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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS.

RECORDS

1959, NO.44

GEOPHYSICAL SURVEY AT BLACKFELLOW'S DAM URANIUM PROSPECT, CONDOBOLIN DISTRICT, N.S.W.

by

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ABSTRACT

Following the discovery of uranium mineralisation at the Blackfellow's Dam Mine, near Condobolin, N.S.W., a geophysical survey was carried out by the Bureau of Mineral Resources to search for evidence of sulphide mineralisation.

Electromagnetic, self-potential and magnetic methods were used, and several hundred soil samples were taken for geochemical analysis. The self-potential and magnetic methods yielded little of importance, and the discussion of the results is concerned mainly with the electromagnetic survey. Several anomalies were located by this method and they are considered to indicate the presence of fissures probably filled with clay and perhaps weakly mineralised. No evidence was obtained of the presence of sulphide bodies of economic value.

1. INTRODUCTION

The Blackfellow's Dam Mine is an old abandoned copper prospect, situated between Condobolin and Nymagee, about 100 miles south-east of Cobar, New South Wales. The mine is reached from Condobolin by travelling along the Condobolin-Nymagee road for 39 miles, branching off to the left for about 11 miles towards Erimeran and then taking a right fork for about 4 miles (Inset map, Plate 2).

Copper prospecting was first carried out at the mine in 1884. The workings consist of a shaft about 42 feet deep and a drive about 40 feet long at the 28-foot level, leading to a 60-foot winze. There are also a few small costeans near the main workings. No records are available of the mineral production from the mine.

Uranium mineralisation was discovered by local prospectors in 1954, and the discovery led to a detailed geological investigation by the Department of Mines, New South Wales, during which the old workings were unwatered and cleared. The results of the geological investigation, which are summarised in Section 2 of this report, led to an application to the Bureau of Mineral Resources for a geophysical survey to investigate whether or not evidence could be found of sulphide mineralisation on a mineable scale. The survey was made during October, 1956, by a geophysical party consisting of O.Keunecke (party leader) and E.Sedmik. A grid of 27 traverses, 100 feet apart and ranging in length from 1,000 to 1,400 feet, was pegged by surveyors of the Department of Mines, N.S.W.

2. GEOLOGY

The geology of the area and the results of investigations of several ore samples are described by Rayner (1954-1956) and Taylor (1956). The regional geology is shown on Plate I. The uranium-bearing lode lies within, but towards the margin of, a post-Silurian granite (the Erimeran granite), which intrudes Lower Palaeozoic metasediments. Some large boulder outcrops and pavements of granite occur; much of the granite surface is covered with a characteristic quartz-felspar shed. The sedimentary beds surrounding the Erimeran granite consist chiefly of slates, phyllites and conglomerates.

The uranium and copper mineralisation occurs in a zone which strikes N40°W and dips steeply to the south-west. The gangue is partly of a hard, greyish granitic and partly of a soft, dark chloritic type; clay material occurs with the lode, and is thought to indicate a fissure.

The uranium is confined to narrow bands in the lode, which is up to 20 inches wide. Radiometric assays show that the ore contains about 0.1 per cent U_3O_8, but selected pieces assay as high as one to two per cent U_3O_8. The mineralisation appears to occur in patches along the clearly defined foot-wall as well as along the hanging wall. Only secondary uranium minerals (autunite, curite and torbernite) have been identified.

The geological investigations show that the uranium mineralisation is associated with ferruginous and manganiferous material.

Some sulphides occur as sparse disseminations near the Blackfellow's Dam Shaft and at the Honeysuckle, which is a granite outcrop about 1,500 feet north-west of the shaft.

3. PROBLEM AND SELECTION OF METHODS

The purposes of the survey were:-

(a) To determine the position and extent of the lode fissure and of any similar fissures which might be concealed by the soil cover.

(b) To locate, if possible, any portions of the lode fissure which are likely to be more strongly mineralised than other portions.

As it is likely that such fissures have higher electrical conductivity than the solid granite, and the presence of sulphide mineralisation would further increase the conductivity, electrical methods are the obvious choice for a survey of this type.

The following methods were used:-

(i) Electromagnetic method.

In these methods, a primary alternating current is applied to the ground and observations are made in order to detect anomalies in the secondary fields, arising from beds or bodies whose conductivity is significantly higher than that of the neighbouring formations. Two electromagnetic methods, known as the Turam and Slingram respectively, were used. They differ mainly in the means used to produce the primary field. In the Turam method, the primary field is applied by means of a long cable, which may be either earthed at the ends or laid in a large loop. Current is supplied to the cable by a motor generator, at either 440 or 880 cycles per second. Intensities and phase conditions in two search coils moved along the traverse at a fixed separation, are compared by means of a bridge arrangement. In the Slingram method, the primary field is derived from a vacuum tube oscillator driving a portable tuned coil, at either 500 or 1500 cycles per second. This primary coil is moved from station to station, a fixed distance being maintained from the receiver or search coil. The electromagnetic field at the observation point is picked up by this search coil and compared with the primary field in amplitude and phase by means of an A.C. bridge.

The Turam method as applied is more sensitive than the Slingram method.

(ii) Self-potential method.

In this method, measurements are made of the naturally occurring potential distribution at the ground surface, using a high-impedance voltmeter. The observed potentials may arise from a variety of causes. In general, a sulphide body situated partly above and partly below water level, so that active oxidation is in progress, gives rise to a difference in potential between the upper and lower parts of the body. The resulting flow of electric current which takes place downwards within the body and upwards and outwards through the surrounding rocks, produces a characteristic negative centre of potential on the surface above the body.

(iii) Magnetic method.

Tests were made using the magnetic method of survey, but the method proved to be ineffective and was discontinued.

4. FIELD WORK

The area surveyed measures 2,600 feet by 1,400 feet. Traverses ranged from 1,000 to 1,400 feet in length, and extended from 600S to 2000N at 100-foot intervals (Plate 1). The shaft of the old copper working is between traverses 100N and 200N.

Turam measurements were made along all traverses, frequencies of 440 and 880 cycles per second being used for the first few traverses. Phase-angle anomalies were more pronounced when using the higher frequency and this frequency only was therefore used for the remaining traverses.

Slingram measurements were made along 9 traverses, using the higher frequency (1,500 cycles per second). As the method disclosed fewer anomalies than the Turam method, the results are not included in the illustrations accompanying this report.

Self-potential measurements were made along traverses 00 to 700N, but revealed no pronounced anomalies. The maximum deviation was only -35mV, but some of the S.P. indications correspond in position with some of the electromagnetic indications.

Several hundred soil samples were taken from areas where electromagnetic anomalies were most pronounced, and geochemical tests on these samples were made in the Bureau's laboratory in Melbourne. The samples were taken from the bottom of holes one foot to three feet deep. The holes were drilled with a 5-inch, post-hole drilling outfit attached to a tractor. The results of the tests on samples taken along traverses 00 and 200N are shown as profiles on Plate 3.

The electromagnetic results were disturbed by a telephone line which crosses the area, and by an earthed rabbit-proof fence which crosses the north-western corner of the area. The fence affected the readings for about 300 feet on each side of it.

5. DISCUSSION OF RESULTS

Significant anomalies were obtained in phase difference only, and the results are shown as phase contours on Plate 2. Phase and ratio profiles, geochemical profiles, and vector diagrams over selected traverses are shown on Plate 3.

The main feature of the results is a series of narrow, fairly weak anomalies, with a north westerly strike. The present workings lie on one of these anomalies. Geochemical anomalies are extremely weak, but such as are present coincide in position with the phase anomalies. A trench, 4 feet to 7 feet deep, was sunk on traverse 300N, from 382W to 400W. This is on the strongest electromagnetic anomaly, and also near the best defined geochemical anomaly. The trench revealed soft clayey material, apparently un-mineralised. No significant radioactivity was present.

All the evidence indicates that these anomalies are due to narrow fissures, along which there has possibly been some movement. It is considered that the material in the fissures is sufficiently conductive to account for the anomalies observed, and that the results give no reason to suppose that mineralisation on a commercial scale is present. It is of course possible that other mineral occurrences similar to the known ore are associated with the fissures.

The main series of anomalies is crossed by a broad weak anomaly striking north east. There is no evidence as to the cause of this anomaly.

A vehicle-borne radiometric survey has been performed over an area surrounding the workings (Howard, 1957). No significant radioactive anomalies were observed, and in particular, no indications which could be correlated in any way with the electromagnetic anomalies.

No anomaly is associated with the Honeysuckle outcrop, which contains slight "greisen-type" mineralisation.

6. CONCLUSIONS

It is concluded that observed anomalies are associated with alteration of the granite along lines of movement, and that there is no evidence of the presence of sulphide mineralisation in significant amount.

It is possible that other occurrences similar to that in the workings exist along the fissures defined by the electromagnetic anomalies, though it would be expected that evidence of their presence would have been obtained, had they been of significant size. The results have been tested by trenching at the spot which appears most favourable from the geophysical and geochemical indications. The complete failure of this testing indicates that trenching is not likely to be a suitable method of prospecting for ore bodies, and that prospecting at greater depth will be required. The results however, give no basis for recommending any such testing.

7. REFERENCES

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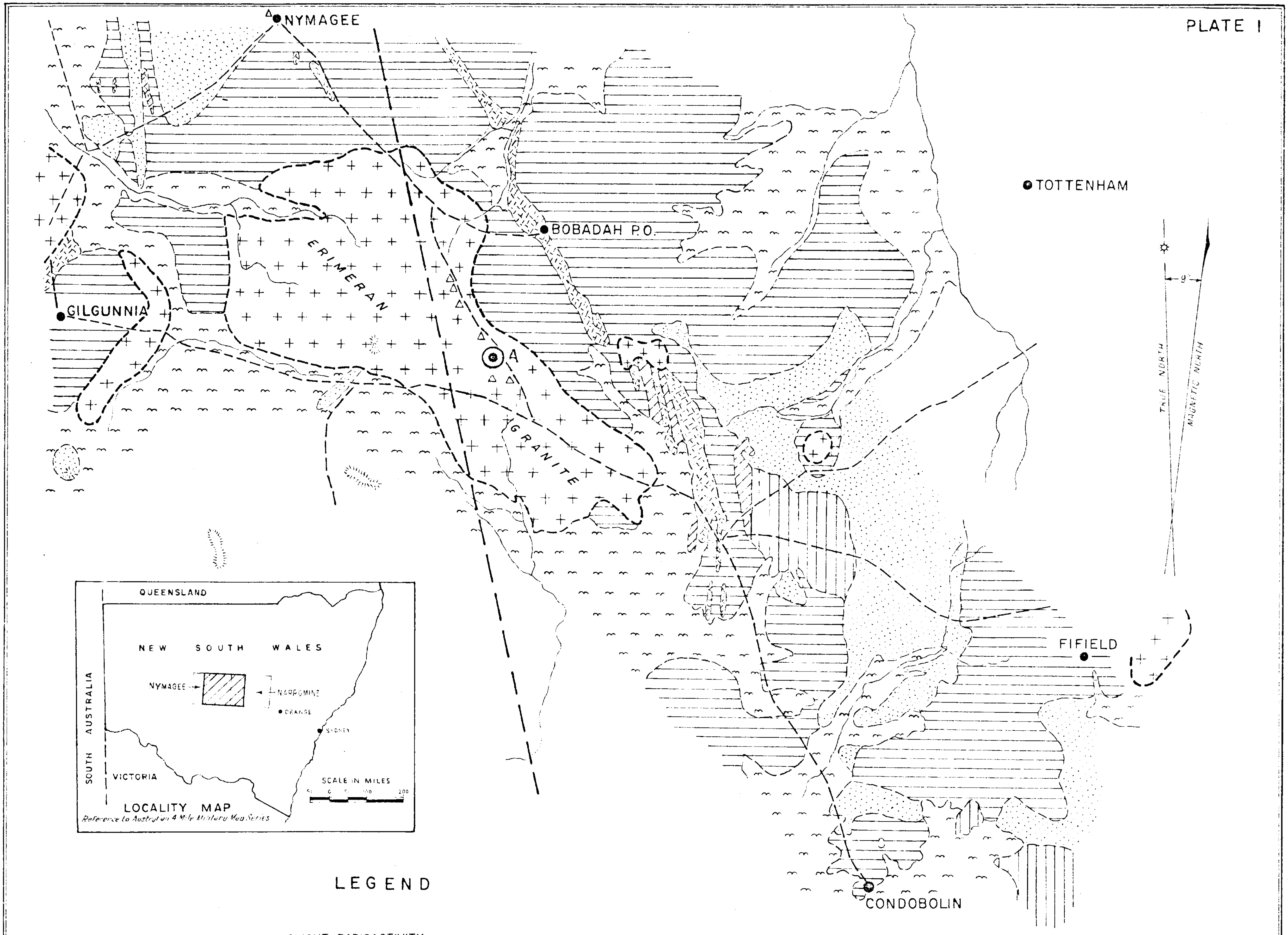


LEGEND

△ SLIGHT RADIOACTIVITY

Ⓐ A BLACKFELLOW'S DAM MINE
(FOR AREA OF GEOPHYSICAL SURVEY, SEE PLATE 2)

SEDIMENTARY

- RECENT — ALLUVIUM AND WASTE
- DEVONIAN — QUARTZITES, SANDSTONES AND SHALES
- SILURIAN — CLAYSTONES, SANDSTONES LIMESTONES & VOLCANICS
- SILURIAN — SLATES, PHYLLITES & CHERTS

IGNEOUS

- EPI-SILURIAN — PORPHYRIES (Deeply weathering type)
- EPI-SILURIAN — PORPHYRIES (Forming strong outcrops)
- EPI-SILURIAN — GRANITE

GEOPHYSICAL SURVEY AT
BLACKFELLOW'S DAM PROSPECT, NEAR CONDOBOLIN, N.S.W.

REGIONAL GEOLOGICAL MAP

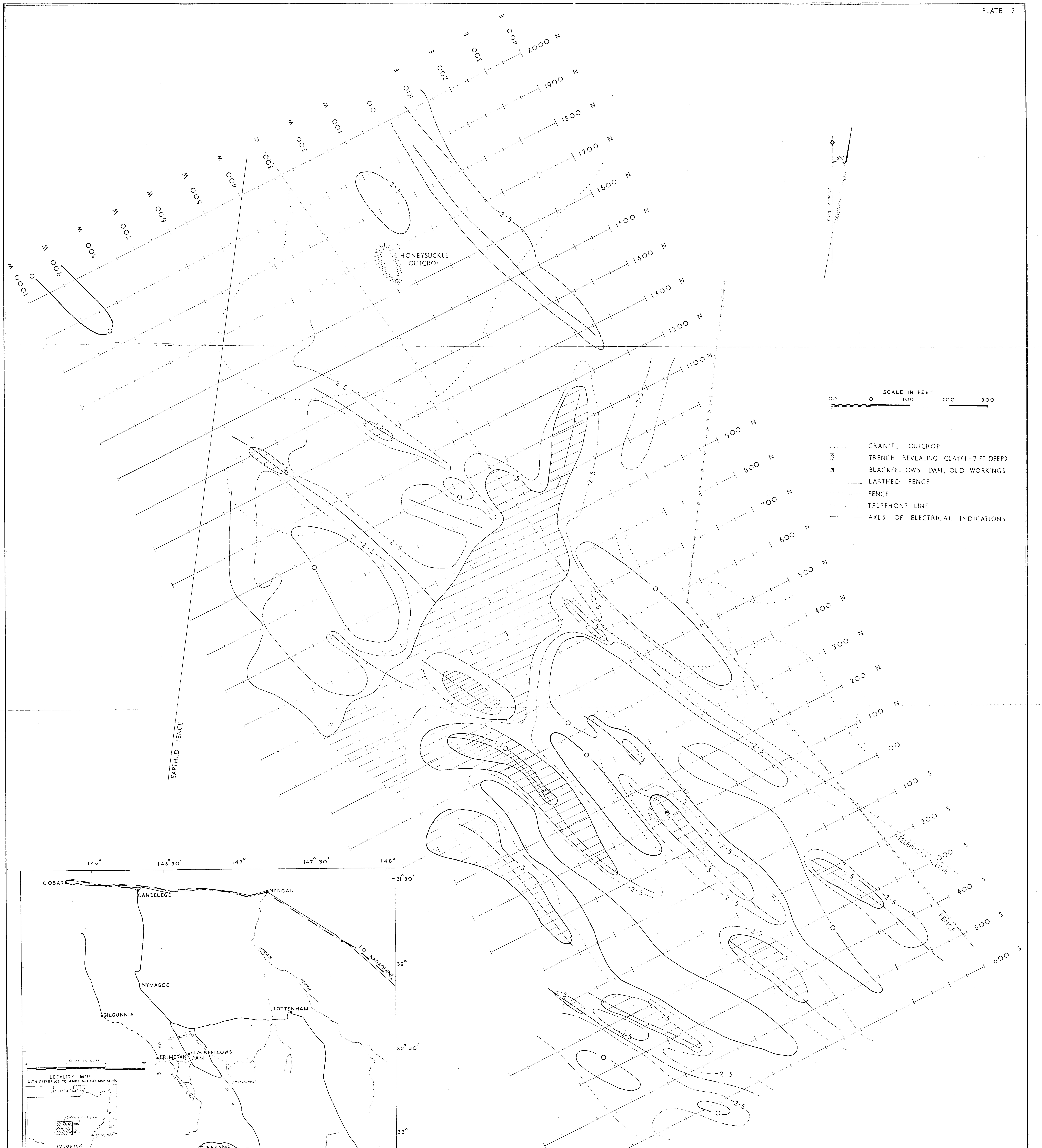
Geology after H.G.RAGGATT and A.C.LLOYD

SCALE IN MILES

8 4 0 8 16 32

Geophysical Section, Bureau of Mineral Resources Geology and Geophysics G 270-1

To accompany Records 1959, No 44



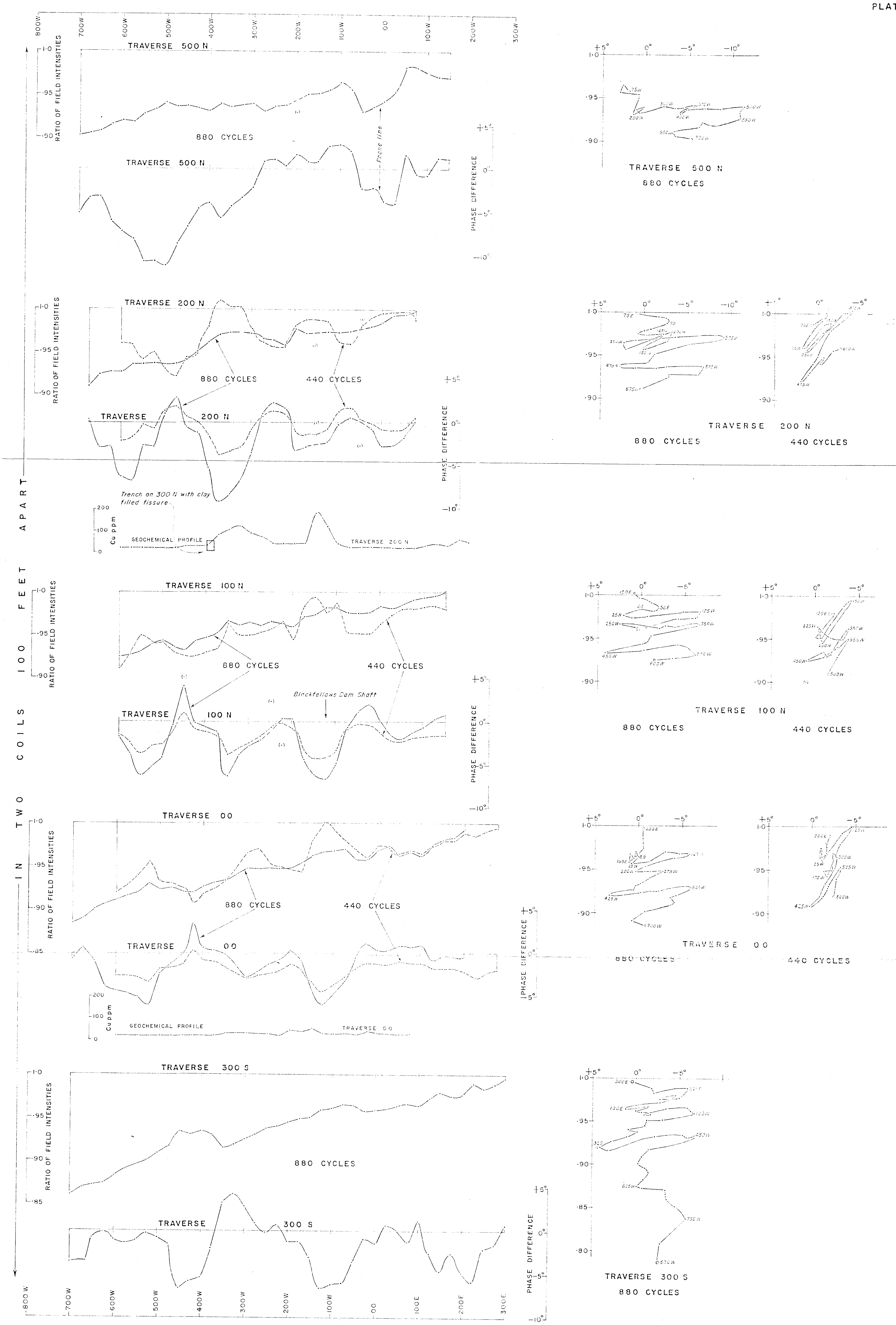
GEOPHYSICAL SURVEY AT BLACKFELLOWS DAM URANIUM PROSPECT, CONDOBOLIN DISTRICT N.S.W.

TURAM PHASE ANGLE CONTOURS

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

G 270-2

PLATE 3



HORIZONTAL SCALE IN FEET
100 50 0 100 200 300 400 500
(VERTICAL SCALES AS SHOWN)

GEOPHYSICIST

GEOPHYSICAL SURVEY AT
BLACKFELLOW'S DAM URANIUM PROSPECT
CONDOBOLIN DISTRICT, N.S.W.

ELECTROMAGNETIC PROFILES
AND
VECTOR DIAGRAMS
AND GEOCHEMICAL PROFILES

G 270-4