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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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RECORD No. 1962/126

DOLERITE RIDGE GEOPHYSICAL SURVEYS, RUM JUNGLE DISTRICT, N.T. 1961

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by

D.L. Rowston

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SUMMARY

The investigation of Dolerite Ridge and Dolerite Ridge East by radiometric and electromagnetic surveys formed part of the 1961 programme of uranium prospecting in the Rum Jungle district.

Two broad areas of anomalous radioactivity were outlined at Dolerite Ridge. The anomalies are weak, their intensity rarely exceeding two times background. It is considered unlikely that these anomalies are directly related to economic uranium deposits.

Most of the electromagnetic anomalies outlined appear to be related to particular rock types rather than to mineralisation. However, one anomaly seems to warrant further investigation and it is recommended that it be tested by drilling.

The geophysical results obtained over Dolerite Ridge East contain nothing of interest.

1. INTRODUCTION

In 1952 an airborne scintillograph survey by the Bureau of Mineral Resources detected an extensive area of anomalous radioactivity around Dolerite Ridge, which is in the Rum Jungle Uranium Field. Two areas, named Dolerite Ridge and Dolerite Ridge East, were investigated during August 1961 by ground geophysical surveys made by the Bureau of Mineral Resources. The surveys were part of the general programme of uranium search carried out with the approval of Australian Atomic Energy Commission and in cooperation with their agents, Territory Enterprises Pty Ltd.

In the Rum Jungle Field the uranium mineralisation is commonly associated with base metal sulphides. As sulphides are normally good electrical conductors, the electromagnetic (Slingram) method was used to detect possible occurrences of sulphide bodies. Radiometric grids and two reconnaissance magnetic traverses were also made. The principles of the methods and the interpretation criteria have been discussed by Daly (1962).

The areas are about two miles north-west of the Rum Jungle railway siding (Plate 1) and are accessible by vehicle track from the siding and via the Browns/Mount Burton road. The topography is rather flat and in consequence the tracks are frequently impassable during the wet season.

2. HISTORY AND OPERATIONS

The 1952 airborne survey was followed by a low-level airborne scintillograph survey in 1956 by Territory Enterprises Pty Ltd, to verify and detail the initial radiometric anomalies. Geological mapping was handicapped by the paucity of outcrops but was augmented by information obtained from shallow auger-drilling during the Bureau's geochemical work in 1961. Earlier surface geochemical surveys (Haldane & Dobnam, 1959) revealed that Dolerite Ridge lies on a line of weak copper anomalies linking Browns deposit with Mount Fitch.

Aeromagnetic contours indicate that the south-westerly trend of the magnetic rocks at the adjacent Browns area change abruptly to a north-westerly direction and continue through Dolerite Ridge. Geophysical surveys have been made over Browns deposit, and a correlation of some of the electromagnetic anomalies thus obtained, with the base metal sulphide mineralisation has been established (Daly, Horvath & Tate, 1962). It is possible, therefore, that electromagnetic anomalies detected at Dolerite Ridge might indicate similar sulphide bodies.

Dolerite Ridge East is on a limestone/slate contact and, because of this geological environment and the associated radiometric anomaly, this area was considered worthy of further investigation.

The geophysical grids are tied in to the Rum Jungle Mine baseline used at Browns deposit in earlier surveys. The Dolerite Ridge baseline (true bearing 341° 07') has its origin at 160W on Browns deposit baseline, and from there extends for 4800 ft to the north-west. Initially Traverses 00 to 48N were pegged at intervals

of 400 ft along and at right angles to the baseline; stations were pegged every 50 ft from about 150W to 172W. Intermediate traverses of shorter length, viz. 14N, 18N, 22N, and 26N, were inserted to obtain more detailed information of the geophysical anomalies. The magnetic reconnaissance Traverses 28N and 36N were pegged farther to extend from 130W to 180W.

The grid layout of Dolerite Ridge East comprises eleven traverses, which are spaced 200 ft apart from 24N to 34N and pegged from 130W to 146W on the same co-ordinate system as at Dolerite Ridge.

The electromagnetic (Slingram) and radiometric methods were used on all traverses. Vertical magnetic force measurements were made only along Traverses 28N and 36N.

3. DISCUSSION AND INTERPRETATION OF RESULTS

Dolerite Ridge

Radiometric (Plate 2). Two broad areas of anomalous radioactivity were detected; the anomalies only attain about two times the normal background of radiation, which is 0.012 mr/hr.

The main anomaly, about 800 ft wide, extends from Traverse 48N in a southerly direction to Traverse 16N; the other anomaly occupies an irregular area between Traverses 8N and 00. This increased radioactivity is restricted to that portion of Dolerite Ridge mapped as grey shale (Plate 2). The radioactivity is unusually uniform, and nowhere does it increase to a significant maximum that might indicate an economic deposit.

Electromagnetic (Plates 3 and 4). The Slingram work over Dolerite Ridge revealed several strong electromagnetic anomalies, and some unusual features that were not encountered in other areas.

In general, the real-component contours show a reasonably simple correlation with the lithology and geological structure. However, the imaginary component presents a complex contour pattern and contains some strong anomalies that are difficult to interpret on our present knowledge.

The most outstanding correlation is apparent over the dolerite along the western edge of the layout. Here very strong positive imaginary-component anomalies and moderate real-component anomalies occur. The dolerite/grey shale boundary is marked by the transition to negative imaginary-component values and to real-component values of less than 110 per cent. These anomalies are considered to be of no importance in the search for uranium.

The grey shale, which occurs in the central and southern sections of the layout, is not as clearly defined by the electromagnetic anomalies as the dolerite is. The real and imaginary components show small anomalies over the grey shale, the imaginary component being somewhat more irregular in contour. Over the shale there are no anomalies that warrant further comment.

The most pronounced and interesting electromagnetic anomalies occur in a zone that commences at the western end of Traverse 8N, extends north-east to Traverse 28N, and then continues over the greywacke along the eastern edge of the grid to Traverse 48N. Because of the dissimilarity of the real and imaginary-component contours, the results are best discussed separately in the first instance.

The real-component anomaly indicates an elongated and nearly vertical conductor which extends from Traverse 8N to Traverse 26N. The centre of this anomaly is close to a gossan outcrop that dips steeply to the west. The origin of the gossan is unknown. The boundary between the shale and greywacke here is uncertain, but it probably occurs close to, and roughly parallel with, the main real-component anomaly. North from Traverse 26N the anomaly is very much weaker and lies about 150 ft east of the contact.

The contours of the imaginary component show that two very strong minima occur at the extremities of the main real-component anomaly. These are centred near 32N/154W and 10N/167W. There is no imaginary-component minimum corresponding with the strongest part of the real-component anomaly. This is unusual and is attributed to a geological feature with very good conductivity between Traverses 14N and 22N but with poor conductivity elsewhere.

Although the greywacke/shale contact may constitute a conductor, the coincidence of the gossan outcrop in the indicated highest-conducting portion is of interest, and further investigation of this section by drilling is advocated. The alternative possibility of faulting is not supported by evidence from the geological mapping. The faults that have been mapped are shown on Plate 2; it can be seen that there are no significant electromagnetic anomalies associated with these known faults.

The other small variations in the secondary fields are at present considered unimportant. Further work is proposed during 1962 over an extension to the south of this grid, and some of the small anomalies appearing on Traverse 00 may be traced farther to the south.

Dolerite Ridge East

The results of the Slingram and radiometric work over this area were devoid of pronounced indications. Sporadic and insignificant increases in radioactivity, up to about two times background, were detected. The Slingram real component was virtually featureless and the imaginary component, although slightly more variable, did not reveal conductors of interest. Little correlation with the geology can be made and no further work is warranted.

Magnetic survey

Two traverses, viz. 28N and 36N were read in both of the Dolerite Ridge areas with the Watts vertical variometer No. 69109; the station interval was 100 ft. The magnetic profiles are not shown but two major magnetic anomalies of about 3000 gammas intensity were detected on Traverse 28N and a broader anomaly of similar magnitude was detected on Traverse 36N. Two of these anomalies, 28N/(158W to 162W) and 36N/(156W to 160W), occur over grey shale, and it is probable that this shale is underlain by amphibolite. The section 146W to 152W on Traverse 28N is unmapped geologically but the magnetic anomaly there is also attributed to an amphibolite-type rock.

4. CONCLUSIONS AND RECOMMENDATIONS

The radiometric results at Dolerite Ridge show that the radioactivity over the grey graphitic shale is uniformly about two times the normal background radiation, which is detected over the dolerite and greywacke. The results do not indicate uranium concentrations of economic interest.

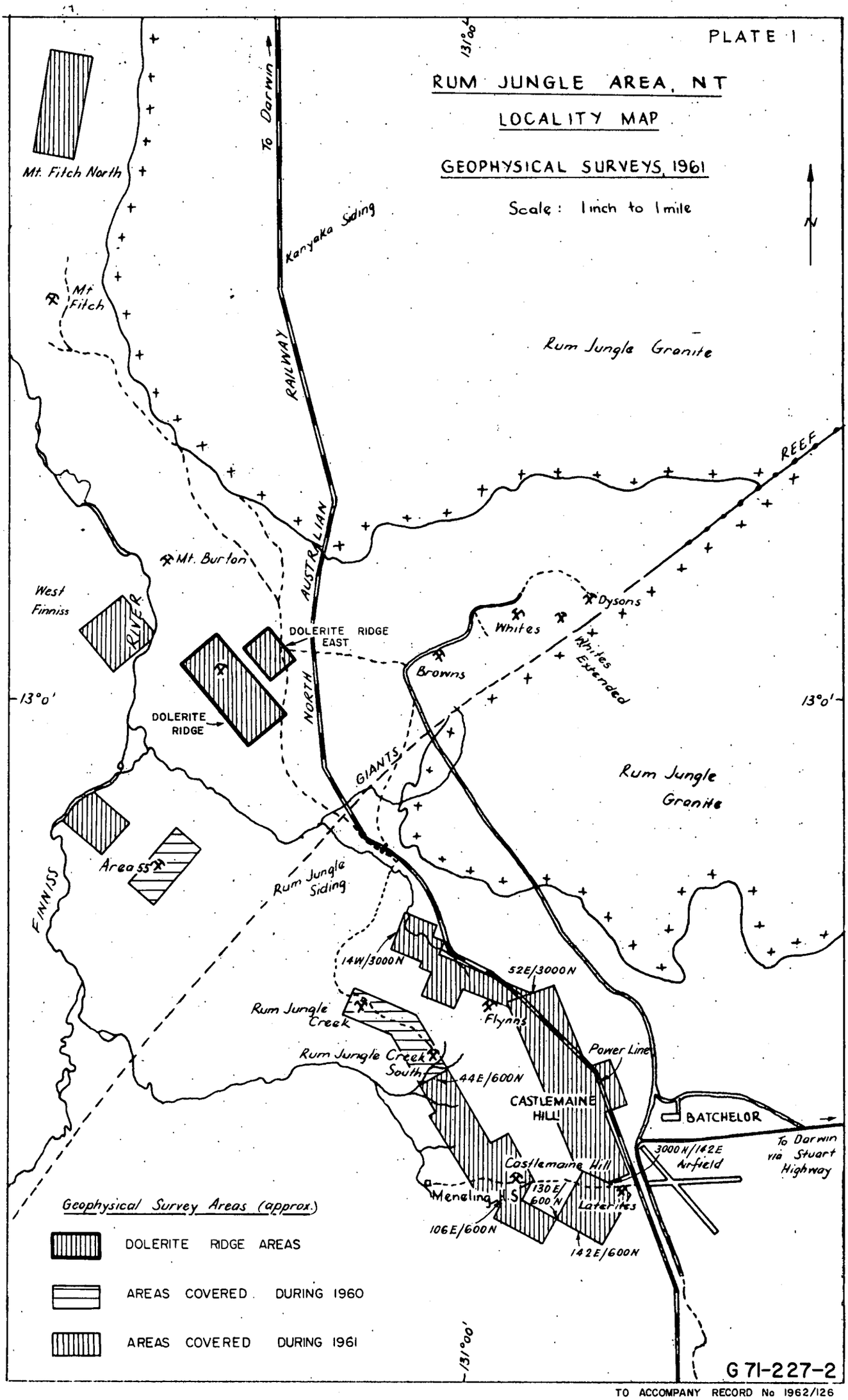
The electromagnetic anomalies, with one exception, are also apparently related to particular rock types and to their boundaries, and these anomalies do not indicate sulphide mineralisation.

The exception, the pronounced real-component anomaly centred about 18N/161.5W and the related imaginary-component anomalies at 10N/167W and 32N/154W may be due either to sulphide mineralisation or to a shear along the shale/greywacke contact. A drill hole sited to intersect at about 100-ft vertical depth the body causing the real-component anomaly at 18N/161.5W is recommended. Vertical drill holes at 10N/167W and 32N/154W to investigate the imaginary-component anomalies could prove valuable in aiding future interpretations of similar Slingram anomalies.

The geophysical results obtained over Dolerite Ridge East contain nothing of interest.

5. REFERENCES

DALY, J.	1962	Rum Jungle district, Northern Territory, introductory report on geophysical surveys 1960-61. Bur. Min. Resour. Aust. Record 1962/27.
DALY, J., HORVATH, J. and TATE, K.H.	1962	Browns deposit geophysical survey, Rum Jungle, NT 1957. Bur. Min. Resour. Aust. Record 1962/146.
HALDANE, A.D. and DEBNAM, A.H.	1959	Geochemical prospecting survey, Rum Jungle, NT 1958. Bur. Min. Resour. Aust. Record C.1959/3.



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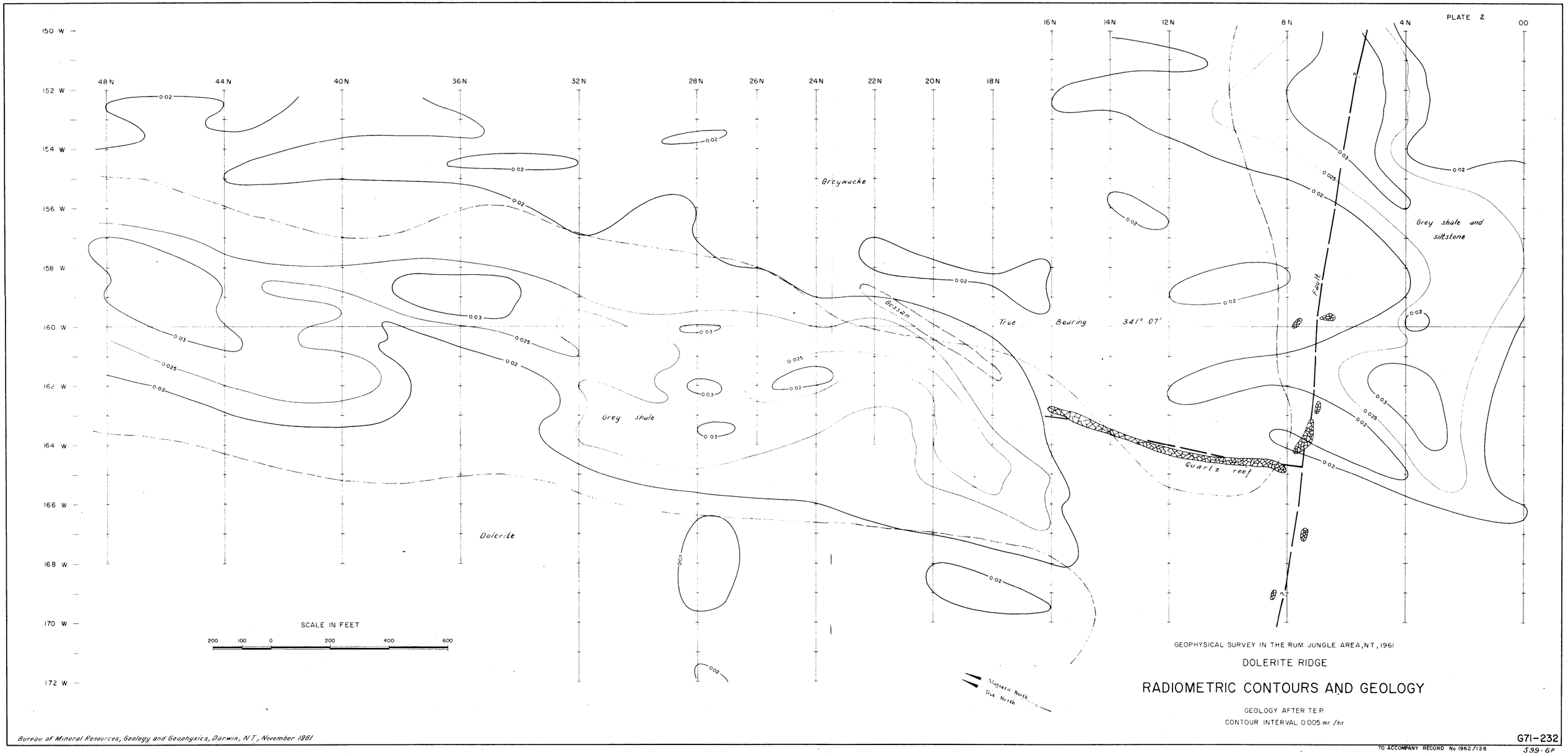
Dolerite Ridge



GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T., 1961

DOLERITE RIDGE

RADIOMETRIC CONTOURS AND GEOLOGY

GEOLOGY AFTER T.E.P.

CONTOUR INTERVAL 0·005 mr/hr

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T., November 1961

G71-232

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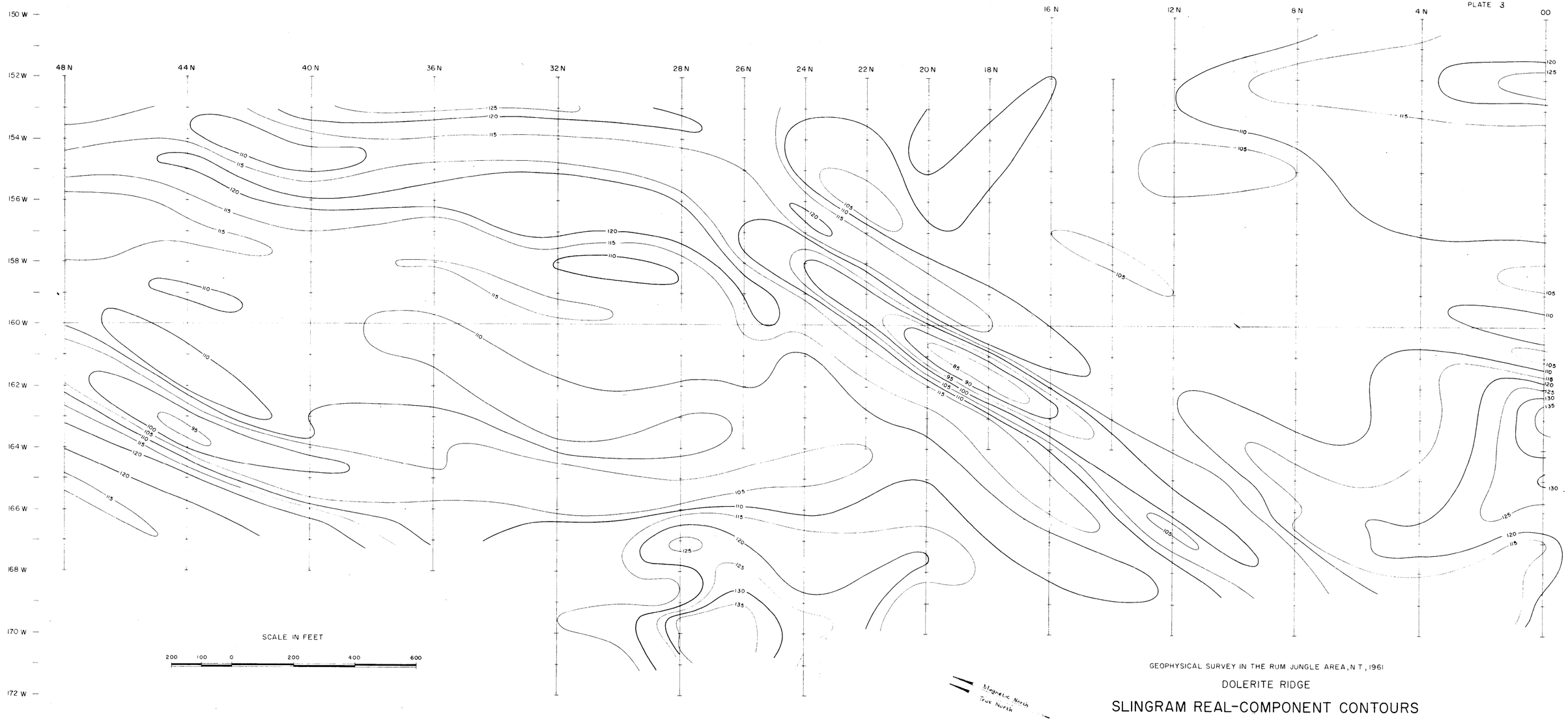

GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N T, 1961

DOLERITE RIDGE

SLINGRAM REAL-COMPONENT CONTOURS

FREQUENCY 1760 c/s COIL SEPARATION 200 FT

CONTOUR INTERVAL 5%

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N T, November 1961

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TO ACCOMPANY RECORD No 1962/126

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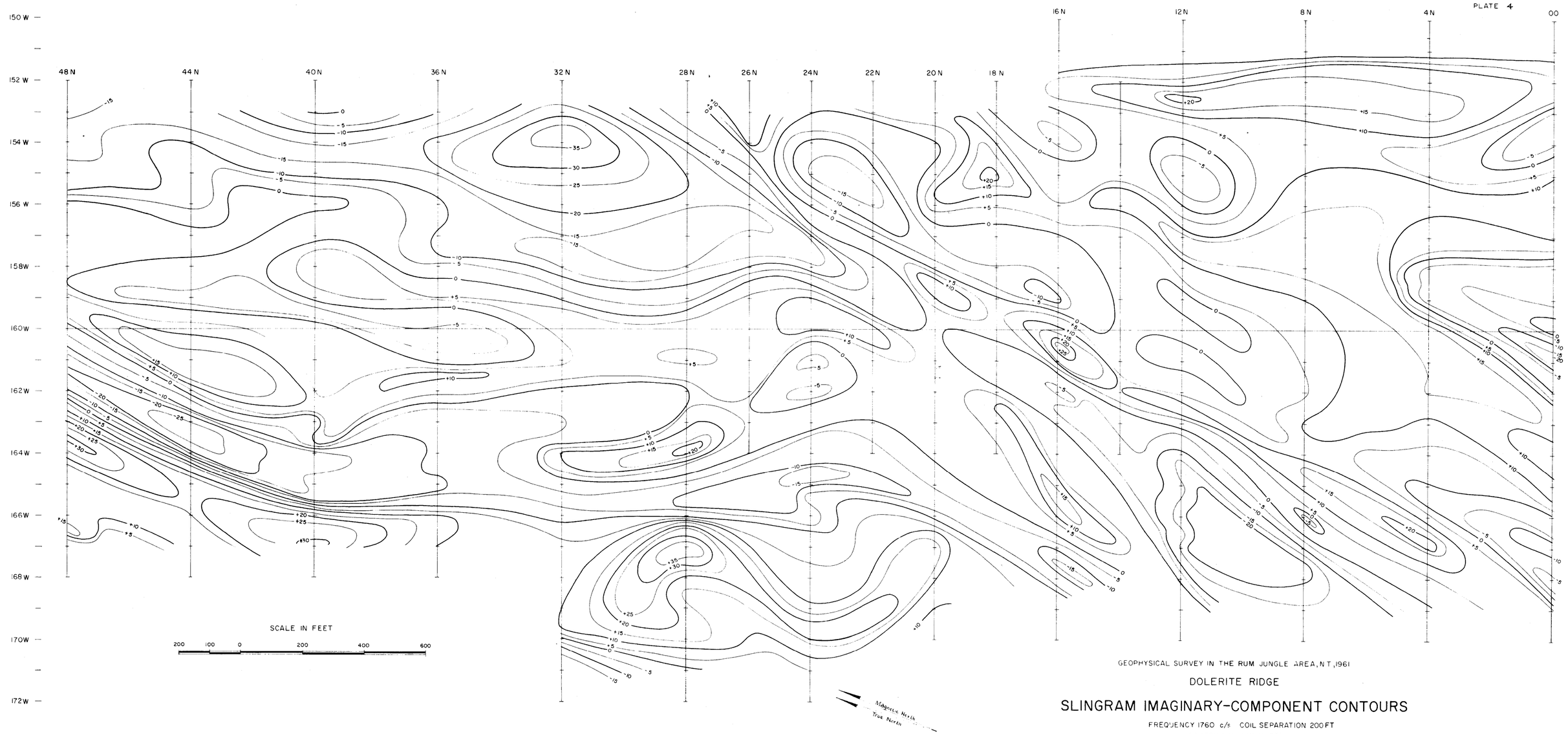
PLATE 4



GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T., 1961

DOLERITE RIDGE

SLINGRAM IMAGINARY-COMPONENT CONTOURS

FREQUENCY 1760 c/s COIL SEPARATION 200 FT

CONTOUR INTERVAL 5%

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T., November 1961

G71-234

TO ACCOMPANY RECORD No 1962/126

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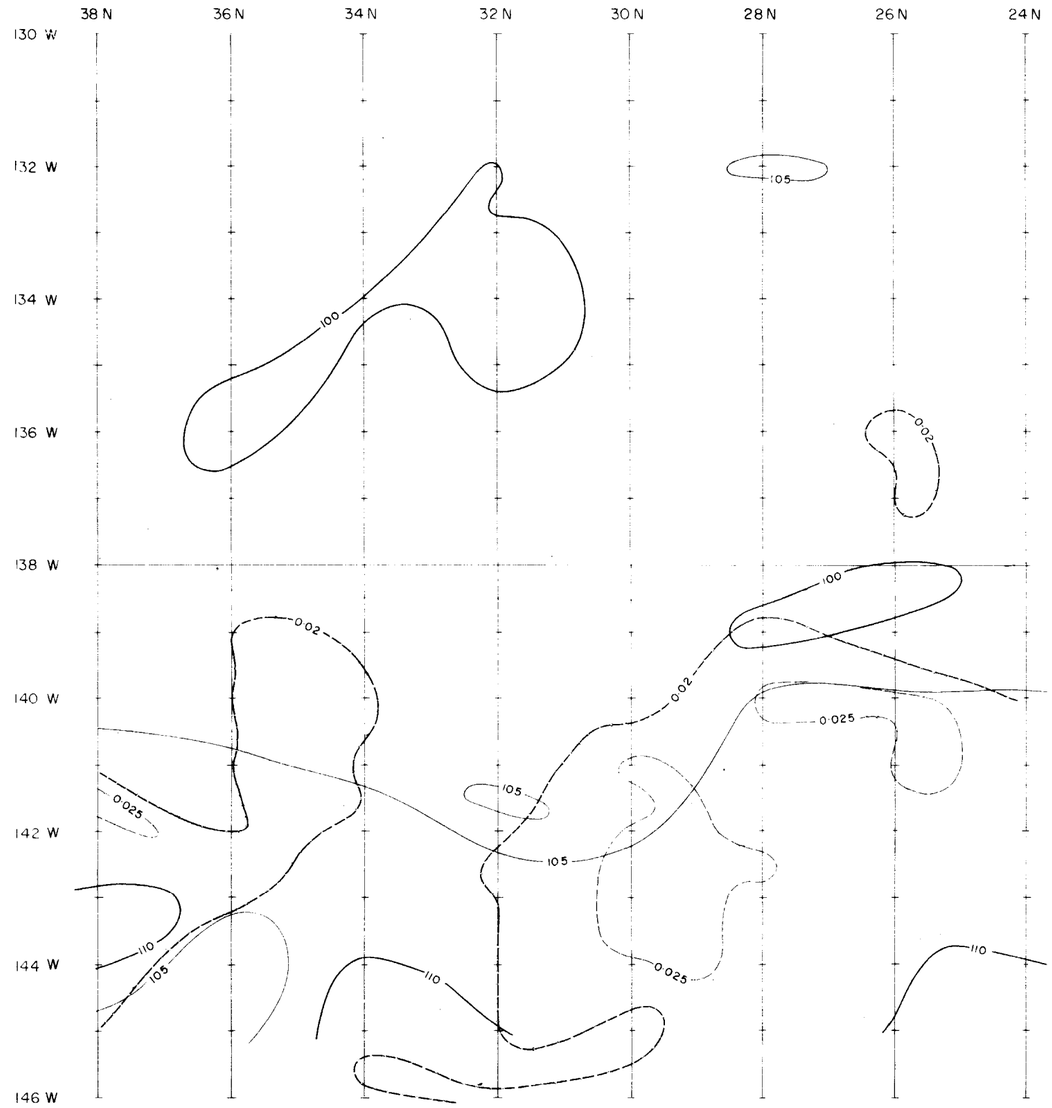


GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T., 1961

DOLERITE RIDGE EAST

SLINGRAM REAL COMPONENT AND RADIOMETRIC CONTOURS

SLINGRAM: FREQUENCY 1760 c/s

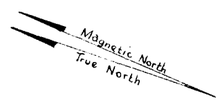
COIL SEPARATION 200FT

CONTOUR INTERVAL 5%

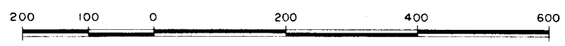
RADIOMETRIC: CONTOUR INTERVAL 005 mr/hr

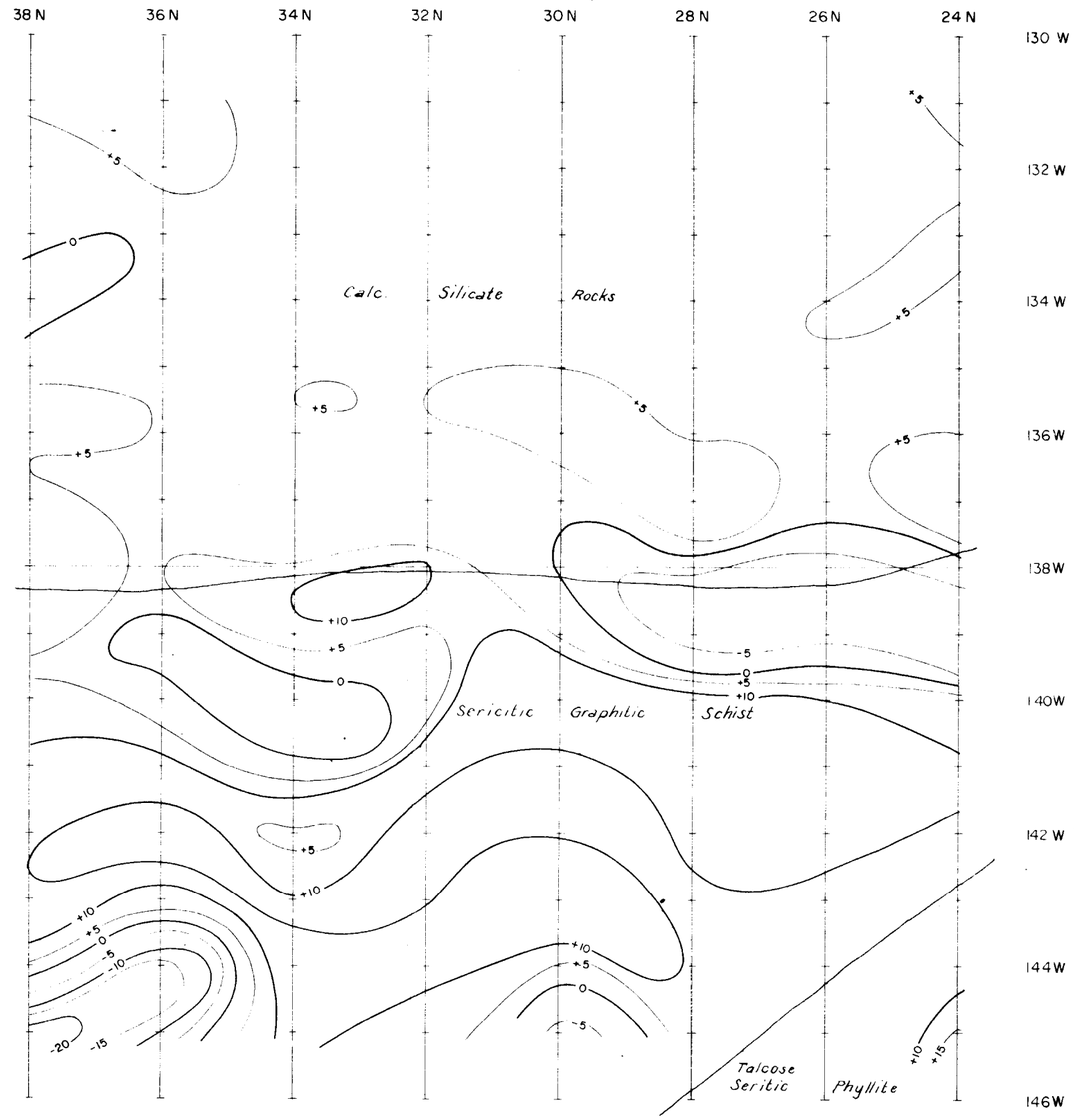
RADIOMETRIC CONTOURS

SLINGRAM "



SCALE IN FEET





GEOPHYSICAL SURVEY IN THE RUM JUNGLE AREA, N.T., 1961

DOLERITE RIDGE EAST

SLINGRAM IMAGINARY-COMPONENT CONTOURS AND GEOLOGY

FREQUENCY 1760 c/s COIL SEPARATION 200FT

CONTOUR INTERVAL 5%

Bureau of Mineral Resources, Geology and Geophysics, Darwin, N.T., November 1961