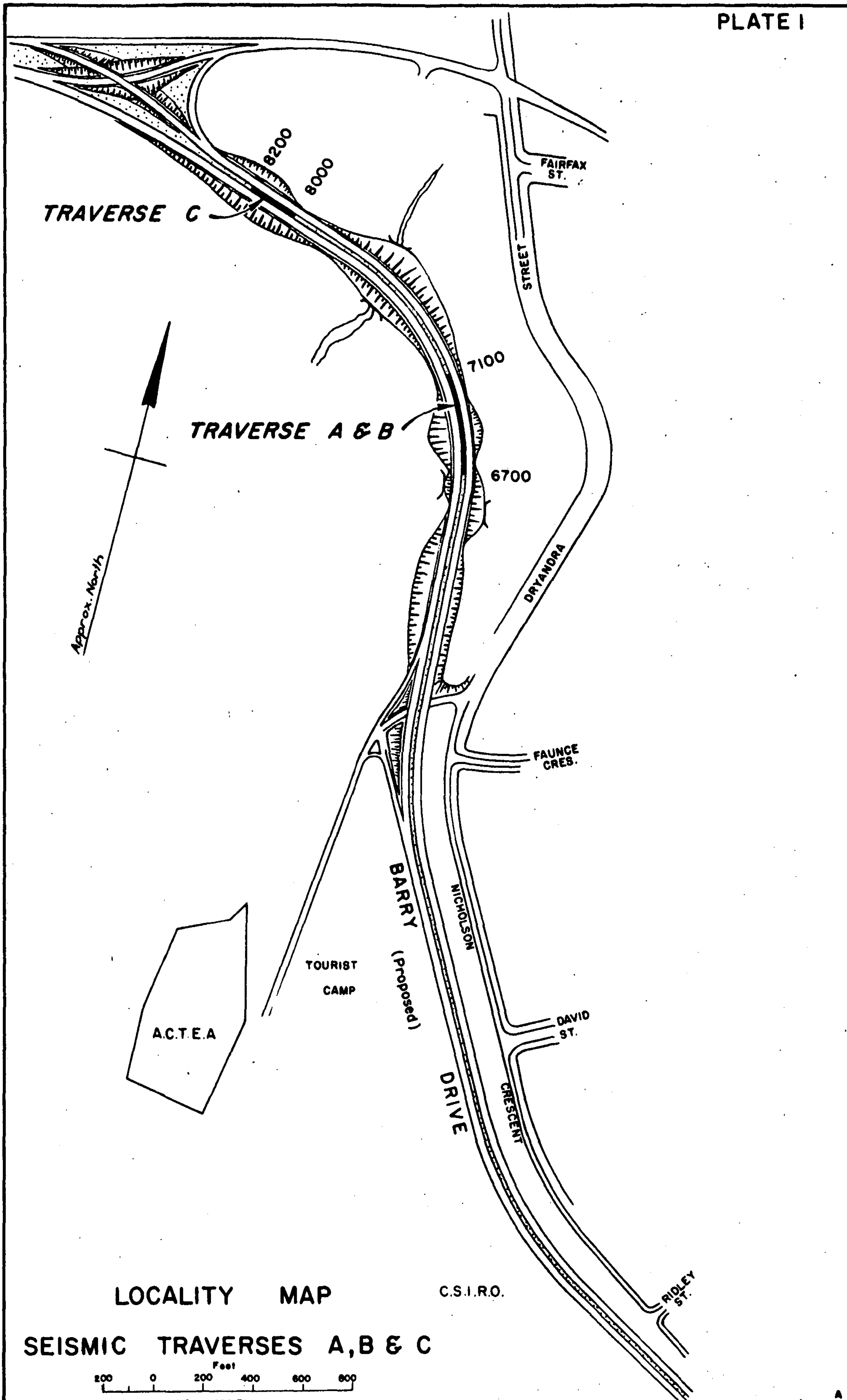
5. CONCLUSIONS

As the deepest layer encountered has a low seismic velocity and is quite deep, material should be removable without difficulty from the shallow depths envisaged.

REFERENCES

HAWKINS, L.V., 1961 - The reciprocal method of routine shallow seismic refraction investigations. Geophysics 26 (6), 806-19.

ÖPIK, A.A., 1958 - The geology of the Canberra City District. Bur. Miner. Resour. Aust. Bull. 32.



LOCALITY MAP

C.S.I.R.O.

SEISMIC TRAVERSES A,B & C

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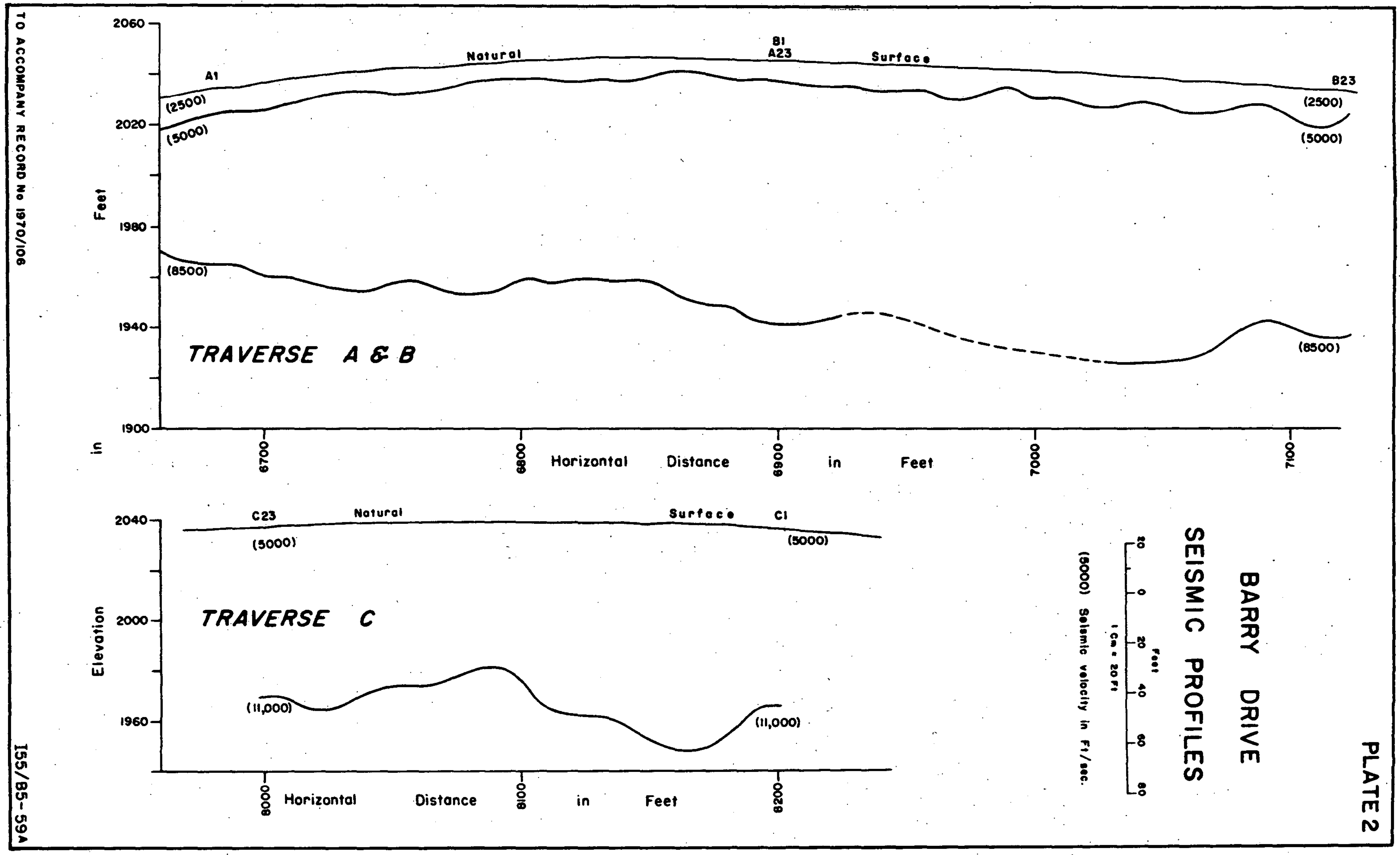

PLATE 2
BARRY DRIVE
SEISMIC PROFILES
TRAVERSE A & B
TRAVERSE C
Natural Surface
A1
B1
A23
B23
C23
C1
(2500)
(5000)
(8500)
(11,000)
2060
2020
1980
1940
1900
2040
2000
1960
Feet in Elevation
6700
6800
6900
7000
7100
8000
8100
8200
Horizontal Distance in Feet
(5000) Seismic velocity in Ft/sec.
Feet
1 Cm = 20 Ft
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