COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record No. 1971/16

Belconnen (Sections 43 and 50) Seismic Refraction Surveys, A.C.T., 1970

by

P. J. Hill

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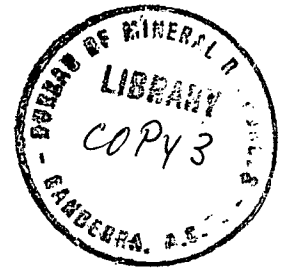

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ILLUSTRATIONS

SUMMARY

At the request of the National Capital Development Commission a seismic refraction survey was carried out at the site of the proposed Belconnen Western Government Offices.

The purpose of the survey was to make a preliminary investigation of foundation conditions on the site; it involved determination of the nature and depth of the bedrock.

Along the traverses the calculated depth to bedrock ranges between 30 and 70 ft. Seismic velocities of 12,500 to 15,000 ft/sec in the bedrock were recorded.

1. INTRODUCTION

The building of a Government Office Complex on Sections 43 and 50 at Belconnen, A.C.T. is proposed by the National Capital Development Commission (NCDC). Following a request by the Commission to the Bureau of Mineral Resources, Geology & Geophysics (BMR) for subsurface information at the site, a seismic survey was conducted by the Engineering Geophysics Section of BMR. The field work was carried out in March 1970 by a geophysical party consisting of P.J. Hill (geophysicist and party leader), L. Hemphill (observer), R. Cherry (shooter) and two field assistants provided by the Department of Works. Interpretation of the field data was done by B. Dolan, geophysicist.

2. GEOLOGY

The following geological description of the area was provided by G.A.M. Henderson of the Engineering Geology Section, BMR. A more detailed description is given by Henderson and Purcell in a letter to NCDC (BMR File 67/748).

The site is thought to be underlain by porphyritic rhyodacite lava, which crops out in the creek on the eastern boundary and which also occurs extensively to the south and west. The rock is massive in appearance and when fresh is grey-green in colour; it weathers to a brown coloured rock which retains the original texture of the fresh rock. The fresh rock is hard and strong and weathers to a soft, granular, sandy clay with properties of a soil. The depth of weathering is uneven, and boulders of fresh rock may occur surrounded by weathered rock.

The rock is jointed but no layering is evident. Joints are spaced up to about one metre apart. A survey of joint directions in the northern

part of Macquarie showed that a variety of attitudes are represented; the most common joint directions are 153/78 SW and 022/90 (true bearings). No major fault is known to cross the site. The nearest fault is the Deakin Fault which is about 800 ft to the east.

3. METHODS AND EQUIPMENT

The site was surveyed using the seismic refraction method. Two intersecting traverses were pegged with a 10 ft geophone spacing. Shots were fired at the centre of each geophone spread and at points 5 ft and 200 ft from each end. The equipment consisted of a 24-channel SIE refraction seismograph and 20-Hz TIC geophones.

For the calculation of depth to bedrock at each geophone station a modification of the "method of differences" (Heiland, 1946) was used. Depth determination of overlying rock layers were made at the centre and ends of each spread by assuming a horizontal layering and using intercept times from the time-distance plots.

4. RESULTS

The locations of the two traverses are shown in Plate 1; the corresponding seismic cross-sections are shown in Plate 2.

The results suggest that the bedrock (defined in this Record as the deepest refractor with the highest seismic velocity) along the traverses is overlain by in situ weathered material of variable thickness.

As shown in the sections the sub-surface can be divided into four seismic layers:

1. An upper layer of soil having a velocity of 1500 ft/sec, ranging in thickness from about 3 to 6 ft.
2. A highly weathered region of rock with velocity 5000 ft/sec (perhaps water saturated).
3. A partially weathered region of rock with velocity 8000 to 8500 ft/sec having a thickness of 12 to 50 ft and rising to within approximately 10 ft of the surface.
4. Fresh bedrock having a velocity of 12,500 to 15,500 ft/sec and varying in depth from about 30 to 70 ft.

An error of less than $\pm$ 20 per cent can be expected in the depth determination, this estimate being based on seismic work done under

similar conditions where drilling was carried out.

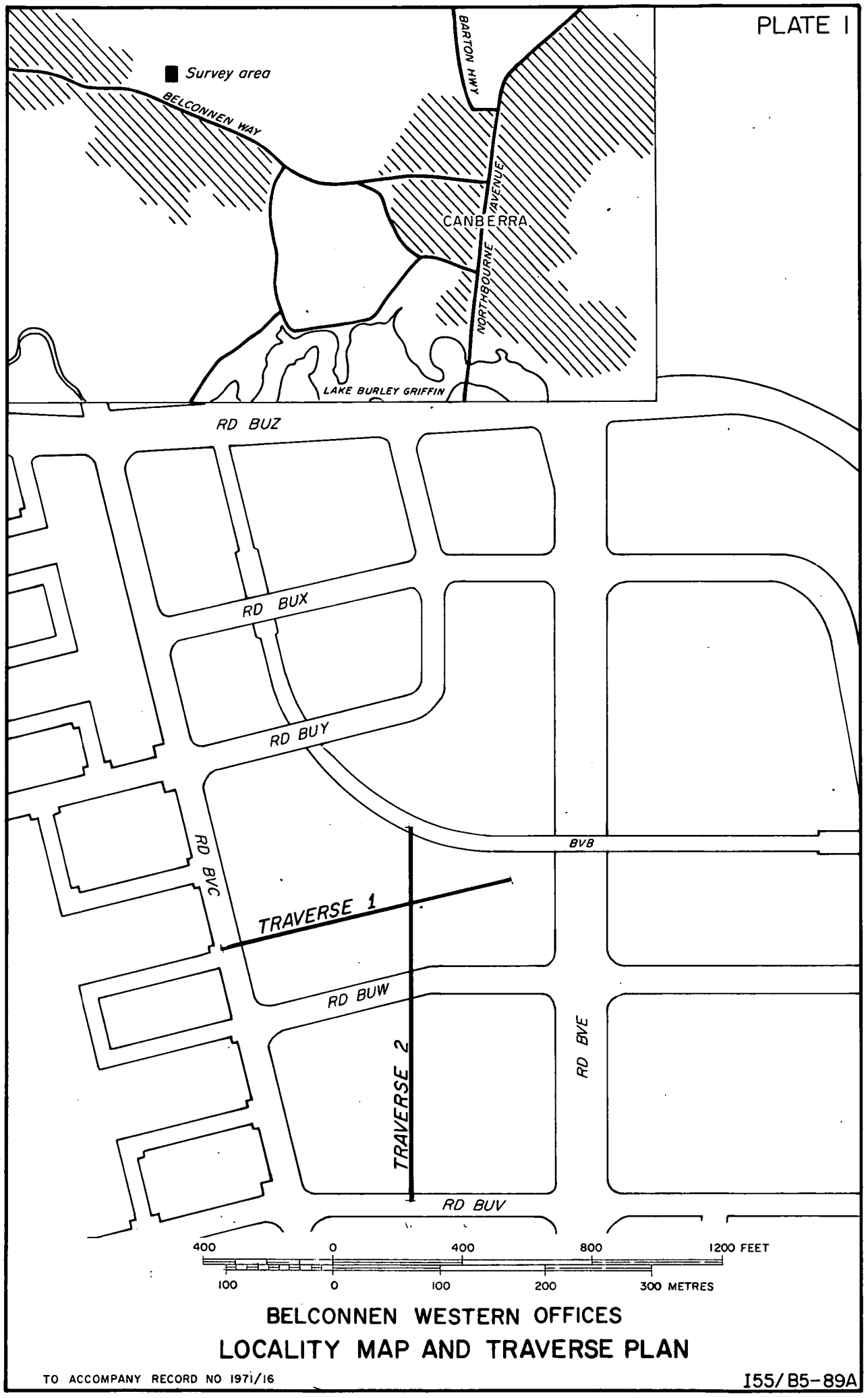
5. CONCLUSIONS

The subsurface layers recorded in the survey show a fairly uniform increase in seismic velocity with depth, this being interpreted as a decrease in weathering. The partially weathered 8000 to 8500 -ft/sec rock may be suitable for foundation.

6. REFERENCES

HEILAND, C.A., 1946 - GEOPHYSICAL EXPLORATION. New York, Prentice-Hall, Inc.

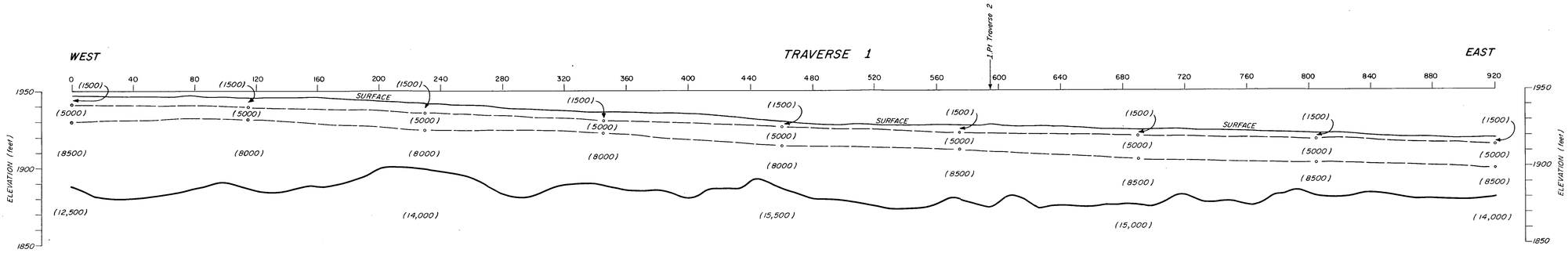
PLATE 1

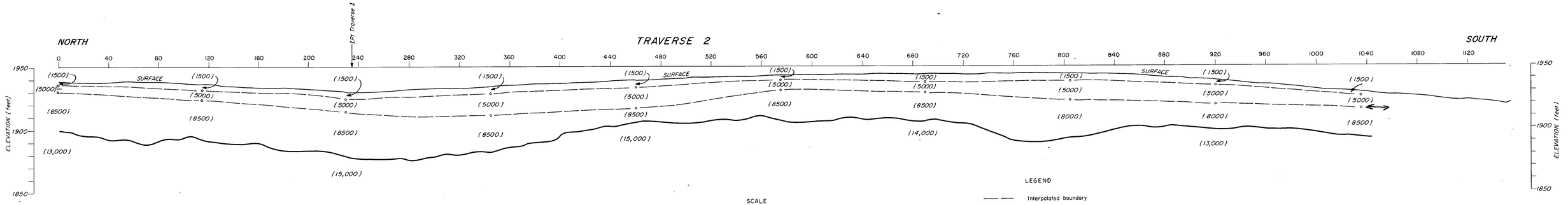


BELCONNEN WESTERN OFFICES
LOCALITY MAP AND TRAVERSE PLAN

TO ACCOMPANY RECORD NO 1971/16

I55/B5-89A





SCALE

40 0 40 80 120 160 200 FEET

10 0 10 20 30 40 50 METRES

LEGEND

Interpolated boundary

Bedrock boundary

(8500) Seismic velocity in formation (ft/s)

I.Pt Intersection point

SEISMIC CROSS-SECTIONS

TO ACCOMPANY RECORD NO 1971/16

I55/B5-90