COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD NO. 1963/10

JERVOIS RANGE GEOPHYSICAL SURVEY, NT 1962

by

A. Douglas and F. Maranzana

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SUMMARY

This Record describes electromagnetic and magnetic surveys for copper and lead sulphides at Jervois Range, NT. Two areas of known near-surface mineralisation were investigated, viz. the Bellbird prospect and the Green Parrot and Reward prospects. No electromagnetic anomalies were outlined in either area.

The magnetic survey outlined one zone of magnetic anomalies at Bellbird prospect and two zones at the Green Parrot and Reward prospects. These anomalies are probably associated with shallow magnetite-bearing bodies and, as magnetite and sulphides are commonly associated at Jervois, these anomalies could also indicate sulphides. However, the absence of any corresponding electromagnetic anomaly suggests that any such concentrations of sulphide are very small. Drilling is recommended to determine whether sulphides are associated with the magnetic bodies.

1. INTRODUCTION

Jervois Range lies about 180 miles east-north-east of Alice Springs, NT (see Plate 1). Near-surface copper mineralisation has been known in the area for some years and has been mined intermittently; it is at present being worked by K. Johannson.

Recently, geologists of New Consolidated Goldfields Pty Ltd have mapped the geology of the area in detail (Hughes and Ward, 1962) and consider that extensive copper and lead-sulphide mineralisation might occur at depth. To help in the location of zones of sulphide ore the Bureau of Mineral Resources was requested to carry out geophysical surveys over the area. This work was done during June 1962 by A. Douglas and F. Maranzana, geophysicists of the Bureau's Darwin Uranium Group.

2. GEOLOGY

The Jervois Range prospects occur in an area of steeply-dipping Archaean rocks, mainly quartz-mica schists, skarns, and calc-silicates with minor marbles. The most important structural feature of the area is a syncline that has a north-south axis and plunges northwards (see Plate 1); the mineralisation is in the limbs of this syncline.

The main areas of known mineralisation are the Bellbird prospect and the Green Parrot and Reward prospects. The Bellbird prospect is situated on the western limb of the Jervois Syncline (see Plate 1); the strike of the rocks is northerly and they dip to the east at 75 degrees. Considerable shearing has taken place in this area between competent and incompetent beds of the Jervois Syncline, and east of this sheared zone there is evidence of strong vertical faults (Plate 2). Mineralisation consisting of chalcopyrite, magnetite, pyrite, pyrrhotite, quartz, and chlorite is concentrated along these lines of movement.

The mineralisation at the Green Parrot and Reward prospects on the eastern limb of the syncline is of the skarn type; the outcrops of these skarns are shown on Plate 3. At the Reward prospect the skarn is a garnet-quartz-magnetite rock with patches of strong lead and weak copper mineralisation. Two lines of skarn lenses occur at the Green Parrot prospect (see Plate 3). These lenses have minor marbles associated with them and are interbedded with schists and quartz - magnetite bands. Galena, chalcopyrite, bornite, and sphalerite have been reported from this prospect. The dip of the rocks of the area is vertical to steep westerly.

3. GEOPHYSICAL METHODS

Electromagnetic and magnetic surveys were made. A brief outline of the principles of these methods is given below.

Electromagnetic method (Turam)

The electromagnetic method is used to locate zones of conducting rocks. The method involves the application of an alternating electromagnetic field to the ground, and where the ground is conducting there are set up eddy currents which produce secondary electromagnetic fields. The resultant electromagnetic field at the ground surface is thus a combination of these secondary fields and the applied primary field. Over non-conductors the applied electromagnetic field is undisturbed and its distribution depends simply on the geometry of the exciting system. Conducting zones are located by detecting the secondary fields.

In the Turam method a primary field is set up by a long, straight, current-carrying cable; the primary circuit is completed either through the ground or by a large insulated cable loop. In this way a primary field is obtained approximating to that produced by a current flowing in an infinite straight cable. Traverses are laid at right angles to the cable and measurements are made of the phase-difference between, and intensity ratios of, the vertical components of the electromagnetic field at pairs of points on these traverses. Over non-conducting ground the phase differences are zero and the intensity ratios are the same as those calculated for the undisturbed primary field. Conductors are usually indicated by negative phase-differences and by intensity ratios greater than unity. As sulphide orebodies are generally good conductors, the Turam electromagnetic method was used in the search for sulphides at Jervois Range.

Magnetic method

In the magnetic method, measurements are made to detect local variations from place to place in components of the Earth's magnetic field. These variations are usually related to changes in the magnetite content of the rocks of the area. If, as is the case at Jervois Range, magnetite is associated with occurrences of base metals, the magnetic method can be used as an indirect method of prospecting for such base metals.

4. OPERATIONS AND GEOPHYSICAL RESULTS

Bellbird prospect

Eleven traverses, 1200 ft long and spaced at 200-ft intervals, were surveyed across this prospect and pegged at 50-ft intervals. The whole of the area was surveyed using a vertical force variometer (Hilger and Watts, No. 69106); the results are shown as contours on Plate 2.

In addition, Traverses 12N and 14N were surveyed with a horizontal force variometer (Hilger and Watts No. 71599); profiles of these results are shown on Plate 4.

The main feature outlined by the vertical magnetic force results is a zone of magnetic anomalies with axis extending from 0N/4E to 20N/0.5W. This anomaly is asymmetrical with its steepest gradient on the eastern side.

The electromagnetic method outlined no anomalies in this area.

Green Parrot and Reward prospects

The area surveyed is approximately 6000 ft by 1400 ft and the Turam survey was made with two layouts. The Green Parrot area was surveyed as one layout with a traverse spacing of 200 ft. As no electromagnetic anomalies were outlined over this area a 400-ft traverse-spacing was used for the Reward prospect. Again the electromagnetic results showed no anomalous values.

The vertical magnetic force contours show two anomalous zones extending for almost the whole length of the area. One of these zones, the more continuous, extends from near 2N/1E to 60N/3W with a possible displacement of the zone axis at Traverse 36N. The anomaly is still well-developed at the northern limit of the area.

The other anomalous zone is less regular, and the anomaly is entirely absent from about 40N to 49N. The axis of the anomalous zone extends from 0N/4E to 60N/5E.

Traverses 28N and 14N were also surveyed with the horizontal force variometer. These results, which are shown as profiles on Plate 5, outlined only very weak anomalies.

5. DISCUSSION OF RESULTS

The magnetic anomalies at Bellbird prospect appear to be related to the faulting of the area rather than the shearing, because the axis of the anomaly lies closer, and is more-nearly parallel, to the fault than to the shear zone. The form of the anomaly suggests that the mineralisation is related to a body dipping steeply westwards with the top of the body at about 200-ft depth. The magnetic anomaly could thus indicate mineralisation along the fault planes.

At the Reward Prospect, the close association of the magnetic anomaly with skarn outcrop could indicate that the skarn is the magnetic body causing the anomaly. From the shape of the anomaly it appears that the dip is vertical to steep westerly; this is consistent with the geological evidence.

The main anomaly in the Green Parrot area is more-or-less continuous with that of the Reward prospect and thus could also indicate a skarn-type body. This body is probably not directly related to the skarn that outcrops at the Green Parrot prospect, as the outcrop of skarn lies about 200 ft west of the axis of the magnetic anomaly. The body probably has an almost vertical dip and has its upper limit directly below the axis of the magnetic anomaly at about 200-ft depth.

The irregular zone of anomalies along the eastern edge of the Green Parrot prospect probably indicates magnetic materials at quite shallow depths, as the gradients of the magnetic anomalies are very steep. These bodies may be of the skarn type but they do not appear to be related to the known skarn outcrops.

The possible displacement of the axis of the westerly magnetic anomaly near Traverse 36N could indicate faulting along Unca Creek.

6. CONCLUSIONS AND RECOMMENDATIONS

From the magnetic results there is evidence at the Bellbird, Green Parrot, and Reward prospects of shallow magnetite-bearing bodies. However, the absence of any electromagnetic anomalies suggests that appreciable concentrations of sulphides are unlikely to be associated with these magnetic bodies. If any sulphides are present they must be so disseminated through the rock as not to greatly alter the conductivity of the rock.

Drill holes to a vertical depth of 250 ft, to determine the amount of sulphide associated with the magnetic bodies, are recommended at the following points:

Bellbird prospect
- 14N/1.25E
- 4N/2.5 E

Green Parrot and Reward prospects
- 18N/1.5W
- 26N/2W
- 32N/1.5W
- 44N/1W

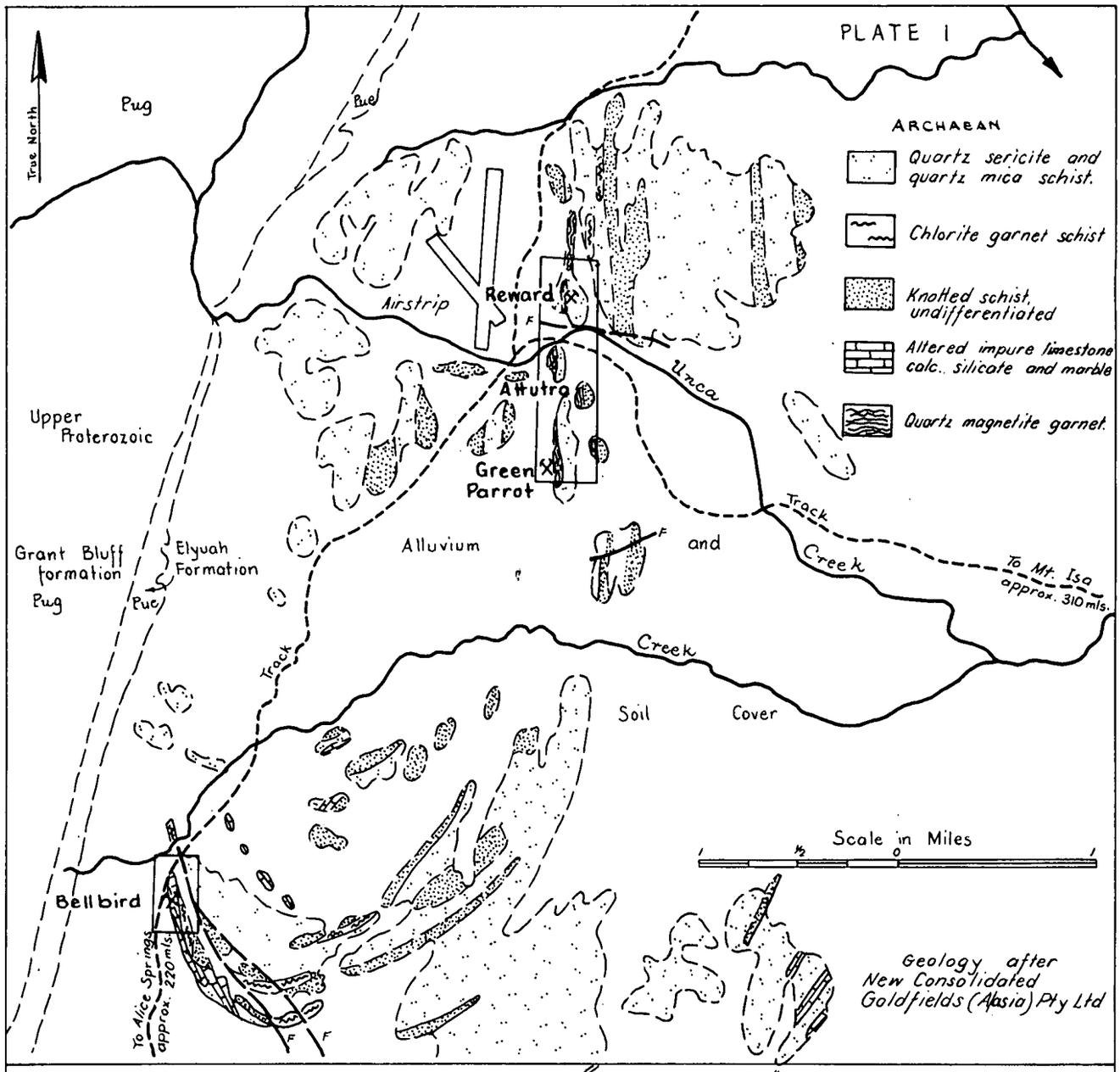
If drilling shows that the magnetic bodies are associated with mineralisation of commercial grade, consideration should be given to an aeromagnetic survey covering the Jervois Range generally. Such a survey would certainly detect any possible anomalies similar to those investigated, and such anomalies would be worthy of investigation for the presence of base metals.

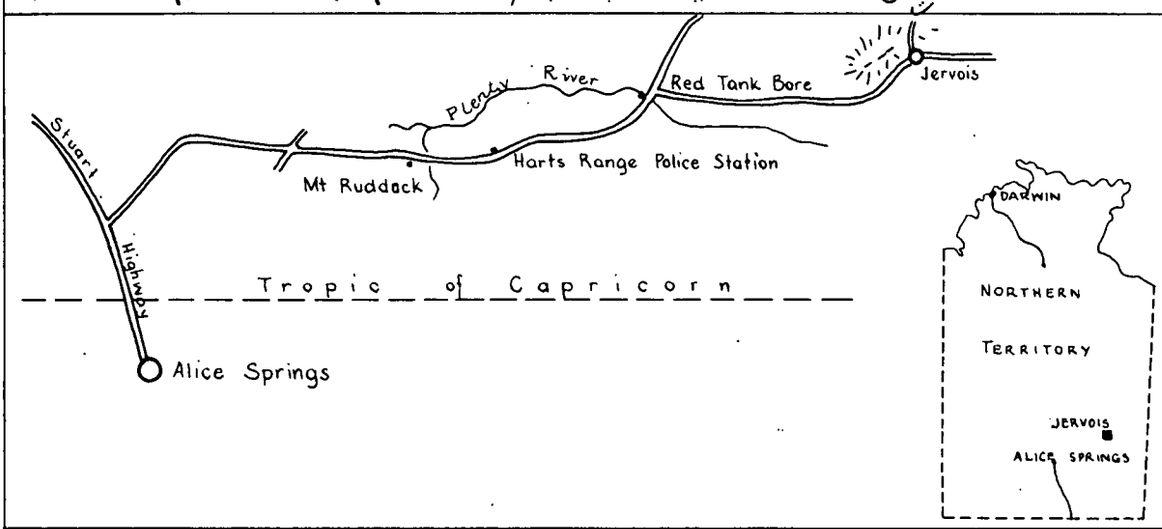
7. ACKNOWLEDGEMENT

The assistance given by the staff of New Consolidated Goldfields Pty Ltd is gratefully acknowledged.

8. REFERENCE

HUGHES, K.K. and WARD, D.F. 1962 Progress report on investigations, Jervois Range copper-lead prospects, NT 1961. New Consolidated Goldfields (A/asia) Pty Ltd Report No. 6/1962 (unpubl.)





GEOPHYSICAL SURVEY AT JERVOIS RANGE NT, 1962

SKETCH MAP OF GEOLOGY AND GEOPHYSICAL GRIDS, & LOCALITY MAP

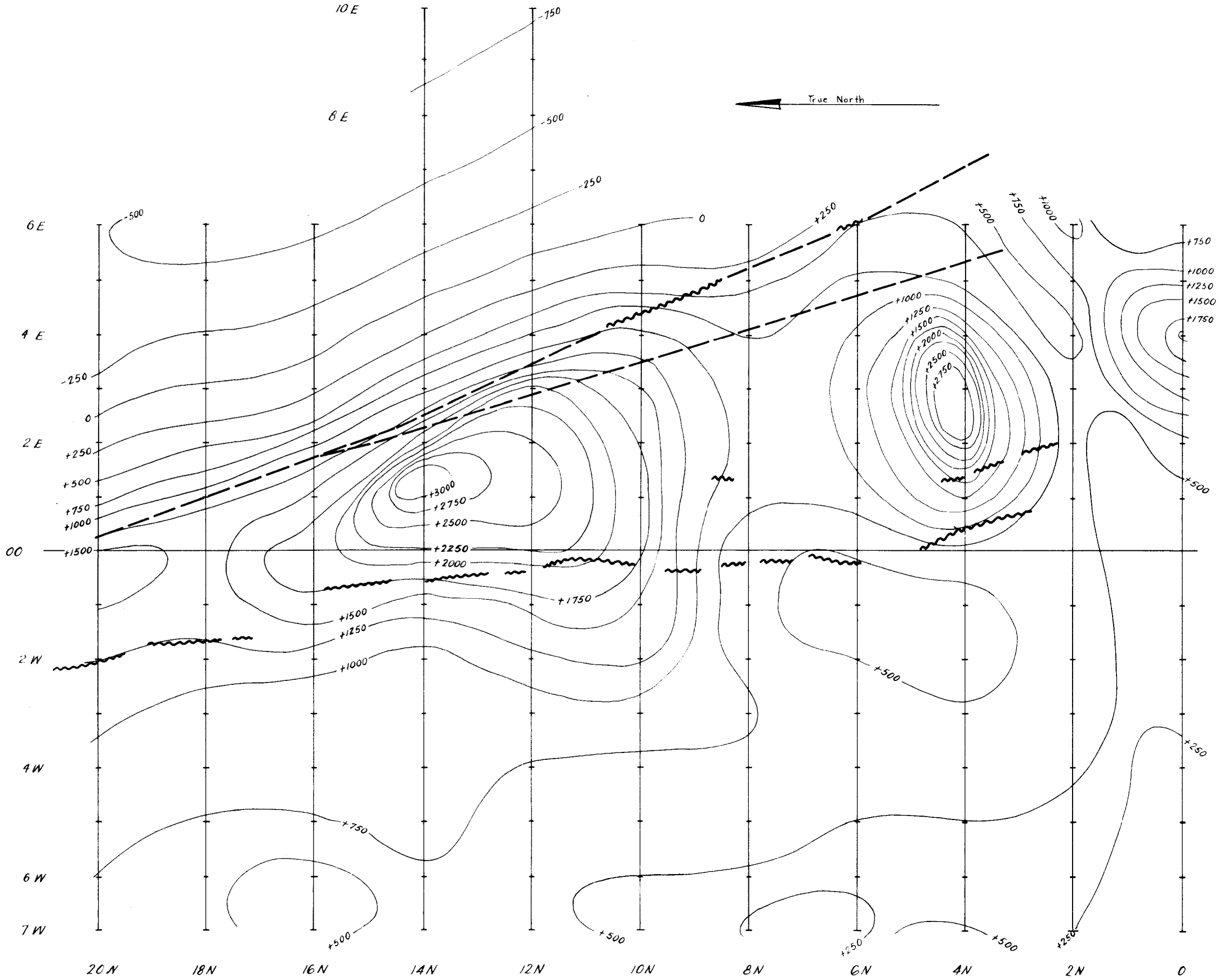
Bureau of Mineral Resources, Geology and Geophysics.
Darwin N T July 1962

F53/B7-1

TO ACCOMPANY RECORD No 1963/10

JERVOIS RANGE NT 1962

PLATE 2



Reference

——— Fault, approximate position.

~~~~~ Shear and mineralised zone.

Geology after New Consolidated Goldfields (Absia) Pty Ltd

BELLBIRD PROSPECT
VERTICAL MAGNETIC FORCE CONTOURS

Contour Interval 250 gammas

Scale

200 0 200 400 600 FT

Bureau of Mineral Resources, Geology and Geophysics,
Darwin, N T July 1962

F53 / B7-2

MACDONNELL RANGES NT 1962
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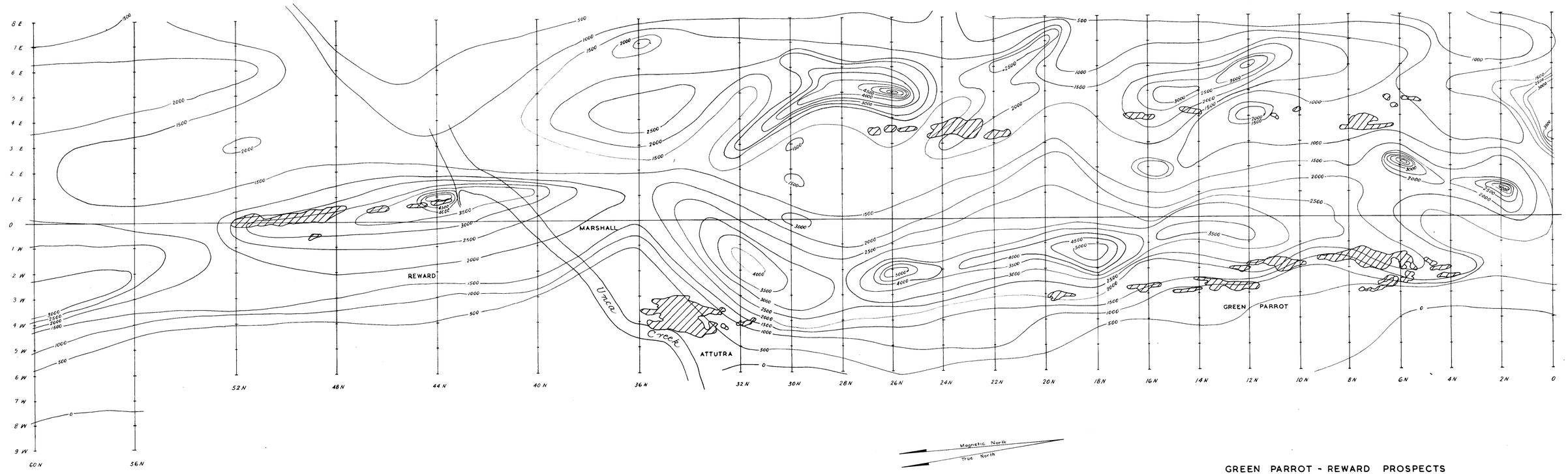

Magnetic North

True North

Skarn rock

Geology after New Consolidated Goldfields (Aust) Pty Ltd

GREEN PARROT - REWARD PROSPECTS

VERTICAL MAGNETIC FORCE CONTOURS

Contour Interval 500 gammas

Scale

200 0 200 400 600 FT

F53/B7-3

TO ACCOMPANY RECORD No 1963/10

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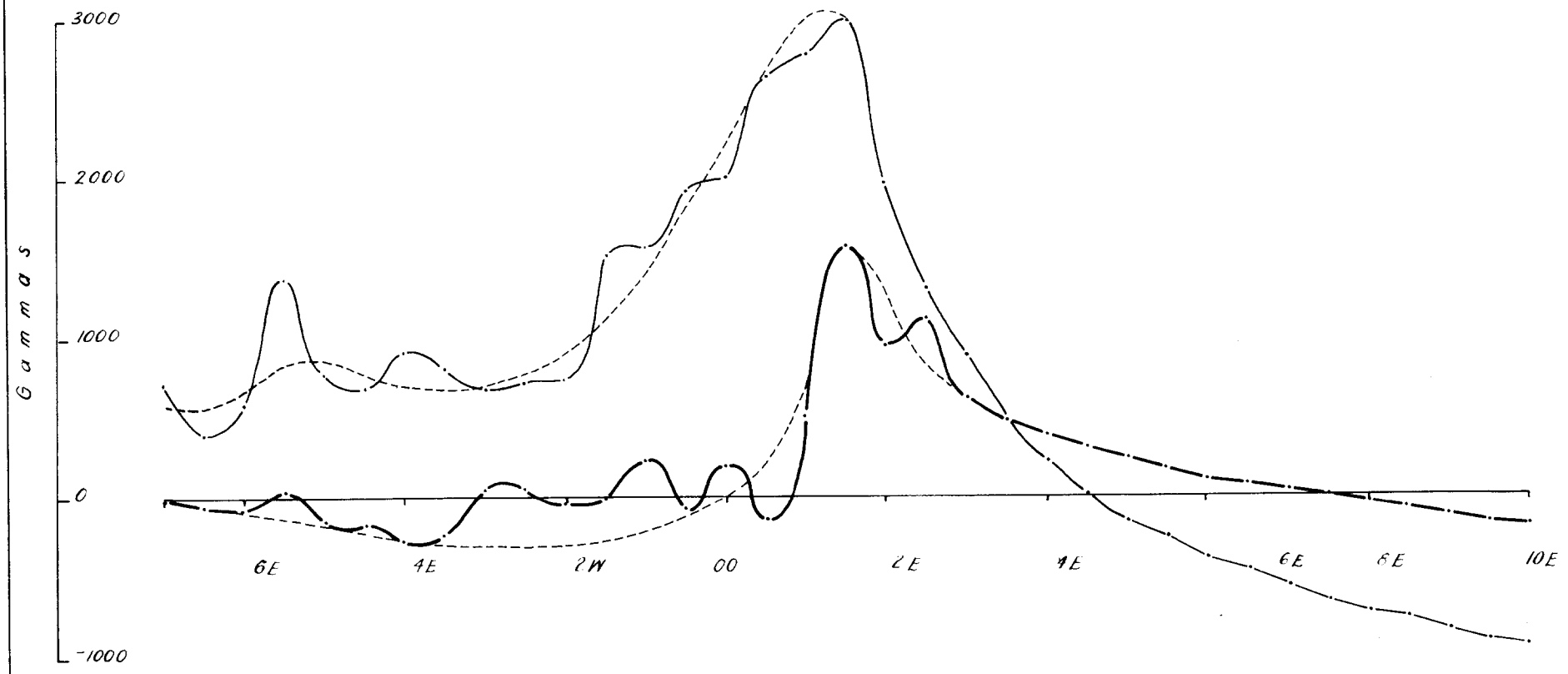
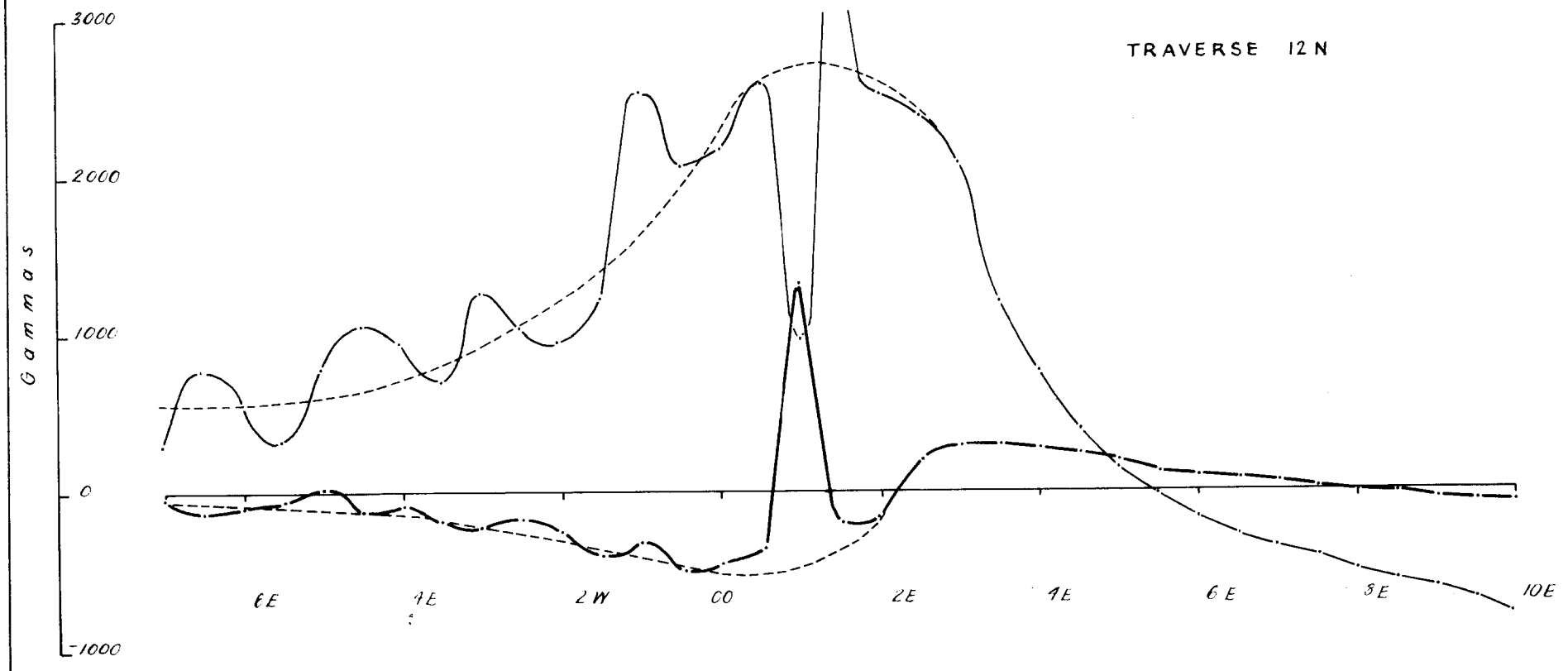
JEKWUS RANGE N T 1962

TRAVERSE 14N



TRAVERSE 12N



Reference

Vertical magnetic force profile

Horizontal " " "

Smoothed profile

BELLBIRD PROSPECT
MAGNETIC FORCE PROFILES

Scale

200 0 200 400 FT

Bureau of Mineral Resources, Geology and Geophysics, Darwin NT July 1962

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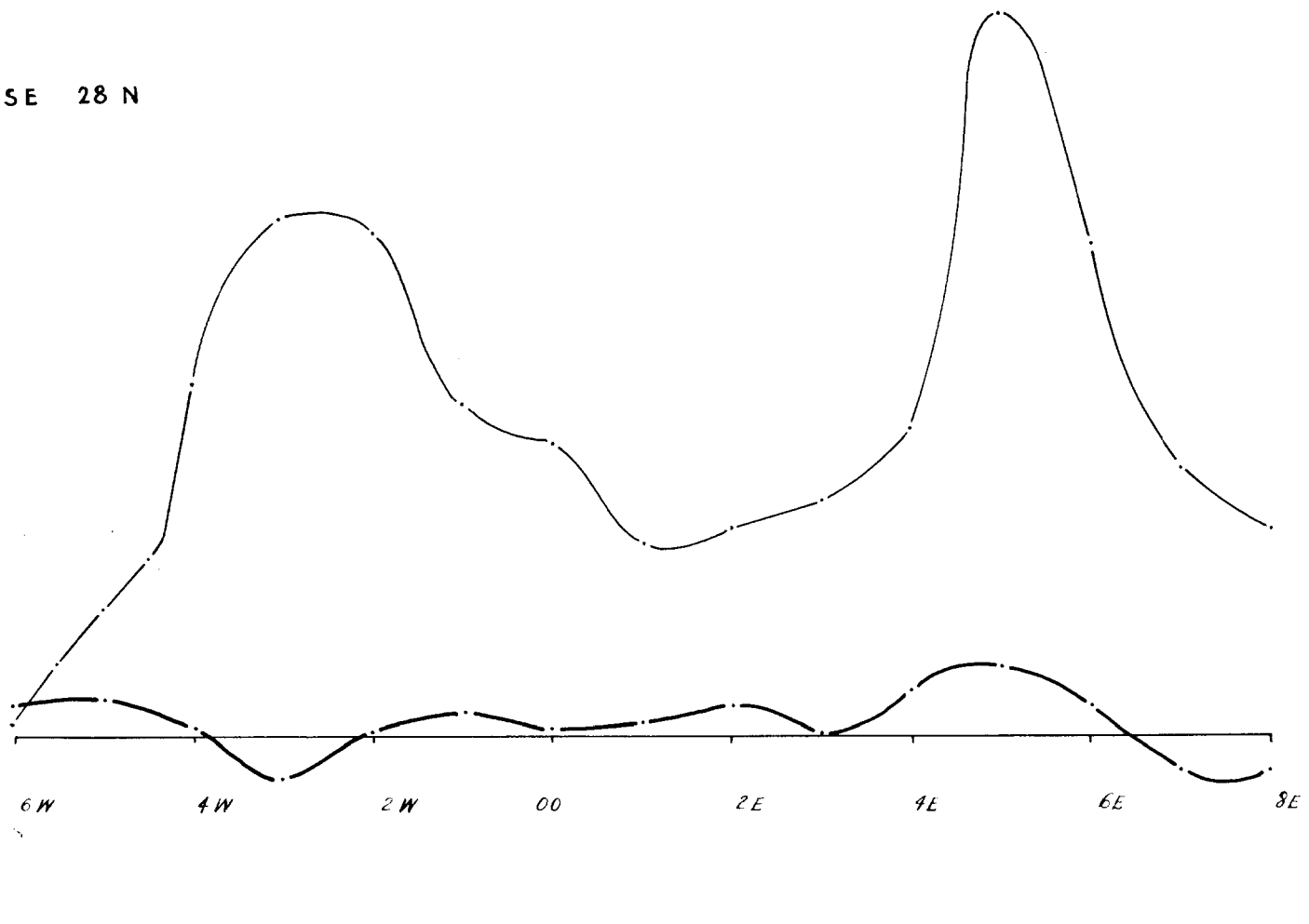
TO ACCOMPANY RECORD No 1963/10

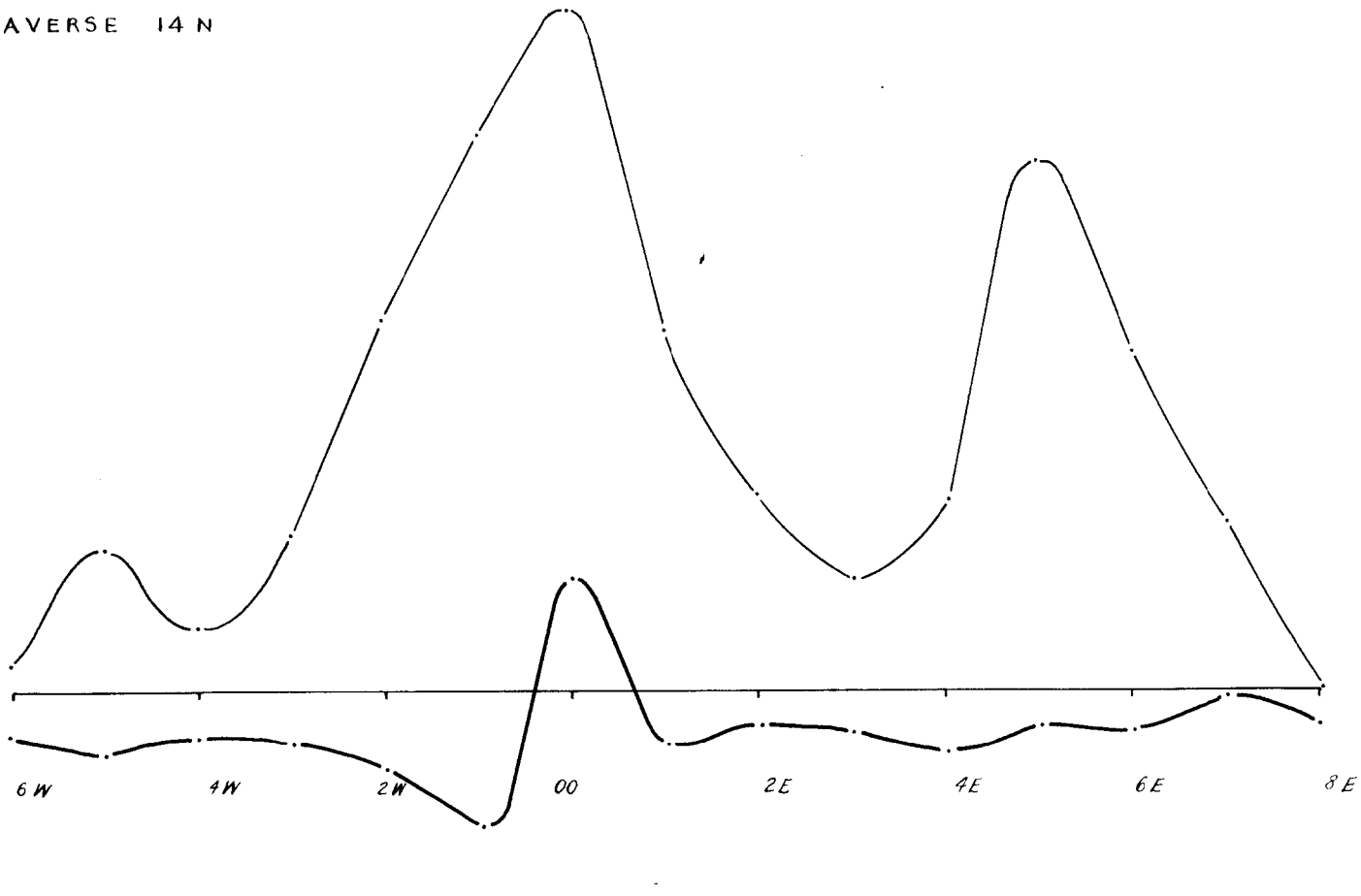
JERVOIS RANGE NT 1962

PLATE 5

TRAVERSE 28 N



TRAVERSE 14 N



Reference

Vertical magnetic force profile

Horizontal " " "

GREEN PARROT - REWARD PROSPECTS

MAGNETIC FORCE PROFILES

Scale

200 0 200 400 FT

Bureau of Mineral Resources, Geology and Geophysics, Darwin N.T. July 1962

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CARVOIS RANGE NT 1962