DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES,
GEOLOGY AND GEOPHYSICS

Record 1975/75

MOUNT STROMLO TO HIGGINS RESERVOIR BULK SUPPLY MAIN, TUNNEL SECTION, SEISMIC REFRACTION SURVEY, MOUNT STROMLO, A.C.T., 1975.

by

D.C. RAMSAY

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1. LOCALITY MAP AND SEISMIC CROSS-SECTION

S U M M A R Y

At the request of the Department of Housing and Construction, a seismic refraction survey was carried out along the tunnel section of the proposed bulk-water main between Mount Stromlo and Higgins Reservoir. The purpose of the survey was to determine tunnelling conditions from a knowledge of the weathering profile.

It was established that bedrock occurs below the level of the proposed tunnel for most of its length, the tunnel being routed through weathered material with an average seismic velocity of about 2200 m/s.

1. INTRODUCTION

The Department of Housing and Construction proposes to build a bulk-water main, 1200 mm in diameter, between Mount Stromlo and Higgins Reservoir. Part of this main will be as a tunnel passing under the access road to Mount Stromlo Observatory.

The BMR carried out a seismic refraction survey along this section of the main to determine subsurface conditions for tunnelling. The fieldwork was completed in February 1975 by a party from the Engineering Geophysics Group, using standard 24-channel refraction equipment. Four spreads with 4-m geoplane spacing were recorded, and shots were fired at the centre, the ends, and 50 m from both ends of each spread. Results were computed using the normal interpretation sequence developed by the Group.

The site is underlain by Silurian blue-grey porphyritic dacite, below which is purple rhyodacite, a member of the Upper Silurian Deakin Volcanics.

2. RESULTS

The location of the traverse and the interpreted cross-section are shown in Plate 1.

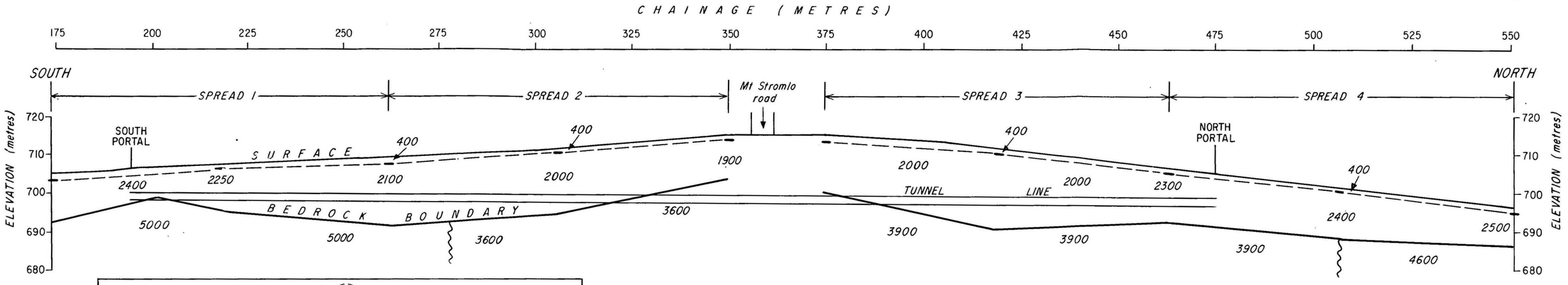
The seismic properties of the subsurface form a three-layer structure, with the degree of weathering decreasing with depth. The top layer, with a seismic velocity of about 400 m/s, is interpreted as surface soil and completely weathered rock. The intermediate layer, with a seismic velocity between 1900 and 2500 m/s is interpreted as highly weathered to slightly weathered rock. Previous experience in this area (F.J. Taylor, pers. comm.) suggests that the weathering pattern within this layer is complex, with large boulders of slightly weathered rock surrounded by moderately weathered to possibly completely weathered material. Bedrock is characterized by two different seismic

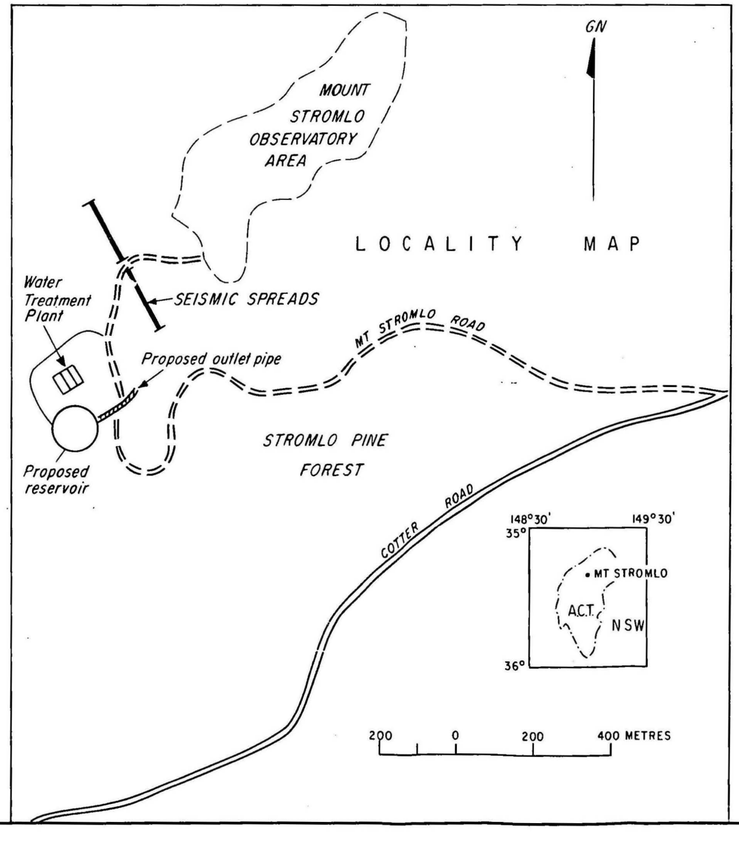
velocity ranges: the central section has a velocity of 3600 to 3900 m/s, flanked on either side by material with velocity 4600 to 5000 m/s. The higher velocity sections probably represent slightly weathered to fresh dacite, whereas the lower velocity central section could represent a fractured or jointed zone running obliquely across the traverse line. The average depth to bedrock is about 15 m and occurs below the proposed tunnel level except in a small section in the middle of the traverse.

3. CONCLUSIONS

The proposed tunnel will be driven through complexly weathered overburden for much of its length; the remainder will be through fractured or jointed bedrock. Extensive support during tunnelling will probably be required along its entire length.

PLATE I





HORIZONTAL AND VERTICAL SCALE

10 0 10 20 30 40 50 60 70 80 90 100 METRES

3900 *Seismic velocity in formation (metres/second)*

SEISMIC STATION AND LOCALITY MAP MT STROMLO TUNNEL

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