COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES,
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RECORDS 1955, No. 84

TEST SURVEYS WITH RADORE EQUIPMENT IN TASMANIA

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ABSTRACT

A test survey was made with a "Radore" Equipment over three mineralised areas in Tasmania. The investigations were made in January, 1955 for the purpose of comparing the performance of the "Radore" equipment with that of lower-frequency electromagnetic equipment previously used successfully over the same areas.

The results show that although some very weak indications were recorded by the "Radore" equipment, it has not been possible to correlate these satisfactorily with the known mineralisation. Moreover, it is difficult to distinguish indications that may possibly be due to mineralisation from apparent indications that are undoubtedly due to irregularities in topography.

1. INTRODUCTION.

The "Radore" geophysical equipment which was tested, had been obtained from W.M. Barrett Incorporated, U.S.A., by John Strevens Pty. Ltd., Engineers and Consultants, Sydney. As the "Radore" method employs a principle not used successfully in Australia before, the Bureau agreed to test the equipment in areas where previous geophysical surveys with conventional methods had given strong indications and diamond drilling had outlined ore-bodies.

The "Radore" equipment was taken to Western Tasmania where several different types of ore-bodies occur within a relatively small area. Three test areas were selected, viz:-

(i) Montana, Zeehan, where a Slingram survey has shown an electromagnetic anomaly over a weakly pyritic lode in limestone country.

(ii) Cuni, Dundas, where a small high grade copper-nickel sulphide lode has been proved by diamond drilling. The drill hole was put down to test a distinct electromagnetic indication observed previously. The lode lies in argillites, near a contact with basic rocks.

(iii) Tasman, Queenstown, where a high-grade lead-zinc lode under a cover of glacial debris has been proved, but from which very little ore has been taken.

Test surveys with the "Radore" equipment were carried out by A.J. Barlow and R.W. Bladworth, geophysicists, between 20th and 28th January, 1955.

2. OPERATION

The object of "Radore" equipment is to use radio waves of frequency 1.7 megacycles to detect ore deposits and structural features below the ground surface. The operation depends on the reflection and refraction of radio waves propagated through the ground. The radio waves are picked up by a receiving loop above the surface and the field strength of the signal is measured from point to point along a profile in line with the exciter and energiser (transmitter and antenna). It is claimed that departures from the normal attenuation curve indicate the presence of structures or bodies with electrical or magnetic properties that constrast with those of the country rock.

Broadly, it is stated by the suppliers of the equipment that reflections from the top of an ore-body will cause an increase in signal strength, and refraction from its edges will decrease the signal strength immediately above the body and also at a distance along the surface approximately equal to its depth. However, there are a number of other factors which cause a variation of signal strength and these are discussed later.

3. RESULTS

Profiles over the three areas are shown in Plate 1.

(A) Montana, Zeehan.

Several profiles observed in opposite directions over adjacent traverses IX and IXA, 100 feet apart, on the Montana lease are shown in Plate 1, Figs. 1 and 2. A lode was originally located by means of a Slingram electromagnetic equipment and was later trenched with a bulldozer. The lode is a soft graphitic and pyritic formation in limestone, about 10 feet wide and only a few feet below the surface. The lode strikes approximately north-west, appearing near 450E on traverse IXA and 525E on traverse IX.

Profiles along traverse IX (Fig. 1) show pronounced "breaks" in the vicinity of the lode but these did not repeat exactly on re-reading (see profiles B_1 and B_2). Further investigation showed that over rough ground slight differences in position of the loop and more particularly in its height above the ground, account for anomalies in the signal strength. Other small "breaks" observed in the profile are probably caused similarly. The broad "high" recorded between 200E and 350E on profiles B_1 and B_2 when the exciter was at the eastern end of the traverse, and the roughly corresponding irregular "low" recorded on profile A when the exciter was at the western end, appear to be due to the higher elevation of the ground at the western end of the traverse.

On traverse IXA the effect of the hill at the western end of the traverse is quite obvious. Small "breaks" occur in the vicinity of the lode but they do not agree exactly with the position of the lode, nor do the "breaks" on the two profiles A and B agree exactly in position.

A profile (Plate 1, Fig.3) was recorded along a trench in the area (on traverse 450E) to determine whether there was any correlation between the "Radore" profile and the graphitic and pyritic slates known to be there. Results were inconclusive as an accurate geological log could not be obtained owing to the trench being partly filled in and overgrown.

(B) Cuni, Dundas

Profiles were run in two directions along two traverses over a proved copper-nickel lode. The lode consists of massive sulphides of copper and nickel, together with some quartz gangue, and is several feet wide. It dips steeply to the east near the surface but flattens considerably at shallow depth. The lode lies on a contact between argillites and a basic dyke.

Of the two profiles along traverse BH (Plate 1, Fig.4) only one shows any indication in the vicinity of the ore body which is located at about 100E to 125E. If the "break" at 55E on profile B is a "delayed break", a depth of about 60 feet to the top of the body is indicated. However, the lode is known to reach to within a few feet of the surface. It will also be noticed that the effect of the hill in both profiles is large and could mask any anomaly due to an ore-body.

On traverse BF (Plate 1, Fig.5) no indication was noted in the vicinity of the ore-body (which is somewhat smaller there than on traverse BH). Small anomalies in the profiles have no relationship to known structures and are probably due to the roughness of the ground. In an ordinary survey it would be extremely difficult to distinguish an anomaly of this type from one caused by a mineral deposit.

(C) Tasman Lode, Queenstown

This lode is a high-grade lead and zinc sulphide ore-body about 200 feet long and ranging from 5 feet to 20 feet in width. It is covered by glacial material from 20 to 60 feet in depth. In addition, there are several large flat makes of ore projecting from the hanging wall side. The profiles (Plate 1, Fig.6) are very irregular and no reliable correlation can be made between "breaks" on the profiles and the ore-body. The dependence on the topography is again evident. Many of the smaller anomalies are due to minor changes in topography and these are indistinguishable from any anomaly that may be caused by the ore-body. The increase in signal strength at about 75N may be due to the ore-body, but no reliable correlation between "breaks" is apparent.

4. ASSESSMENT OF THE EQUIPMENT

It should be pointed out that the test areas examined did not conform to the ideal conditions laid down in the Instruction Manual supplied with the equipment. It is considered, however, that in the tests carried out, the "Radore" method has shown no advantages over the conventional low-frequency electrical methods, and has certain obvious disadvantages. These arise mainly from the fact that most of the signal at the receiver appears to be transmitted by direct waves. Only a small proportion of the energy is transmitted by waves travelling through the ground. Because of this, the observed readings are critically dependent on topography and on the height of the receiving coil.

The equipmentis light and convenient to use, but the tuning of the receiver is seriously affected by hand and body capacity effects.

The Instruction Manual recommends that spacing between stations be determined to suit the dimensions and depth of the ore-body being sought. According to the rules given, very close spacing would be required in searching for bodies close to the surface. Alsok it is recommended in the instructions that at least two, and preferably several, profiles be run along each traverse, with the exciter in different

positions. These requirements would make the use of the equipment very expensive in most areas. Attention is also drawn in the Instruction Manual to the possibility of interference from trees, fences and the like, and from radio transmissions in the broadcast band.

5. CONCLUSIONS

(i) The "Radore" equipment has been tested over three areas in Tasmania containing mineralised formations which give definite indications when surveyed by conventional low-frequency electromagnetic prospecting methods. In no instance was any indication obtained from the "Radore" equipment which could be satisfactorily correlated with the geology.

(ii) The results obtained with the "Radore" equipment are critically dependent on topography, on the height of the receiver and on the position of theobserver. Irregularities in these can give rise to apparent anomalies comparable in size with the indications to be expected from ore-bodies.

(iii) The equipment is light and convenient to read, but might well be slow and expensive for surveying a large area if the instructions given in the operating manual were observed faithfully.

(iv) The methods of interpretation discussed in the instructions appear to be based on a considerable over-simplification of the geological conditions generally associated with ore-bodies.

(v) For the reasons stated above, it is believed that the diagnostic value of results obtained with the "Radore" equipment as a guide to the presence of mineralisation in an area of complex geology would be very low, and that the low-frequency techniques are more suitable.

PLATE I

FIG. 1

PROFILES ALONG TRAVERSE IX, MONTANA, ZEEHAN

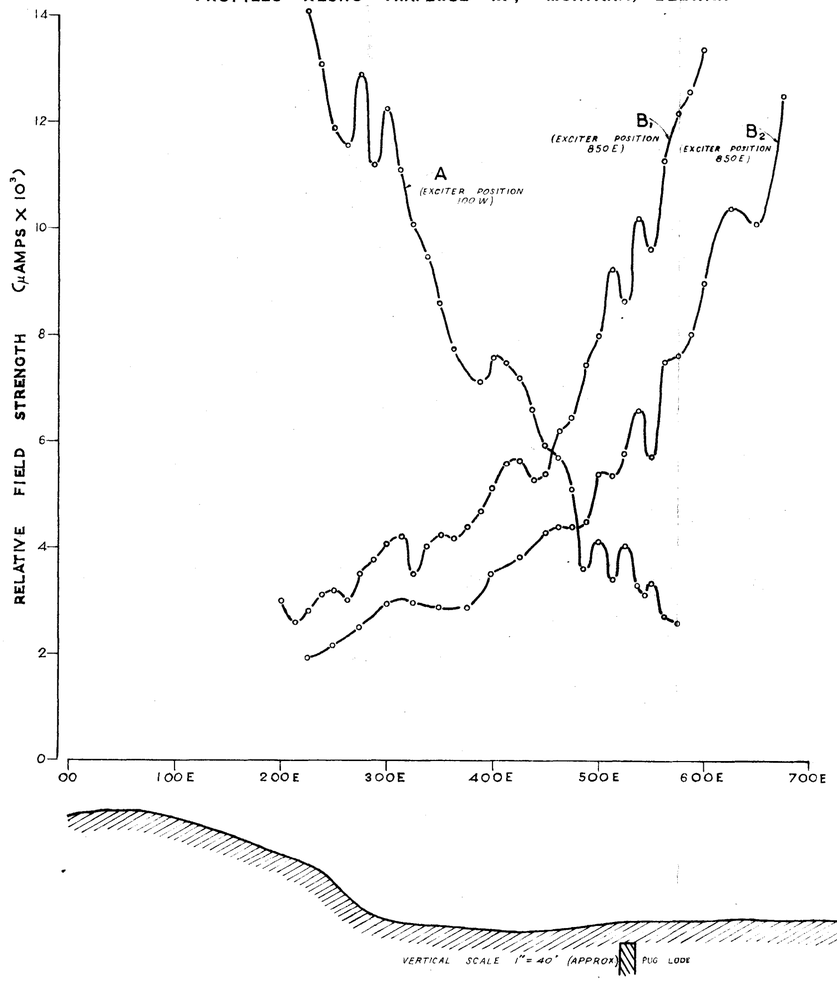


FIG. 2

PROFILES ALONG TRAVERSE IXA, MONTANA, ZEEHAN

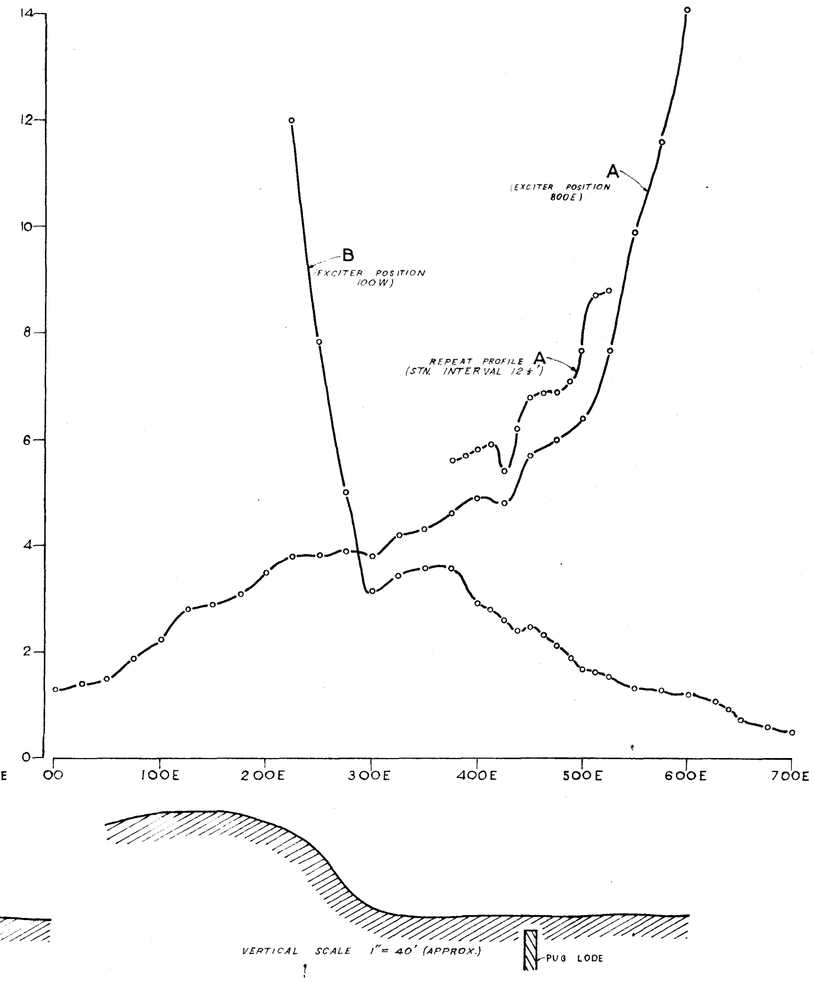


FIG. 3

PROFILES ALONG TRAVERSE 450E, MONTANA, ZEEHAN

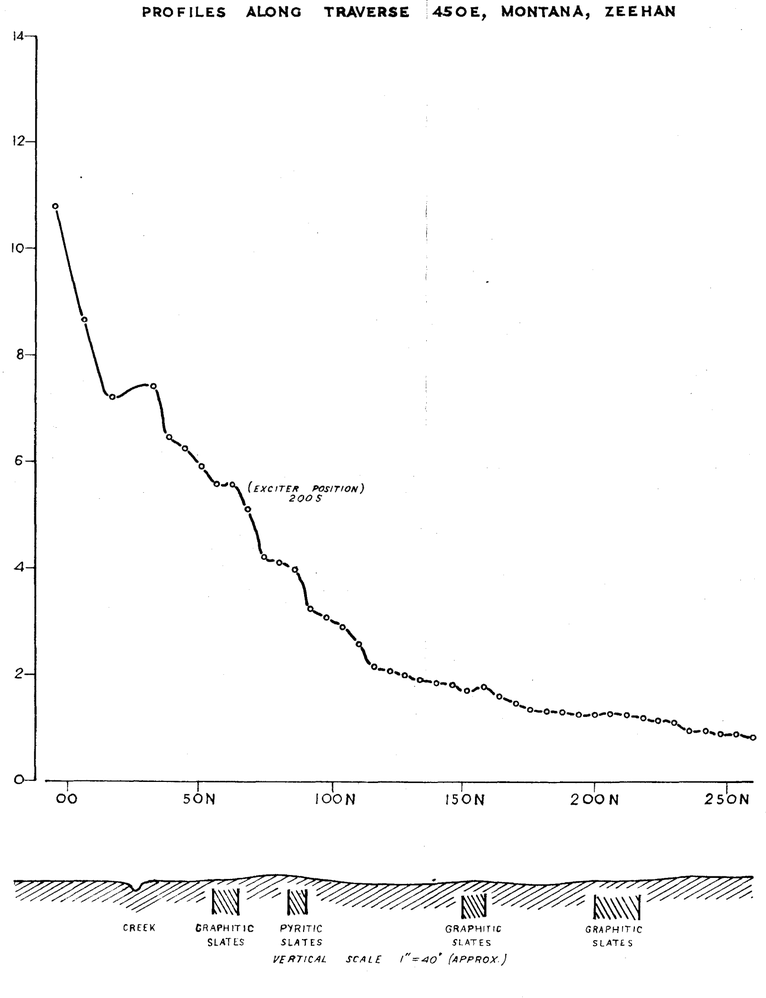


FIG. 4

PROFILES ALONG TRAVERSE BH, CUNI, DUNDAS

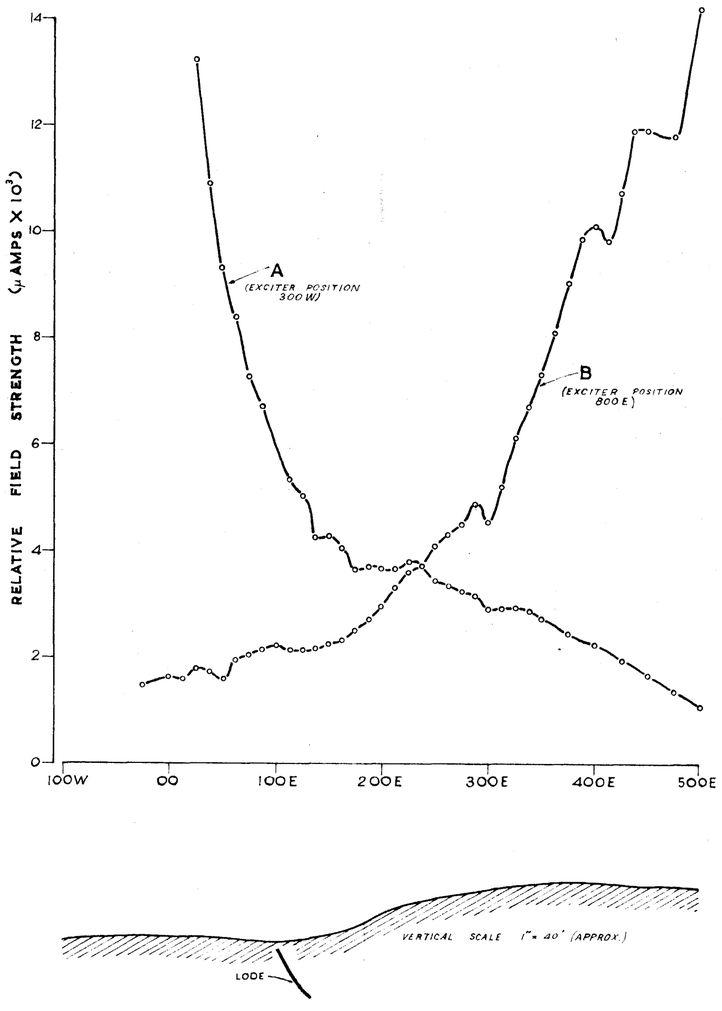


FIG. 5

PROFILES ALONG TRAVERSE BF, CUNI, DUNDAS

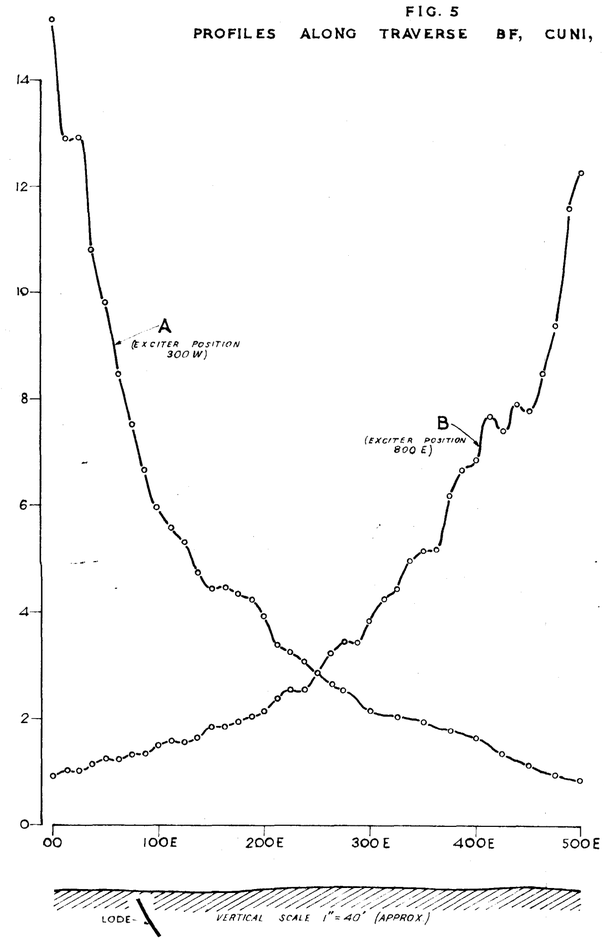
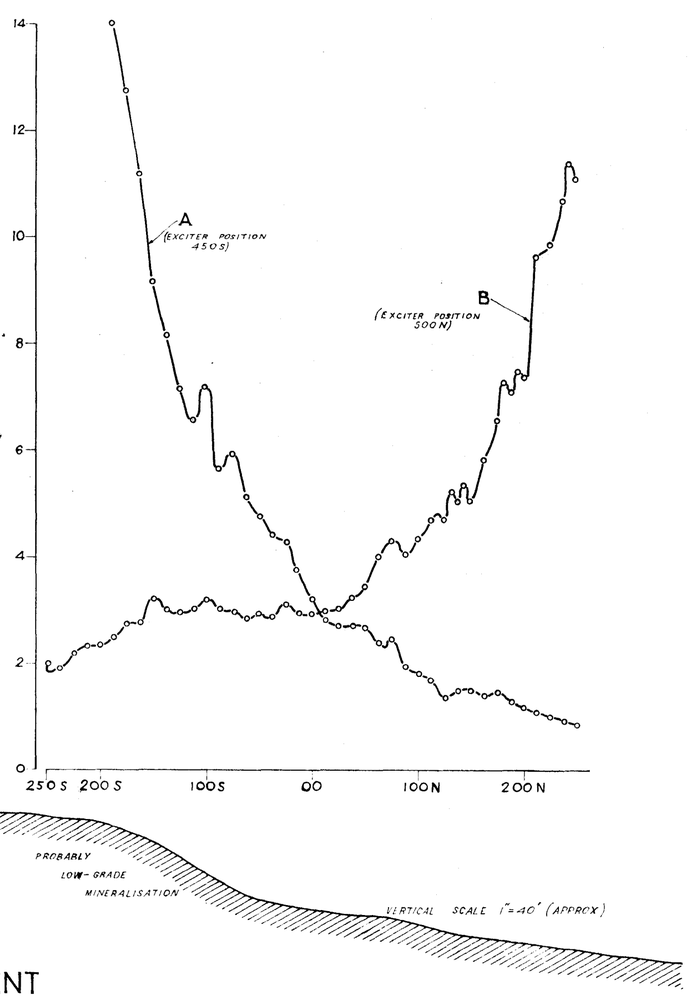


FIG. 6

PROFILES OVER TASMAN LODE, QUEENSTOWN



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"RADORE" PROFILES

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