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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS
1956, No.55

GEOPHYSICAL SURVEY OF NEW TUNNEL LINE, WAYATINAH "A" POWER DEVELOPMENT SCHEME, TASMANIA.

by

W.A. WIEBENGA, D.F. DYSON and M.J. O'CONNOR.

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C O N T E N T S.

I L L U S T R A T I O N S.

ABSTRACT.

Since the first geophysical survey of the proposed Wayatinah "A" tunnel line was made, the Hydro-Electrical Commission decided to move the dam site, and consequently the tunnel line, further to the east. At the request of the Commission, the Bureau of Mineral Resources carried out seismic and resistivity surveys over a small section of the new tunnel line, where the proposed tunnel is near to the surface and where an adit into the tunnel is planned.

Seismic results show that the tunnel will be sited within fresh dolerite and the combined results of the seismic and resistivity surveys indicate two major shear zones within the section surveyed. It is recommended that the line of the adit into the tunnel be placed north of these shear zones.

1. INTRODUCTION.

The original Wayatinah "A" Power Development Scheme consisted of a dam near Wilson's Creek, a power station near Wayatinah, and a tunnel line from the dam to the power station (Plate 1). The geophysical survey of the original tunnel line has been described by Wiebenga, Dyson and Hawkins (1956). At a later date the proposed position of the dam site, and consequently of the tunnel line, was moved further east, to the position shown on Plate 1. The Hydro-Electric Commission considered that a geophysical survey of the whole of the new tunnel line was not necessary, but requested a survey of the part shown as B-B' on Plate 1 where the tunnel would be near the surface. It is proposed to drive an adit into the tunnel between B and B'.

The report describes the result of seismic refraction and resistivity surveys of the section B-B'. The surveys were made during February and March, 1955, by a geophysical party consisting of D. F. Dyson (party leader), M. J. O'Connor and J. P. Piggott. Five assistants were provided by the Hydro-Electric Commission. The geology and geophysical methods are discussed in the report by Wiebenga et al (1956).

2. RESULTS.

The seismic sections along A-A' (old tunnel line) and B-B' (new tunnel line) are shown on Plate 2 and the resistivity profile along B-B' on Plate 3.

(a) Depth to fresh rock.

As the tunnel is sited within fresh rock, small errors in the depth estimates to fresh rock are not important. The following table gives the observed seismic velocities of the rock types present.

Rock type.	Seismic velocity (ft./sec.).
Soil	1,100 ±
Weathered dolerite	2,700 - 4,700
Fresh dolerite	15,000 - 18,000.

In two of the weathering spreads, velocities as high as 11,000 to 12,000 feet per second were recorded. These may represent longitudinal refraction waves following a thin intermediate layer between the weathered and fresh dolerite, or they may represent so-called composite refractions from the fresh dolerite. These high velocities were ignored in the computations.

As the seismic method measures the thickness of the weathered layer perpendicular to the surface of fresh dolerite, which, near the Nive River, slopes towards the river, the section indicating weathered dolerite (B-B' on Plate 2) does not lie in the vertical plane through the tunnel line. Consequently, the depths for the weathered layer in the vertical plane through the tunnel line may be up to 20 per cent. higher than those shown in the sections.

(b) Shear zones.

In both weathered and fresh rock, shear zones are indicated by resistivity minima, by the shape of the fresh rock profile and by relatively low seismic velocities.

It is known from previous work in this area that the lower part of the 15,000 to 18,000 feet-per-second range represents fractured or broken fresh dolerite and is an indication of the presence of shear zones.

The seismic and resistivity results indicate that within section B-B' only a few narrow shear zones exist north of R1445 and the shearing is weak. South of R1445, however, the seismic results show that wider shear zones are present and the shearing is strong, the most prominent being between R1401 and R1409 and between R1426 and R1434.

It is considered that the methods used give a reliable indication of the presence of shear zones to a depth of 200 feet, and that extrapolation of the indications is fairly accurate to a depth of about 300 feet. Below that depth, the accuracy of extrapolation decreases and in places where the tunnel is more than 300 feet below surface it is uncertain whether the shear zones indicated on Plate 2 exist at tunnel level. Some displacement from the positions indicated may also occur.

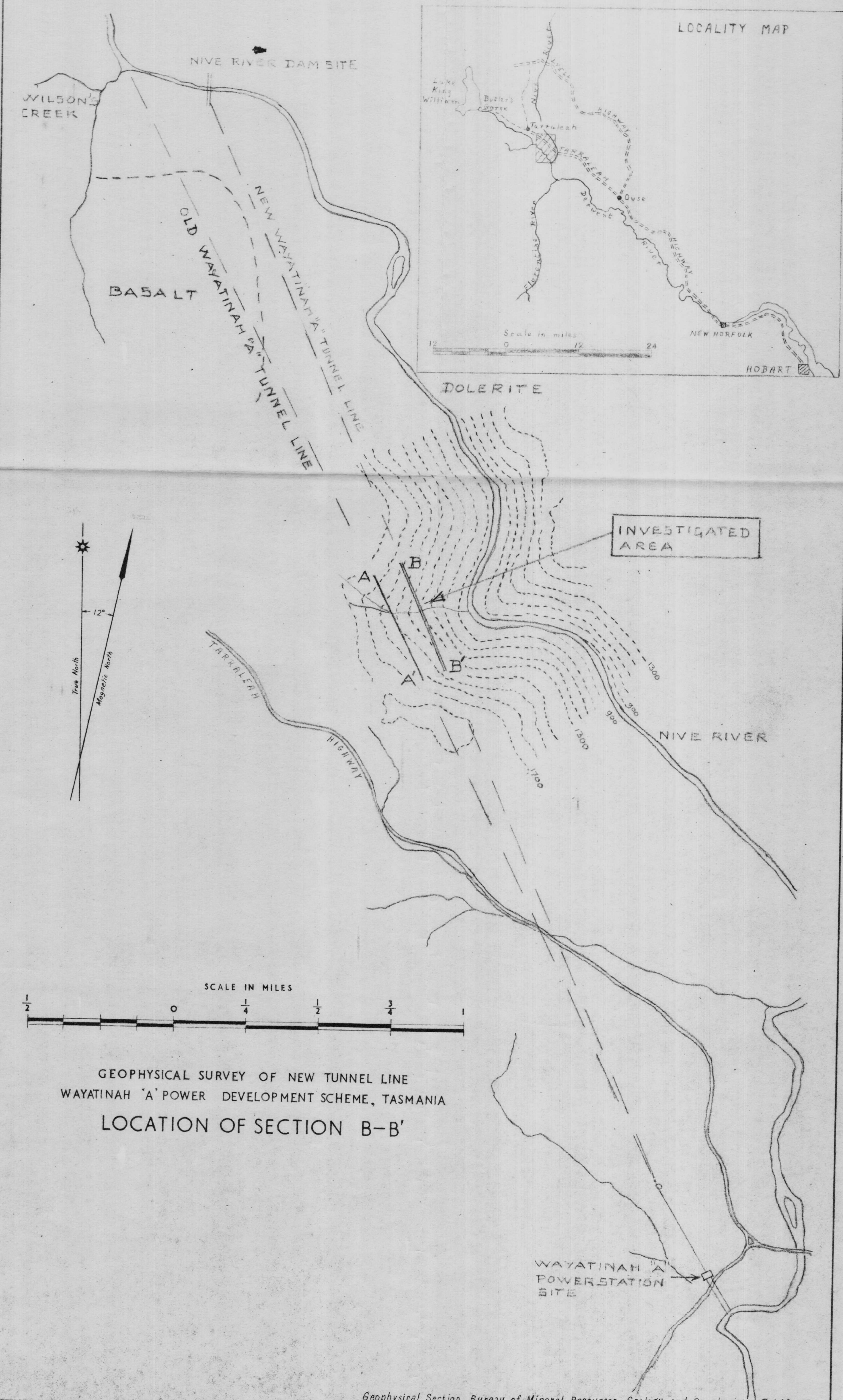
3. CONCLUSIONS.

Along section B-B', the tunnel will be sited in fresh rock, but two major shear zones (R1401 to R1409 and R1426 to R1434) are likely to be met at tunnel level.

It is recommended that the proposed adit into the main tunnel be sited north of R1445, i.e. outside the major shear zones.

4. REFERENCE.

Wiebenga, W. A., Dyson, D. F. and Hawkins, L. V., 1956 - Geophysical survey of proposed tunnel line, Wayatinah "A" Power Development Scheme, Tasmania. Records 1956, No. 51.



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WAYATINAH 'A' POWER DEVELOPMENT SCHEME, TASMANIA

LOCATION OF SECTION B–B'

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PLATE 2

GEOPHYSICAL SURVEY OF NEW TUNNEL LINE
WAYATINAH 'A' POWER DEVELOPMENT SCHEME, TASMANIA
SEISMIC CROSS-SECTIONS

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics. G 142-18

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RESISTIVITY PROFILES

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