COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1963/105

AREA 55 TO BROWNS, GEOPHYSICAL SURVEY, RUM JUNGLE, NORTHERN TERRITORY 1962

by

A. DOUGLAS

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1963/105

AREA 55 TO BROWNS, GEOPHYSICAL SURVEY, RUM JUNGLE, NORTHERN TERRITORY 1962

by

A. DOUGLAS

CONTENTS

ILLUSTRATIONS

SUMMARY

Electromagnetic and radiometric surveys at Area 55A and 55B are described; these surveys were done to trace electromagnetic anomalies partly delineated by earlier surveys by the Bureau of Mineral Resources. Area 55A lies between Areas 55 and 55W; Area 55B lies between Area 55 and Browns.

The radiometric results outlined a continuation of the Area-55 anomaly, several weak anomalies at Area 55A, and a small area of roughly twice background radioactivity at Area 55B. Most of these anomalies lie close to a dolomite/shale contact; this suggests uranium mineralisation is concentrated along this contact.

The main electromagnetic anomaly outlined, Anomaly 1, strikes north-east across Area 55A and 55B. Anomaly 1 could indicate sulphides as it is on the continuation of the Browns line of base-metal sulphide mineralisation. For part of its length Anomaly 1 follows the dolomite/shale contact; as the radiometric results suggest the uranium mineralisation follows this contact, Anomaly 1 may indicate sulphides with associated uranium. Recommendations are therefore made to test Anomaly 1 by drilling.

Several other electromagnetic anomalies were outlined at Areas 55A and 55B. None of these anomalies are considered worth testing.

1. INTRODUCTION

Between 1956 and 1961 the Bureau of Mineral Resources, Geology and Geophysics detected in the Rum Jungle district a number of linear electromagnetic anomalies that could indicate base-metal sulphides and associated uranium mineralisation. Some of the anomalies continued beyond the limits of the area surveyed and further exploration was therefore needed to determine the full extent of these anomalies. This follow up work was done during 1962 by geophysicists J. Ashley and F. Maranzana, and the staff of the Darwin Uranium Group. This Record describes the results over Area 55A (between Areas 55 and 55W) and Area 55B (between Area 55, Dolerite Ridge, and Browns).

Area 55 and Dolerite Ridge are respectively about $1\frac{3}{4}$ miles west and 2 miles north of Rum Jungle Siding. Area 55W is 2000 ft north-west of Area 55. Browns area extends for about 7000 ft south-west from the Rum Jungle mine; the western end of Browns area overlaps the southern end of the Dolerite Ridge area. Areas 55A and 55B link these various survey areas (see Plate 1).

2. HISTORY

Dolerite Ridge and Areas 55 and 55W are all areas of anomalous radioactivity investigated during the 1960 and 1961 field seasons as part of a programme of uranium prospecting in the Rum Jungle district; the results of this work are described in detail by Rowston (1962), and Douglas (1962a; 1962b). Linear electromagnetic anomalies were outlined in all three areas; these anomalies could indicate sulphides and associated uranium mineralisation. Drilling at Dolerite Ridge has shown one of these anomalies is caused by a pyrrhotite body; at Area 55W weak uranium mineralisation has been detected in bore holes close to electromagnetic anomalies. None of the anomalies at Area 55 have yet been tested by diamond drilling. Territory Enterprises Pty Ltd (TEP) has outlined a low-grade lead orebody at Area 55 but this orebody is not indicated by the electromagnetic results.

At Browns, surface lead and copper mineralisation has been known for many years and between 1952 and 1954 TEP outlined a base-metal orebody near the north-western end of the area. In 1954 a test survey (Langron, 1956) showed that this orebody can be detected by the electromagnetic method; electromagnetic surveys were therefore extended to the whole of Browns area in 1957 (Daly, Horvath, and Tate, 1962) in the search for other sulphide bodies. The 1957 results show a linear anomaly extending for the whole length of Browns area; this anomaly is continuous with that caused by the known orebody. The continuation of the anomalous zone could indicate mineralisation but this has not been tested by drilling.

Because of the evidence of sulphide and uranium mineralisation in the area between Area 55 and Browns, further surveys near these areas seemed warranted. Accordingly electromagnetic surveys were made at Areas 55A and 55B in 1962; these areas were also surveyed radiometrically to assist in the search for uranium.

The principles of the electromagnetic method with reference to uranium and base-metal prospecting in the Rum Jungle district have been described by Daly (1962) and are not repeated here.

3. GEOLOGY

The mineralisation in the Rum Jungle district occurs in the Golden Dyke Formation, a group of Lower Proterozoic schists and shales that crop out around the southern edge of the Rum Jungle Granite. The shales of the Golden Dyke Formation are underlaid by Coomalie Dolomite; mineralisation is usually concentrated at, or near, the dolomite/shale junction. A tear fault, the Giants Reef Fault, strikes north-easterly across the granite and has displaced the north-western side three miles to the north-east. This fault system cuts across and displaces the mineralised zone; the Giants Reef Fault thus post-dates the mineralisation. The Giants Reef Fault lies about a mile south of Areas 55A and 55B.

The detailed geology of Areas 55, 55A, and 55W is shown on Plate 2. This map has been compiled from the results of shallow auger-drilling carried out by the Geological Branch of the Bureau of Mineral Resources (Ruxton and Shields, 1962 and in preparation). Mineralisation could occur at, or near, the dolomite/shale contact shown on this plate.

The auger-drilling programme is to be extended across Area 55B to Browns. To date only half of this section has been drilled. The dolomite/shale boundary continues at roughly 035 degrees from the northern corner of Area 55.

At Browns area no detailed geology is yet available but it is known that the dolomite/shale junction strikes roughly north-east along the centre line of the area. The dolomite lies north-west of the junction; the contact probably dips steeply south-east. Near the south-western limit of Browns area the junction swings sharply north. At Dolerite Ridge East (a small area of weak radioactivity east of Dolerite Ridge) auger drilling has shown that the dolomite/shale junction strikes north-west through the centre of this area.

4. SURVEYING AND OPERATIONS

The survey grids at Areas 55, 55A, 55B, and 55W are all part of the same rectangular co-ordinate system. The direction of the traverses in all the areas, except Area 55W, is 124°45' true; in Area 55W the traverses are at right angles to this direction, i.e. they are at 214°45' true. At Area 55 the baseline is along 00W (Plate 1). In 1960 this baseline was pegged from 00S to 32S and traverses were run at right angles to this line and pegged from 00W to 14W or 15W. Area 55 was investigated with geophysical methods in 1960 (Douglas, 1962a).

Traverse 18S was extended in 1961 and the part of this traverse between 34W and 58W was used as a baseline for the Area-55W grid. The traverses at Area 55W extend from 10S to 26S (Douglas, 1962b).

The 24W line was used as the baseline for Area 55A and the 15W line was used as the baseline for Area 55B. Both these baselines were tied to the 18S baseline. The traverses at Areas 55A and 55B were at 200-ft intervals and pegged every 50 ft.

The baseline of the Dolerite Ridge grid is the 160W line. The direction of this line is 321°07' true and its southern end is the 160W peg of the 1958 geochemical baseline. The 1958 geochemical baseline runs at 246°07' true from the Rum Jungle mine and extends through Browns area to Area 55W; this baseline was used for the 1954 (Langron, 1956) and 1961 (Douglas, 1963) geophysical surveys at Browns and for the 1958 geochemical survey (Haldane and Debnam, 1959).

Areas 55, 55A, and 55B and the western end of Browns area were all surveyed in 1962 with the electromagnetic (Slingram) method; all these areas, except for Area 55, were also investigated in 1962 with the radiometric method. Area 55 was surveyed radiometrically in 1960 (Douglas, 1962a).

5. GEOPHYSICAL RESULTS

Radiometric results (Plate 3)

The results of 1962 radiometric survey show that the Area-55 radiometric anomaly outlined as far as Traverse 32S in 1960 extends farther south-westwards, at least as far as Traverse 38S. Over the remainder of Area 55A there are several patches of anomalous radioactivity but most of these anomalies are weak; their maximum rarely exceeds 0.035mr/hr. The most intense and extensive anomaly in Area 55A had its maximum activity of 0.038mr/hr recorded at 34S/18.5W.

At Area 55B the maximum reading was 0.030 mr/hr at 34N/10W.

The radiometric results for Browns area show nothing of interest; those of Areas 55 and 55W and Dolerite Ridge area are described by Douglas (1962a and 1962b) and Rowston (1962) respectively.

Electromagnetic results (Plates 4 and 5)

The most important electromagnetic anomaly (called Anomaly 1) extends in a south-westerly direction from 120W/1S in Browns area across Areas 55A and 55B to 62S/25W. The intensity of this anomaly varies markedly along its length. The anomaly is most intense in Area 55B and attains a maximum amplitude near Rum Jungle Creek. In Browns area and Area 55A the anomaly is much weaker. South-west of Traverse 43S the anomaly is very weak and is only shown by the imaginary-component results (Plate 5).

A line of weaker anomalies extends from 26S/12W to 6N/12W. This line of anomalies was detected by the 1960 Turam survey of Area 55 (Douglas, 1962a). The part of this line of anomalies between Traverses 26S and 16S corresponds to Anomaly A of the 1960 Turam results and the part north of Traverse 6S corresponds to Turam Anomaly B. The 1962 Slingram results show Anomaly A better developed in the real component and Anomaly B better developed in the imaginary component.

Several other electromagnetic anomalies were outlined at Areas 55A and 55B. These have been called Anomalies 2, 3, and 4.

Anomaly 2 extends from 48S/20.5W to 36S/21W and is stronger in the imaginary component.

Anomaly 3 extends from 2S/16W to 10N/15W. This anomaly is well developed only in the imaginary component

Anomaly 4 is clearly defined by the real-component results in which the anomaly axis extends from 38N/11W to 48N/9W. The imaginary-component anomaly axis is more irregular and extends from 40N/14W to 50N/9W and from there extends northerly into the Dolerite Ridge area.

All the anomalies described above have roughly parallel axes with directions between 035° and 055°. The imaginary-component results also show several anomalies with roughly northerly axes. Anomalies with this trend pass through the following points : 20S/25W, 12S/26W, and 20N/6W.

6. DISCUSSION OF RESULTS

Almost all the radiometric anomalies at Areas 55, 55A, and 55W lie near the dolomite/shale contact; this suggests that, as with other areas in the Rum Jungle Uranium Field, uranium mineralisation is concentrated near this contact. If this uranium is associated with sulphides, these sulphides should be indicated by electromagnetic anomalies near the dolomite/shale junction.

Slingram Anomaly 1 consists of a series of anomalies which align in a south-westerly direction; the series is interrupted in places but it appears likely that the series is caused by a single conducting zone. Anomaly 1 could indicate sulphides with associated uranium mineralisation; the anomaly is on the extension of the Browns line of sulphide mineralisation and between Traverses 18S and 43S this anomaly follows the dolomite/shale contact.

The two electromagnetic components of Anomaly 1 however, are of roughly equal intensity and thus Anomaly 1 is probably caused by a moderate conductor; any sulphide mineralisation is therefore weak. The increased intensity of both electromagnetic components near Rum Jungle Creek does not suggest an increase in conductivity there, but that the conducting body is at a shallower depth than elsewhere; the water table near the creek is shallow and has preserved conducting material close to the surface.

It is possible that Anomaly 1, which cuts across lithological divisions, indicates a shear; the shearing has increased the conductivity of the rock by aligning carbonaceous material parallel to the shear. As shales contain a high proportion of carbonaceous material the anomaly will be clearly developed where the shearing has taken place within a shale sequence; where the shear lies within dolomite containing little carbonaceous material the conductivity will be poor. This would explain the sharp drop in intensity of Anomaly 1 at Traverse 43S where the geological information shows the shear passes into a dolomite sequence after following the dolomite/shale junction. The shear would be parallel to the Giants Reef Fault and could be of the same age. If the shear is of the same age, it is unlikely to be mineralised as mineralisation pre-dates the Giants Reef Fault.

Nevertheless, because it is on a line with the Browns mineralisation, Anomaly 1 should be tested. Recommendations for drilling are given below.

The Slingram results for Anomalies A and B agree essentially with those of the 1960 Turam survey (Douglas, 1962a) except that Anomaly A is more intense on the Turam results. This is to be expected as the Slingram method only clearly detects bodies down to depths of about 160 ft; the body causing Anomaly A is probably at a depth of 200 ft. The Turam method probes to depths exceeding 200 ft. For further discussion of Anomalies A and B see Douglas (1962a).

All other electromagnetic anomalies at Areas 55A and 55B are more strongly developed in the imaginary component than in the real component and thus indicate poor conductors, which are not worth testing.

7. CONCLUSIONS AND RECOMMENDATIONS

Electromagnetic Anomaly 1 is the only anomaly that should be tested; this anomaly may indicate low-grade sulphide mineralisation.

The radiometric results suggest that any uranium present is concentrated near the dolomite/shale contact. As Anomaly 1 coincides with this contact for over 2500 ft, this anomaly could indicate sulphide and uranium mineralisation.

Anomaly 1 should be tested by drill holes to a vertical depth of 200 ft at the following points:

28S/22.5W
12S/22.5W
6N/19.5W
10N/18W
16N/14.5W
22N/14W
42N/7W

8. REFERENCES

DALY, J. 1962 Rum Jungle District, Northern Territory, introductory report on geophysical surveys 1960-61. Bur. Min. Resour. Aust. Rec. 1962/27 (unpubl.)

DALY, J., HORVATH, J., and TATE, K.H. 1962 Browns deposit geophysical survey Rum Jungle, NT 1957 Ibid. 1962/146 (unpubl.)

DOUGLAS, A. 1962a Area 55 geophysical survey, Rum Jungle district, NT 1960. Ibid. 1962/124 (unpubl.)

DOUGLAS, A. 1962b Area 55 West geophysical survey, Rum Jungle district, NT 1961. Ibid. 1962/123 (unpubl.)

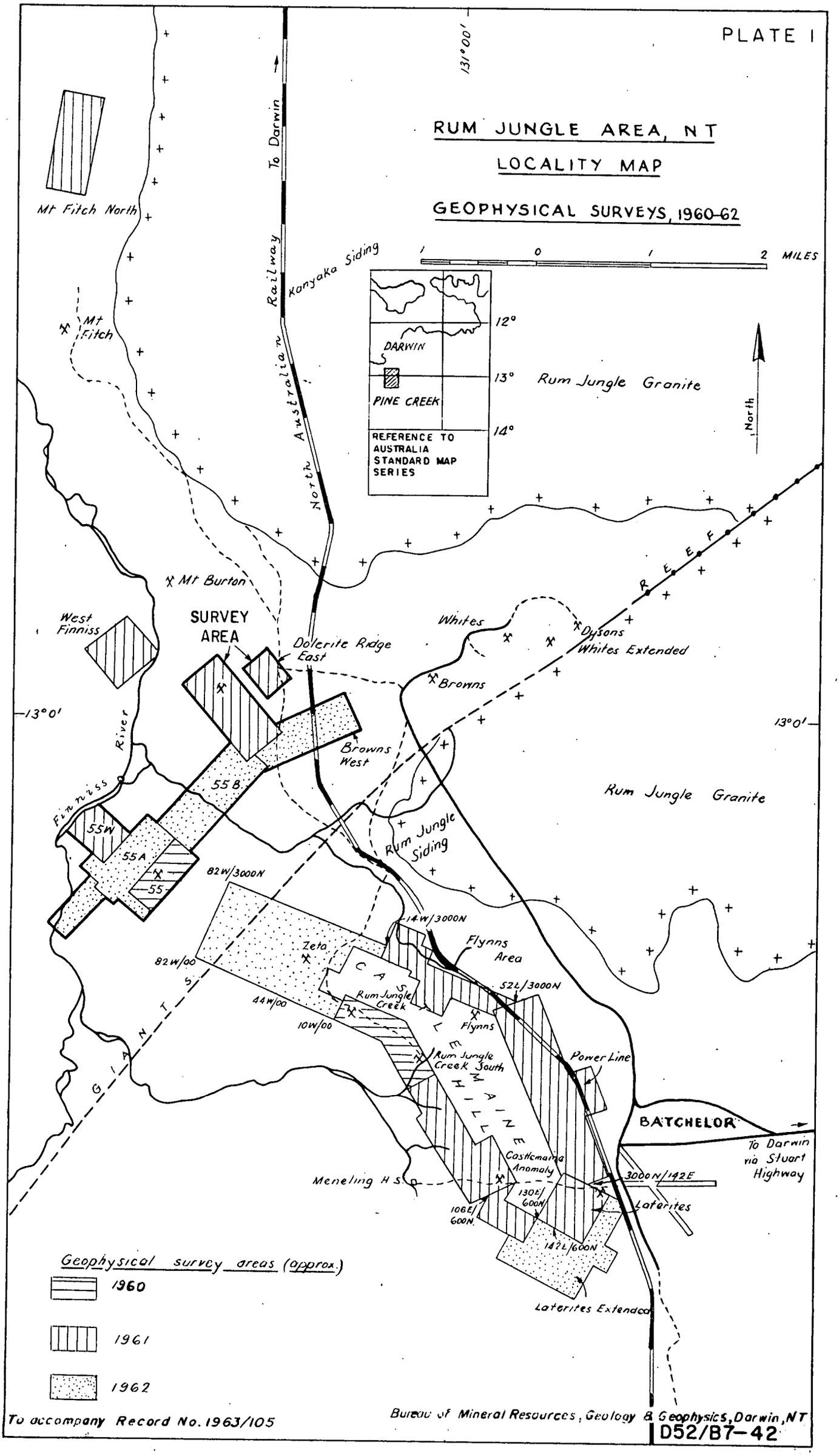
DOUGLAS, A.	1963	Browns deposit geophysical survey, Rum Jungle, NT 1961 Ibid. 1963/29.
HALDANE, A.D. and DEBNAM, A.H.	1959	Geochemical prospecting survey, Rum Jungle, NT 1958. Bur. Min. Resour. Aust. Rec.C1959/3 (unpubl.)
LANGRON, W.J.	1956	Geophysical survey in the Rum Jungle area NT Bur.Min. Resour. Aust. Rec. 1956/43 (unpubl.)
ROWSTON, D.L.	1962	Dolerite Ridge geophysical surveys, Rum Jungle district, NT 1961 Ibid. 1962/126 (unpubl.)
RUXTON, B.P. and SHIELDS, J.W.	1963	Geochemical and radiometric survey, Rum Jungle, NT 1961. Ibid. 1963/49.
RUXTON, B.P. and SHIELDS, J.W.	-	Geochemical and radiometric survey, Rum Jungle, NT 1962. Ibid. (in preparation).

PLATE 1

RUM JUNGLE AREA, N.T.

LOCALITY MAP

GEOPHYSICAL SURVEYS, 1960-62

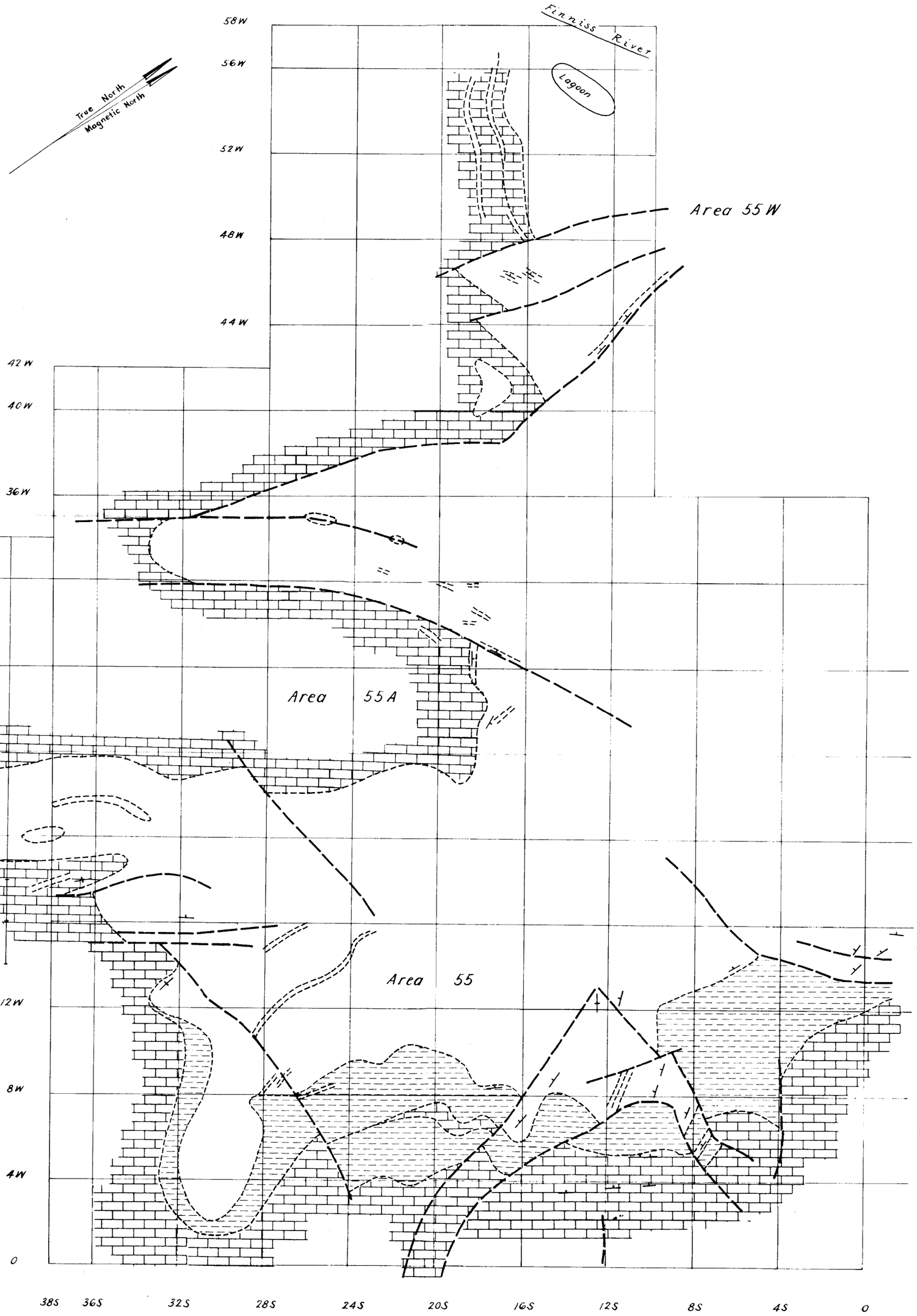


To accompany Record No. 1963/105

Bureau of Mineral Resources, Geology & Geophysics, Darwin, N.T.

D52/B7-42

PLATE 2



Reference

LOWER PROTEROZOIC

- Tremolitic shale, calcareous shale and dolomite.
- Chlorite and actinolite schist.
- Carbonaceous shale and chloritic shale.

- Geological boundary
- Fault
- Prevailing dip
- Vertical strata

AREAS 55, 55A, 55W
GEOLOGICAL MAP

(AFTER B.P.R. & J.W.S.)

Scale

400 0 400 800 FT

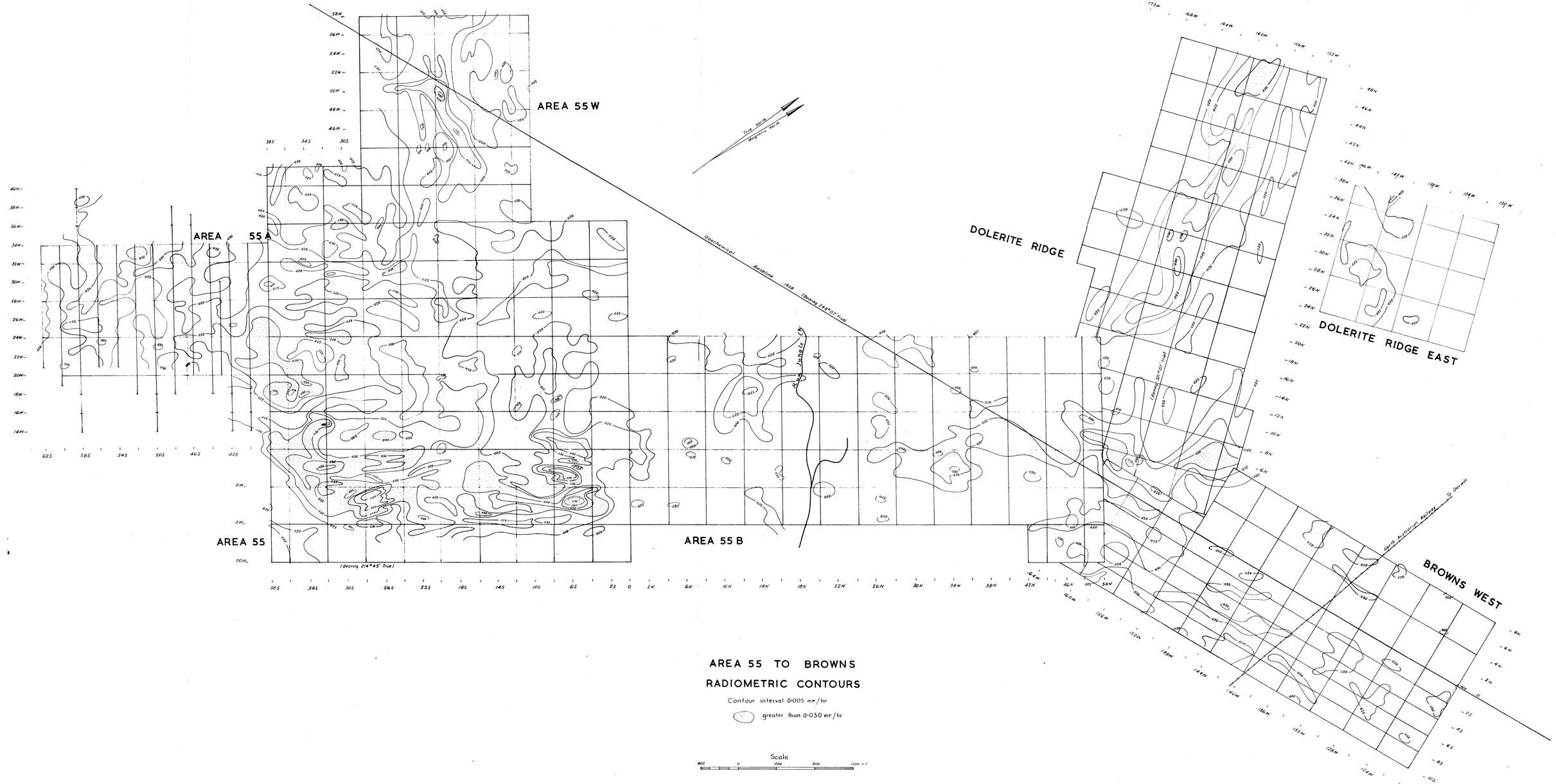
Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. March 1963.

To Accompany Record No. 1963/105

D 52/B7-54

S128 GP

RUM JUNGLE AREA 1962



AREA 55 TO BROWNS
RADIOMETRIC CONTOURS

Contour interval 0·005 mr/hr

greater than 0·030 mr/hr

Scale

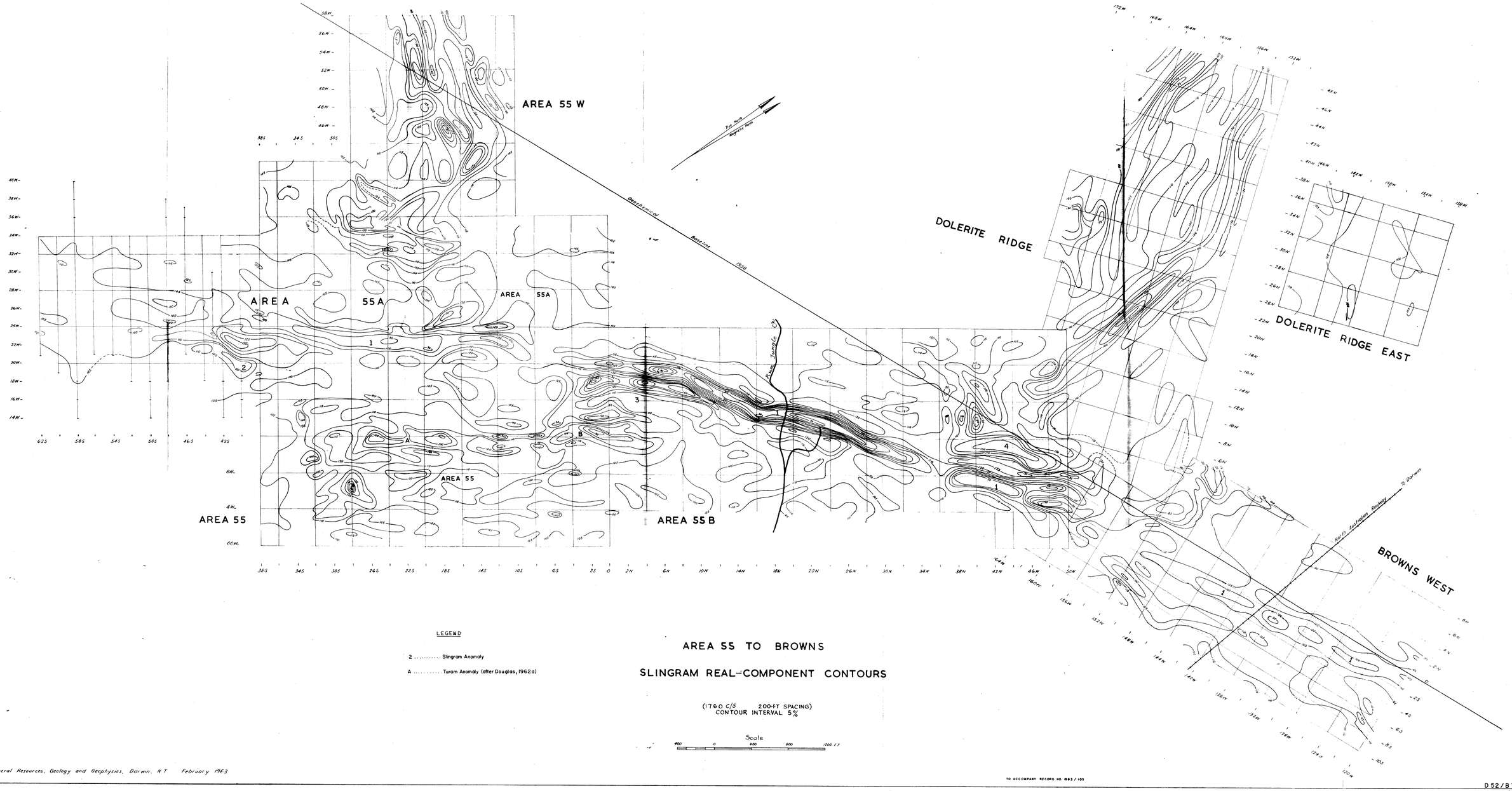
400 0 400 800 1200 ft

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. February 1963

TO ACCOMPANY RECORD NO 1963/105

D 52/B 7-51

5127 GP



LEGEND

2 ..... Slingram Anomaly

A ..... Turam Anomaly (after Douglas, 1962a)

AREA 55 TO BROWNS

SLINGRAM REAL-COMPONENT CONTOURS

(1760 C/S 200-FT SPACING)
CONTOUR INTERVAL 5%

Scale

400 0 400 800 1200 FT

GEOPHYSICAL SURVEY RUM JUNGLE AREA NT 1961-62

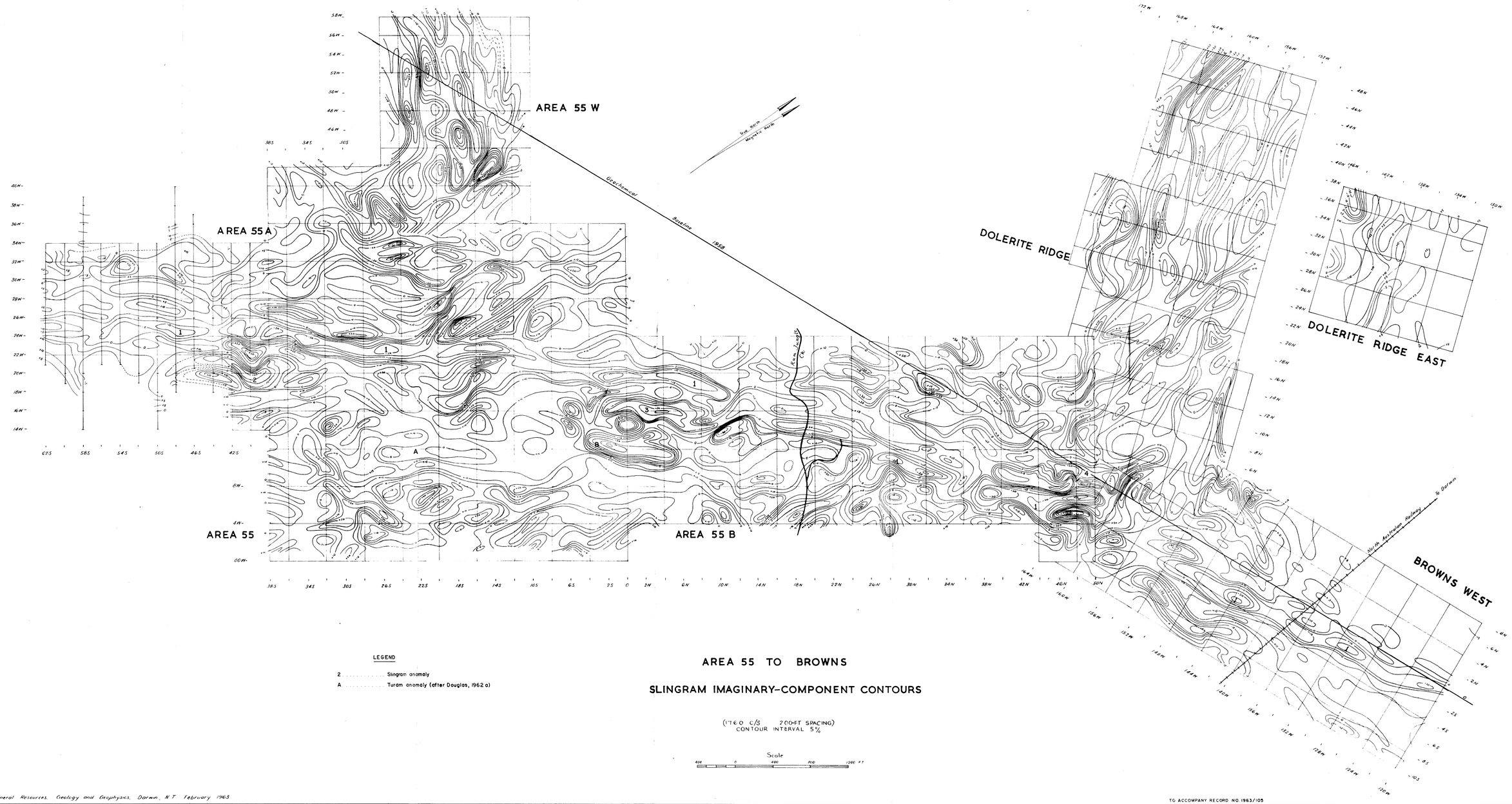
Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. February 1963

TO ACCOMPANY RECORD NO. 1963/103

D 52/B7-52

3/25 GP

PLATE 5



LEGEND

2 ..... Slingram anomaly

A ..... Turam anomaly (after Douglas, 1962 a)

AREA 55 TO BROWNS

SLINGRAM IMAGINARY-COMPONENT CONTOURS

(1T€0 C/S 200-FT SPACING)
CONTOUR INTERVAL 5%

Scale

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T. February 1963

TO ACCOMPANY RECORD NO. 1963/105

D 52/B 7-53
5/26 GP