Copy 3

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORD No. 1967/97

500326

GOULD AREA (MOUNT MINZA AND WATERHOUSE No.2) GEOPHYSICAL SURVEY, NORTHERN TERRITORY 1966

by

B.B. FARROW

CONTENTS

		Page
	SUMMARY	
1.	INTRODUCTION	1
2.	PREVIOUS WORK	1
3.	GEOLOGY	2
4.	EQUIPMENT AND METHODS	3
5.	FIELD WORK AND RESULTS	4
6.	INTERPRETATION	8
7.	CONCLUSIONS	9
8.	REFERENCES	9

ILLUSTRATIONS

Plate 1.	Locality map	(Drawing No. D52/B7-215)
Plate 2.	Geology, sheet 1	(D52/B7-338)
Plate 3.	Geology, sheet 2	(D52/B7-339)
Plate 4.	Electromagnetic gun real component contours, sheet 1	(D52/B7-216)
Plate 5.	Electromagnetic gun real component contours sheet 2	(D52/B7-217)
Plate 6.	Surface radiometric contours, sheet 1	(D52/B7-218)
Plate 7.	Surface radiometric contours, sheet 2	(D52/B7-219)
Plate 8.	Contours of vertical component of the Earth's magnetic field, sheet 1	(D52/B7-220)
Plate 9.	Contours of vertical component of the Earth's magnetic field, sheet 2	(D52/B7-221)
Plate 10.	Turam reduced ratio contours	(D52/B7-222)
Plate 11.	Induced polarisation profiles	(D52/B7-224)
Plate 12.	Summary of geophysical indications	(D52/B7-223)
Plate 13.	Section along traverse 237S	(D52/B7-239)
Plate 14.	Electric, geological,and radiometric logs of DDH 66/4	(D52/B7-240)

SUMMARY

A detailed geophysical survey was made in an area south of Batchelor, Northern Territory, during 1966 by the Darwin Uranium Group of the Bureau of Mineral Resources. Electromagnetic and surface radiometric and magnetic readings were taken on a 50-ft x 400-ft grid, and induced polarisation test measurements were made.

It is unlikely that the geophysical results indicate the existence of economic deposits of uranium or base metals in the area, with the possible exception of the Waterhouse No. 2 Prospect. No specific drill holes are recommended.

The induced polarisation tests showed that the method was of limited use in this area, mainly because of extremely low ground resistivity.

1. INTRODUCTION

A detailed geophysical survey was conducted in the Gould area by a geophysical party from the Darwin Uranium Group of the Bureau of Mineral Resources (BMR) between June and September as part of their 1966 field programme. The survey area (Plate 1) lies immediately north and west of the area of a detailed geophysical survey made by Duckworth in 1965 (Shatwell and Duckworth, 1966) The aim of the survey was to complete the geophysical work in the Gould area, and to supplement geological, geochemical, and auger hole radiometric surveys conducted by a geological party of the Darwin Uranium Group (Semple, 1967).

The traverses were surveyed and pegged by a surveyor under contract to the Department of the Interior; they ran east-west with pegs at 50-ft intervals and were 400 ft apart. Grid coordinates were based on the Territory Enterprises Pty Ltd (T.E.P.) mine grid.

Throughout the text, and in the plates, all coordinates are expressed in units of 100 ft for brevity.

The geophysical party, comprising B.B. Farrow (geophysicist), N.A. Ashmore and C.J. Braybrook (geophysical assistants), and two field-hands, surveyed the area with electromagnetic, radiometric, and magnetic methods, and made tests to assess the applicability of the induced polarisation and self-potential methods in the Gould area.

2. PREVIOUS WORK

The following notes are based in part on the summary of previous work in the Gould area in the report by Shatwell and Duckworth (1966).

The geology of the Darwin-Adelaide River area, which includes the Gould area, has been described by Malone (1958).

Airborne radiometric surveys made by the BMR in 1952 and 1957 located a number of radiometric anomalies (Wood and McCarthy 1952; Livingstone, 1959). As a result of the 1952 airborne survey, four areas of anomalous radioactivity within the Gould area were selected for follow-up work by ground parties. One of these, known as Waterhouse No. 2 Prospect, lies within the present survey area.

A preliminary geological, radiometric, geochemical, and magnetic survey of the Waterhouse No. 2 Prospect area revealed copper and radiometric anomalies (Wyatt and Alle, 1953). The area was then held under reserve by Northern Uranium Development N.L., who sank a shaft to 41 ft, drilled a diamond-drill hole, and bulldozed ten costeans. Uranium mineralisation, apparently approaching ore-grade, was intersected over a few feet in the shaft. An electromagnetic survey and some magnetic and gravity work were done in 1957 (Daly and Tate, 1960). Five diamond-drill holes were recommended to test the electromagnetic indications and two were subsequently drilled: DDH 2 and DDH 4 (Plate 3).

The results of the diamond drilling are described by Ruxton (1961), who reported anomalous radioactivity in black slates in one of the holes. He also recorded phosphate (apatite crystals in amphibolite) in the second hole. No further work has been done to test the uranium mineralisation in the shaft.

Reconnaissance geological, geochemical, and geophysical surveys were made in the Gould area in 1965 by the Darwin Uranium Group, on traverses spaced 2400 ft apart (Shatwell and Duckworth, 1966). The Waterhouse No. 2 Prospect was relocated, and an area of interest was outlined which extended north of Mount Minza, where intense electromagnetic anomalies are associated with radiometric and weak geochemical anomalies. Detailed surveys were made of the Mount Minza area and two diamond-drill holes were recommended on the geophysical and geochemical results. One of these, DDH 66/4, was drilled in 1966 (Plate 3), but revealed no economic mineralisation; subsequent logging of the hole (Plate 14) revealed a bed of highly conducting black shale, between 210 and 320 ft, sufficient to account for the intense electromagnetic anomalies.

3. GEOLOGY

The geology of the area is described in detail by Shatwell (Shatwell and Duckworth, 1966) and Semple (1967) and is shown in Plates 2 and 3.

Coomalie Dolomite

The Coomalie Dolomite does not crop out in this area, but in the south-western part of the area auger samples were obtained of a light red-brown fine-grained quartz sand, with minor ironstone grains, in a ferruginous matrix; at Rum Jungle the sand is known to overlie the Coomalie Dolomite.

Golden Dyke Formation

This formation underlies most of the Gould area but exposures are restricted to outcrops around Mount Minza and in costeans at the Waterhouse No. 2 Prospect. Tremolitic siltstone, sericitic schist, graphitic and chloritic black shale, and amphibolite are the main rock types. Facies changes and lenticilar beds are common. Alternating beds of graphitic and chloritic black slates are characteristic of the middle part of the formation; towards the top, tremolitic siltstone and sericitic schist predominate.

In areas of outcrop, hematitic quartz breccia, banded ironstone, and silicified slate predominate. The hematitic quartz breccia could be a dolomitic breccia that has undergone post-depositional silicification and hematisation.

Noltenius Formation

This formation is well exposed in the core of a syncline in fairly rugged country south-west of the Mount Minza area. The main rock type is a grey medium-grained sub-greywacke containing over 50% quartz grains with interbedded lenses of siltstone and silicified shale.

Structure

The rocks of the Mount Minza sequence are folded into a south-plunging anticline, the outlines of which are well marked by outcrops of hematitic quartz breccia and banded ironstones. This sequence is separated from the easterly dipping Waterhouse sequence by a conjugate syncline, which is well developed in the Noltenius Formation.

Three parallel faults trending north-east dominate the structure of the Mount Minza area. The largest of the faults passes just north of Waterhouse No. 2 Prospect. The faults are all sub-parallel to the Giants Reef Fault (Plate 1), but they display only small displacements, which are in the same direction as the Giants Reef Fault movement, that is, north block east.

Experience has shown that the Golden Dyke Formation is the most likely host for mineralisation and that "the known important mineral occurrences in the Rum Jungle area are localized by the Giants Reef Fault system and at loci determined by coincidence of these fractures and the contact between carbonaceous rocks of the Golden Dyke Formation and carbonate rocks of the underlying Coomalie Dolomite" (Warin, 1959).

4. EQUIPMENT AND METHODS

The initial electromagnetic survey was done using the ABEM Electromagnetic Gun (E.M. Gun) type 1744, with horizontal co-planar receiving and transmitting coils at a separation of 200 ft. A frequency of 1760 c/s was used for the exciting field throughout the survey. This system is exactly equivalent to the Slingram system used by Duckworth in 1965 in the Mount Minza area.

A follow-up survey was done over part of the area using the ABEM Turam type 2S system, with a large rectangular transmitting loop of breadth 1800 ft and variable length. Excitation frequencies of 220 and 660 c/s were used throughout with horizontal coplanar receiving coils 50 ft apart along traverses perpendicular to the long axis of the loop. Readings were taken only outside the loop.

Surface radiometric measurements were taken with Harwell type 1368A ratemeters. The vertical component of the Earth's magnetic field was measured with a Sharpe fluxgate magnetometer type MF-1. Self-potentials were measured with a high-impedance Sharpe ground voltmeter type VT-6.

The test induced polarisation spreads were read with the McPhar High-Power IP equipment, with the dipole length of 100 ft, using buried sheets of aluminium foil as current electrodes. Readings were taken at frequencies of 5.0 and 0.3 c/s.

5. FIELDWORK AND RESULTS

E.M. Gun

Readings were taken at intervals of 50 ft along traverses which were generally 400 ft apart, but which were 200 ft apart over the Waterhouse No. 2 Prospect. Traverse lines and the contoured real component values are shown in Plates 4 and 5. Since the imaginary component values here reflect the real component values, they are not presented as contour maps.

A large part of the area is subject to strong electromagnetic disturbance: the approximate position of the boundary between disturbed and quiet zones is plotted in Plate 12. The distrubed area is seen to lie wholly within the Golden Dyke Formation, and is associated largely with the occurrence of amphibolite, which has been shown by R. Bryan (Ruxton, 1961: Appendix B) to contain magnetite and metallic sulphides in considerable quantities. The disturbance takes the form of irregular anomalies in both the real and imaginary components, with the latter very strong and often in excess of the maximum reading of the instrument (- 40%).

Large real component anomalies associated with relatively smaller imaginary component anomalies are considered to be significant and can be separated from background noise. This type of anomaly occurs in two sections of the area: Waterhouse No. 2 Prospect (Plate 5) and between 460E and 475E on traverses 165S to 189S (Anomaly Zone A, Plate 4).

Waterhouse No. 2 Prospect. The anomaly extends for 2000 ft north-south at about 394E, being strongest between 265S and 247S. The anomaly extends southwards from traverse 265S and is still pronounced on traverse 285S, which is the most southerly traverse on which readings were taken. Parallel with this anomaly and about 400 ft to the west is a less prominent anomaly which persists for 3500 ft. Both anomalies are consistent with those due to easterly dipping tabular bodies, and are of similar type to the Slingram anomalies in the Mount Minza area (Shatwell and Duckworth, 1966).

Comparison of these Slingram anomalies and the anomalies over the Waterhouse No. 2 Prospect with the geological map (Plate 3) shows that the two anomalous areas are associated with the same stratigraphic sequence, of which the hematitic quartz breccia is a persistent and easily distinguished bed. The anomalies occur over beds of black graphitic shales. The sequence occupies portions on opposite limbs of a syncline, in the core of which occurs the electromagnetically non-reactive Noltenius Formation. In the north the syncline is truncated by a fault trending north-east and the anomalies end at this fault.

Representative E.M. Gun profiles across the Waterhouse No. 2 Prospect and Mount Minza areas are shown in Plate 11.

Anomaly Zone A. The main anomaly is about 3000 ft in length and is sigmoid in plan; west of it are smaller sub-parallel anomalies. The anomalies are interpreted as being caused by tabular bodies with appreciable widths and varying easterly dips, so that the widths of the anomalies vary from traverse to traverse. Since they occur entirely over black shales, between two north-east trending faults, the anomalies are probably due to individual conducting horizons within the shales.

The anomaly on the eastern edge of the area between traverses 173S and 201S (Anomaly B, Plate 4) requires special mention. It occurs over shales down-dip of the hematitic quartz breccia bed, which are faulted eastwards out of the area at 181S. The anomaly is not of large magnitude but is quite definite and persistent.

Radiometric

Measurements were taken of surface radioactivity at 50-ft intervals along traverses generally 400 ft apart over the entire area. The ratemeters were calibrated regularly against a cobalt 60 source. Instrument drift was experienced; it was mainly due to temperature variations, and was corrected for where necessary. Field profiles had to be smoothed slightly before contouring was undertaken. The resulting contour maps, with traverses surveyed, are shown in Plates 6 and 7.

Over most of the area, values fall between 0.010 and 0.020 mr/hr; values above 0.020 mr/hr are regarded as anomalous. Significant anomalies occur as follows:

1. At Waterhouse No. 2 Prospect. Here the anomaly is at about 253S/392E and has peak values of up to 0.040 mr/hr. A smaller anomaly (0.025 mr/hr) occurs to the south, at 285S/394E. Both anomalies are associated with E.M. Gun anomalies and black shales.

2. A large area of high values (up to 0.030 mr/hr) occurs east of the Waterhouse No. 2 Prospect, approximately between 418E and 432E on traverses 253S to 277S. This is associated with siltstones within the Noltenius Formation, where there are no electromagnetic anomalies.

Magnetic

Measurements of the vertical component of the Earth's magnetic field were taken at 50-ft intervals along traverses 400 ft apart. Contour maps with traverses surveyed are shown in Plates 8 and 9. The traverses also covered the part of the Mount Minza area surveyed by Duckworth in 1965.

Readings were greatly influenced by surface effects, which resulted in irregular profiles; considerable smoothing had to be undertaken to produce the contour maps. It was found in places that the piles of cuttings beside auger holes caused large variations in readings when the magnetometer was close to them. Broad zones of very irregular field readings are marked on the contour maps.

Generally, the area is characterised by small, intense positive magnetic anomalies, between 1000 and 8000 gammas in magnitude. Comparisons with the geological maps show that they occur over amphibolites, except in a few cases where certain smaller anomalies occur over laterite.

A slight general increase in the magnetic field, of the order of 500 gammas, is evident in the northern part of the area, where the geological map shows an area of siltstones and schists at the surface.

Turam

One transmitting loop was laid out and readings were taken every 50 ft along traverses 400 ft apart on either side of it. The traverses surveyed, the position of the loop, and reduced ratio contours are shown in Plate 10. Traverses were arranged to cover Anomaly Zone A and part of Anomaly B. However, the field over Anomaly Zone A was very distorted, which gave rise to Turam reduced ratio anomalies of large magnitude and confusing shape, with smaller but no less complicated phase-difference anomalies. It was found that strengths dropped dramatically as the conductors were crossed, and it was impossible to take readings beyond the anomaly. Consequently, little can be inferred from the results other than that there are several conductors involved, all with high conductivity and very close to the surface.

Anomaly B recurs in the Turam results; it is clearly defined, and depth to the current concentration is estimated to be about 120 ft. The conductor is interpreted as a steeply dipping tabular body striking north.

Comparison with the geological map would point to a conducting horizon within shales, down dip of the hematitic quartz breccia and cut off at the northern end by a north-east trending fault.

During the survey, test Turam traverses were read in the area of the 1965 Mount Minza survey (K. Duckworth, pers. comm.) with the object of testing the response of the strong conductors encountered there to various positions of the transmitting loop. The tests showed that this type of conductor gave anomalies varying in shape, magnitude, and position, depending on the distance from the transmitting loop. Consequently, interpretation of Turam results over such large, highly conducting, and near-surface bodies becomes complicated and uncertain, which indicates that such bodies are better investigated by the less sensitive E.M. Gun. Full results of these tests are to be published by K. Duckworth in a separate report.

Induced polarisation

Five induced polarisation (IP) spreads were read, two over Waterhouse No. 2 Prospect, two over Anomaly Zone A, and one over the main electromagnetic anomaly in the area of the 1965 Mount Minza survey. The locations of these spreads are shown in Plates 4, 5, and 12; the results, in the form of pseudo-sections, together with the relevant electromagnetic profiles are shown in Plate 11.

Waterhouse No. 2 Prospect. Two spreads, on traverses 249S and 253S, were read over the E.M. Gun anomalies. Both showed resistivity 'lows' coinciding with the electromagnetic anomalies and associated with graphitic shales. These were particularly strong on traverse 249S, where the lowest resistivity measured was 0.6 ohm-metre. Although the frequency effect background was high (3% to 6%) no significant increase was recorded in association with low resistivities. Very high frequency effects (up to 25%) were recorded at depth (i.e. larger dipole separation) on the western end of the spreads owing to the presence of amphibolite(qualitative laboratory tests on samples of amphibolite from Mount Fitch showed high IP effects.) Where the IP spreads cross into the siltsone-schist sequence; low frequency effectsoccur near the surface and increase with depth; the associated resistivities however are fairly uniform. The effects could be caused by the shales that occur lower in the sequence since dips are somewhat gentler in this region.

Mount Minza. The spread at Mount Minza (on traverse 217S) showed results similar to those at Waterhouse No. 2 Prospect, with frequency effects increasing with depth and a resistivity 'low' in the region of the electromagnetic anomalies. The results are associated almost entirely with shales; amphibolites and their associated high frequency effects are absent.

Anomaly Zone A. The two spreads, on traverses 173S and 181S, showed low resistivity anomalies as anticipated from the electromagnetic results. Frequency effect variations were too irregular to be interpreted but showed a general increase with depth, and, on traverse 181S, with the occurrence of amphibolite.

On all traverses the metal factor was influenced so much by resistivity variations that its diagnostic value is doubtful.

Apart from providing numerical values for resistivities in the area, the IP measurements provided little information that was not available from the electromagnetic work. In areas of interest, i.e. where electromagnetic anomalies occur, resistivities were often so low that, with the equipment used, readings were not obtainable for dipole separations greater than 300 ft. Currents from the transmitter were of the order of 3 to 4 amp, which is the instrument's maximum, but as the dipole separation was increased the voltage of the received signals rapidly fell below the lower limit of the voltage measureable by the receiver (0.5 millivolts). However, it is evident from the form of the anomalies and the resistivity values measured that the widths of most of the conductors were of the same order of magnitude as the dipole length used to take the IP readings, viz. 100 ft. This conclusion agrees with the interpretation of the E.M. Gun results.

Self-potential

One self-potential traverse was read over the Waterhouse No. 2 Prospect, but it was found that the dry conditions caused very bad ground contacts, and reliable readings were impossible to obtain without laborious preparation of electrode positions, even with the very high input impeolance available with the meter used. It was therefore decided to discontinue use of the method.

//

6. INTERPRETATION

A summary of the geophysical results is given in Plate 12.

Throughout the area, electrical, electromagnetic, and magnetic measurements are disturbed by the presence of amphibolite, but the response is not uniform, and variations in composition and physical properties of the amphibolite are indicated.

The anomalies over the Waterhouse No. 2 Prospect are very similar to those in the Mount Minza area (except that the radiometric anomaly is more intense) and occur in the same sequence on opposite limbs of a syncline; as Anomaly B also occurs in this sequence it may be linked with the same group of anomalies. The sequence has been tested twice by diamond drilling and subsequent logging of the holes, once at Waterhouse No. 2 Prospect (Ruxton 1961) and once at Mount Minza (J.E.F. Gardener, pers. comm.) This testing revealed that electromagnetic anomalies are due to highly conducting black shales, and that radiometric anomalies are due to non-economic amounts of uranium minerals; IP effects are small and are accounted for by graphite and traces of pyrite.

The radiometric anomaly over the Noltenius Formation east of Waterhouse No. 2 Prospect is quite extensive and has high values (up to 0.030 mr/hr). Shatwell has given evidence suggesting that the Noltenius Formation is derived from the Crater Formation (Shatwell and Duckworth, 1966); the latter contains horizons where the high radioactivity has been shown to be due essentially to the presence of thorium (Warin, 1959). This suggests that the anomaly is due to concentrations of derived thorium within the Noltenius Formation, but analysis of samples from auger holes would be necessary to test this opinion.

The interpretation of anomalies in Anomaly Zone A is uncertain, but general steep easterly dips are indicated, the conductors appearing as horizons within black shales. The kink in the anomalies between traverses 173S and 177S may be due to a transverse fault trending north-east parallel to other faults in the area, or to a synclinal fold that plunges eastwards. The minor anomalies end abruptly at the western edge of the black shales and could indicate a faulted contact between the shales and the amphibolite to the west. That these shales should react electromagnetically, whereas the shales to the east and west of them do not, suggests that they are a different sequence, below the amphibolite bed, and that they are separate from the shales that are so reactive at Mount Minza and Waterhouse No. 2 Prospect. The lack of any radiometric, geochemical, or IP anomalies wouldappear to show that economic mineralisation is unlikely to be associated with the electromagnetic indications.

Hypothetical sections of the structure in the vicinity of Anomaly Zone A are given in Plate 11.

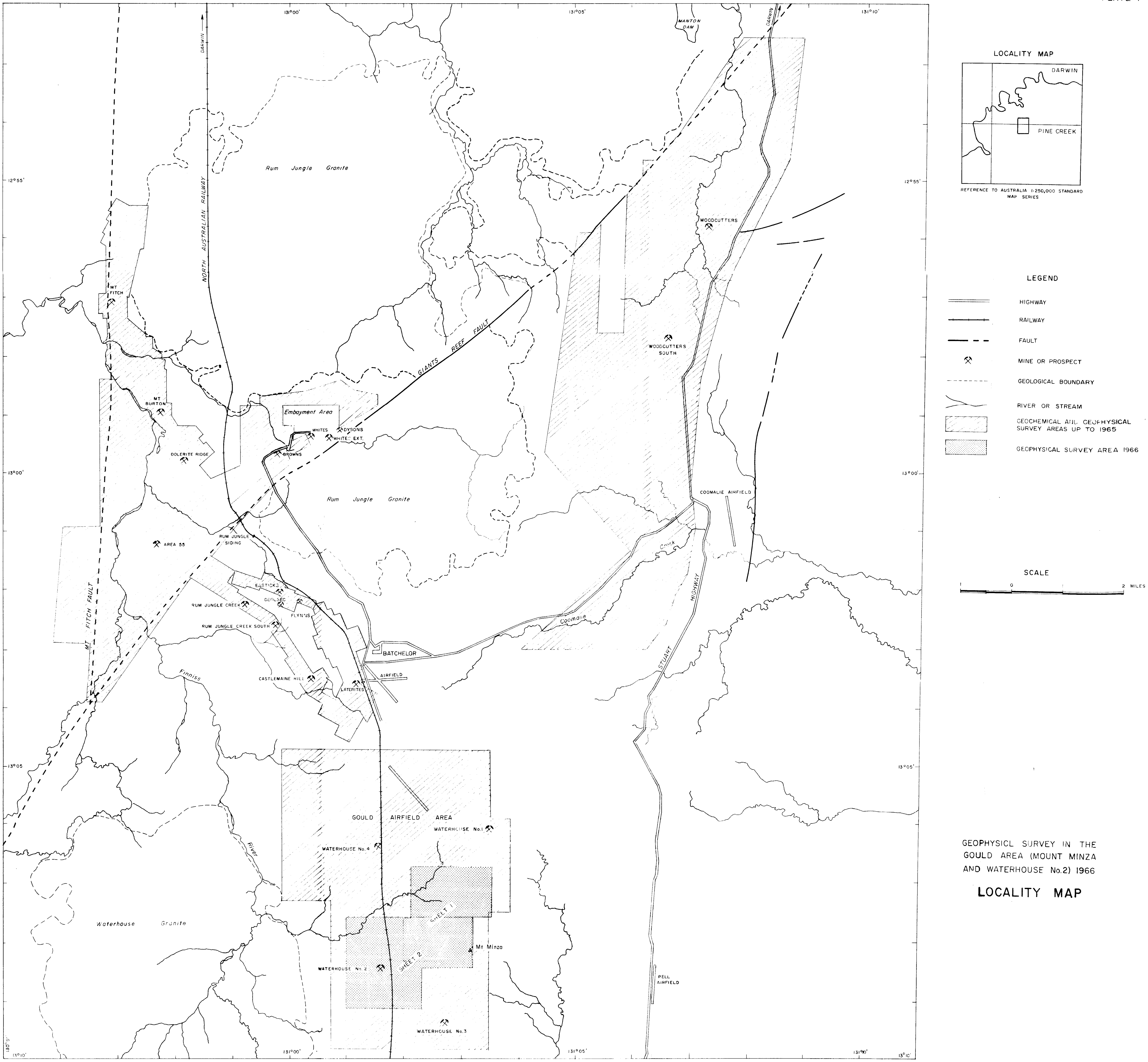
7. CONCLUSIONS

It is unlikely that the geophysical investigations indicate economic uranium or base-metal mineralisation, with the possible exception of the Waterhouse No. 2 Prospect area, where sub-economic grade uranium ore has been previously encountered, and where radiometric anomalies continue to the south. Testing for mineralisation in the Waterhouse No. 2 Prospect area should take the form of diamond-drill holes directed into the black shales on both sides of the hematitic quartz breccia bed at intervals along their strike and below the zone of weathering (about 100 ft thick; Ruxton, 1961). Because the structure and succession are well known in most of this area, targets based on geophysical results alone are unnecessary, although to the south electromagnetic anomalies can be used to select targets where drift obscures all outcrop.

8. REFERENCES

DALY, J. and TATE, K.H.	1960	Waterhouse Nos. 2,3, and 4 Uranium Prospects geophysical surveys, NT 1957. Bur. Min. Resour. Aust. Rec. 1960/109.
LIVINGSTONE, D.F.	1959	Airborne radiometric survey of the Rum Jungle region, NT 1957 Bur. Min. Resour. Aust. Rec. 1959/9.
MALONE, E.J.	1958	The geology of the Darwin - Adelaide River area, NT Bur. Min. Resour. Aust. Rec. 1958/96.
RUXTON, B.P.	1961	The testing of electromagnetic anomalies by diamond drilling at Waterhouse No. 2 Uranium Prospect, NT. Bur. Min. Resour. Aust. Rec. 1961/161.
SEMPLE, D.G.	1967	Geochemical and radiometric investigations, Gould area NT 1966 (Mount Minza and Waterhouse No. 2 areas) Bur. Min. Resour. Aust. Rec. 1967/41.
SHATWELL, D.O. and DUCKWORTH, K.	1966	Gould Area geochemical and geophysical surveys, Rum Jungle area, NT 1965 Bur. Min. Resour. Aust. Rec. 1966/154.
WARIN, O.N.	1959	Report of investigations of radiometric anomalies discovered by Auster aircraft in the Rum Jungle district, NT. Bur. Min. Resour. Aust. Rec. 1959/18.
WOOD, F.W. and McCARTHY, E.	1952	Preliminary report on scintillometer airborne surveys over the Rum Jungle area and other portions of the Northern Territory. Bur. Min. Resour. Aust. Rec. 1952/79.
WYATT, J.D. and ALLE, A.F.	1953	Preliminary report on Waterhouse Uranium Prospect No. 2. Bur. Min. Resour. Aust. Rec. 1953/105.

PLATE 1



GEOPHYSICL SURVEY IN THE GOULD AREA (MOUNT MINZA AND WATERHOUSE No.2) 1966

LOCALITY MAP

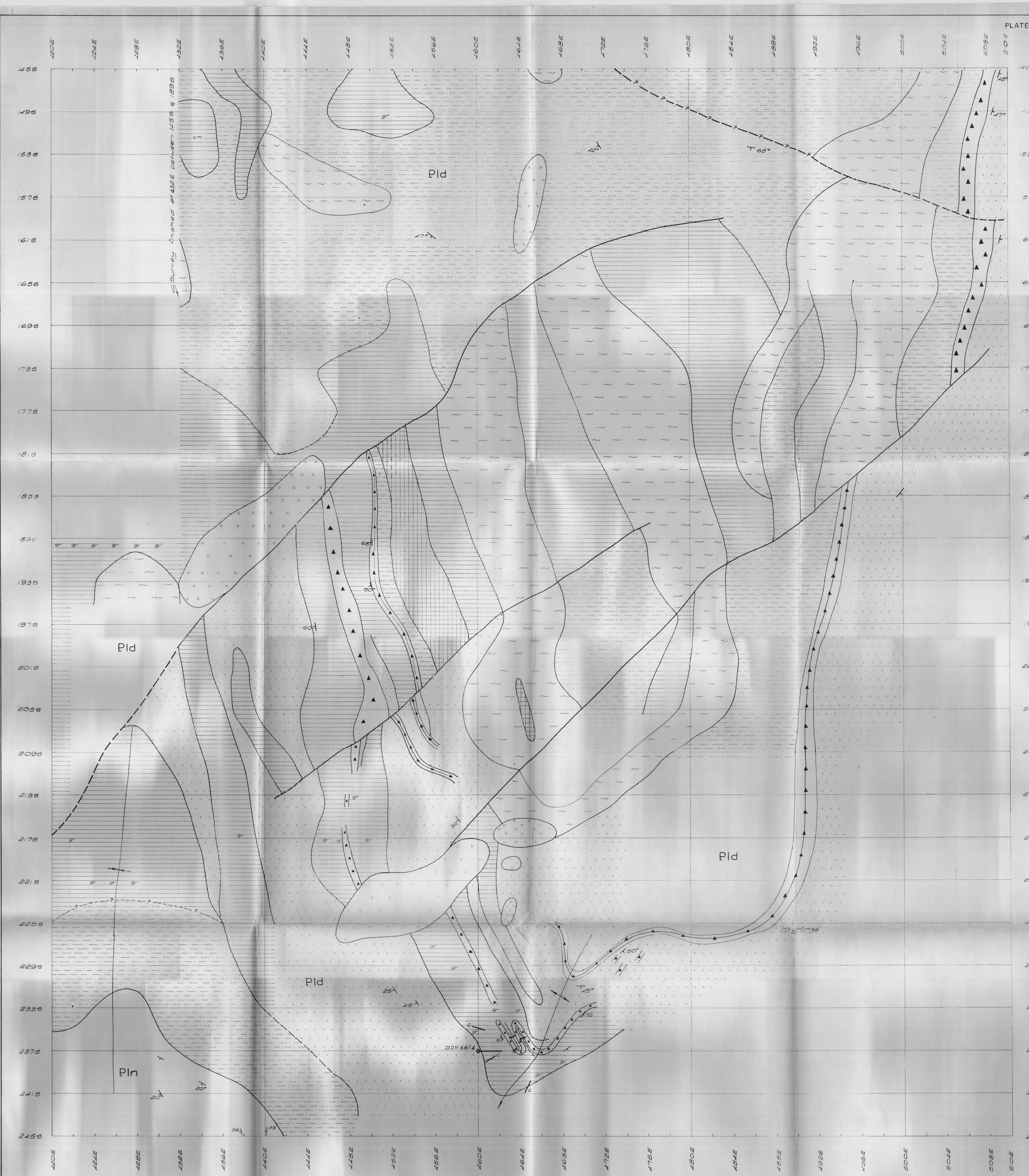
BASED ON D52/B7-191

To accompany Record No.1967/97

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics

D52/B7-215

PLATE 2



REFERENCE

Geological Boundaries
- Position accurate
- Position approximate
- Inferred, deduced

Bedding
- Measured
- Prevailing

Faulting
- Position accurate
- Position approximate
- Inferred
- Anticline (plunge indicated)
- Syncline (plunge indicated)
- Costean

Grid values are in hundreds of feet

LOWER PROTEROZOIC
Noltenius formation
Pln

LOWER PROTEROZOIC
Golden Dyke Formation
Pld

- Laterite
- Subgreywacke
- Siltstone
- Amphibolite
- Black shale (gr. - graphitic chl. - chloritic)
- Shale
- Heamatitic quartz breccia
- Banded iron formation
- Quartzite
- Tremolitic siltstone / sericitic schist
- Limestone
- Undifferentiated

MOUNT MINZA AND. WATERHOUSE No.2 AREAS

GEOLOGY

SHEET I

SCALE: 400 FEET TO AN INCH

400 0 400 800 1200

N

Bureau of Mineral Resources, Geology & Geophysics, Darwin, Dec. 1966

To accompany Record No. 1967/97

D52/B7-338


Pld
Pln
Plo
Scattered
Laterite
DDH4
DDH2
DDH 66/4
'Mt Minza'
North Australia Railway
REFERENCE
Geological Boundaries
Position accurate
Position approximate
Inferred, deduced
Bedding
Measured
Prevailing
Faulting
Position accurate
Position approximate
Inferred
Anticline (plunge indicated)
Syncline (plunge indicated)
Costean
Grid values are in hundreds of feet
LOWER PROTEROZOIC
Voltenius formation
Pln
LOWER PROTEROZOIC
Golden Dyke Formation
Pld
Laterite
Subgreywacke
Siltstone
Silicified shale
Amphibolite
Black shale (gr.-graphitic chl.-chloritic)
Shale
Heamatitic quartz breccia
Banded iron formation
Quartzite
Tremolitic siltstone/sericitic schist
Limestone
Undifferentiated
LOWER PROTEROZOIC
Coomalie Dolomite
Plo
Undifferentiated
MOUNT MINZA AND WATERHOUSE No.2 AREAS
GEOLOGY
SHEET 2
SCALE : 400 FEET TO AN INCH
400 0 400 800 1200
D52/B7-339
To accompany Record No.1967/97
Bureau of Mineral Resources, Geology & Geophysics, Darwin 1·1·67

E.M. GUN REAL COMPONENT CONTOURS

SHEET 1

Frequency 1760 c/s Coil separation 200 ft. Contour interval 10 %

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. D 52/B7-216
To accompany Record No. 1967/97

PLATE 5

E.M. GUN REAL COMPONENT CONTOURS

SHEET 2

Frequecy 1760 c/s. Coil separation 200 ft. Contour interval 10%.

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. D52/B7-217

To accompany Record No. 1967/97

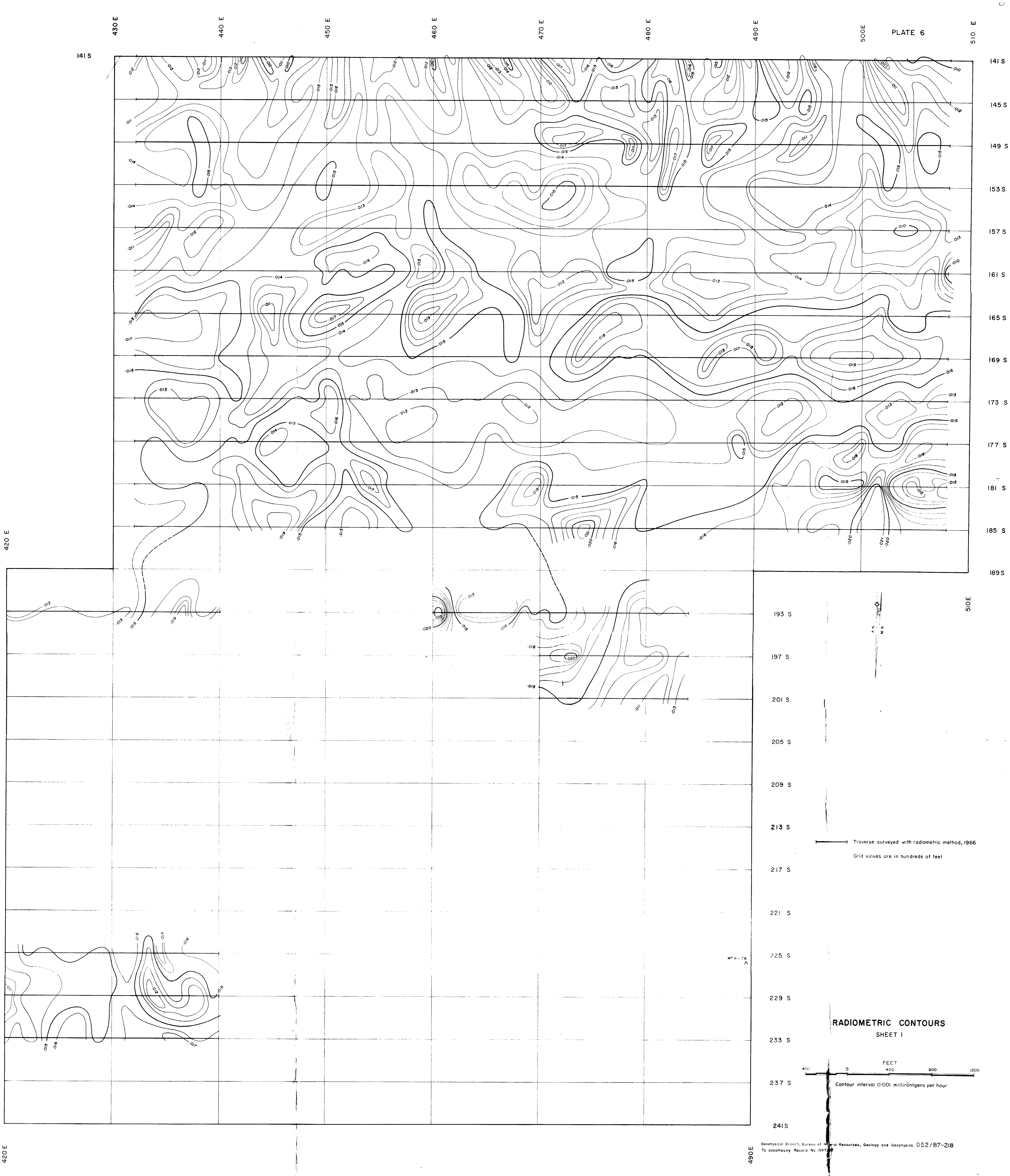
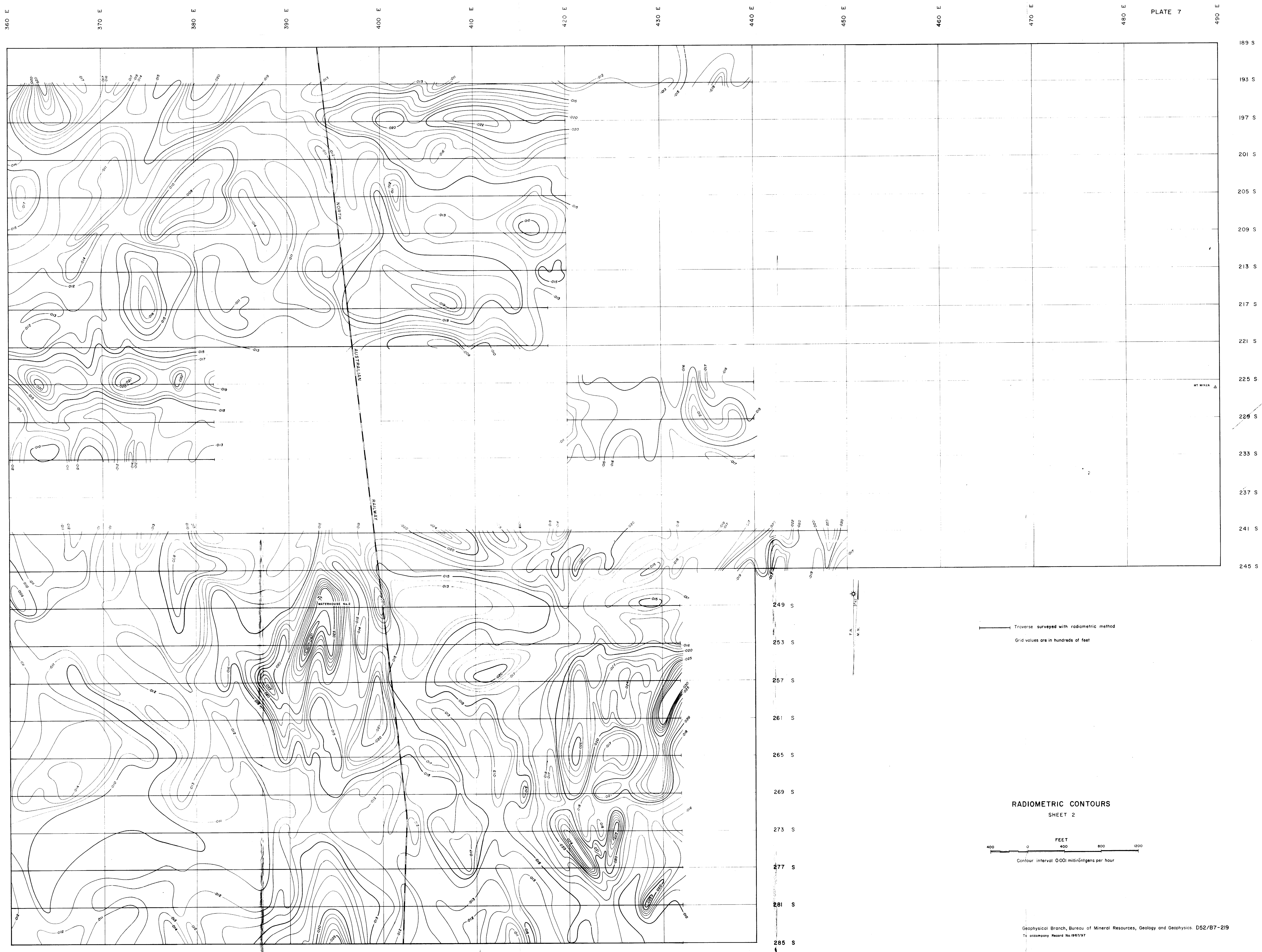


PLATE 6
RADIOMETRIC CONTOURS
SHEET 1
Traverse surveyed with radiometric method, 1966
Grid values are in hundreds of feet
FEET
400 0 400 800 1200
Contour interval 0·001 milliröntgens per hour
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. D52/B7-218
To accompany Record No. 1967/
430 E
440 E
450 E
460 E
470 E
480 E
490 E
500E
510 E
420 E
141 S
145 S
149 S
153 S
157 S
161 S
165 S
169 S
173 S
177 S
181 S
185 S
189S
193 S
197 S
201 S
205 S
209 S
213 S
217 S
221 S
225 S
229 S
233 S
237 S
241S

PLATE 7



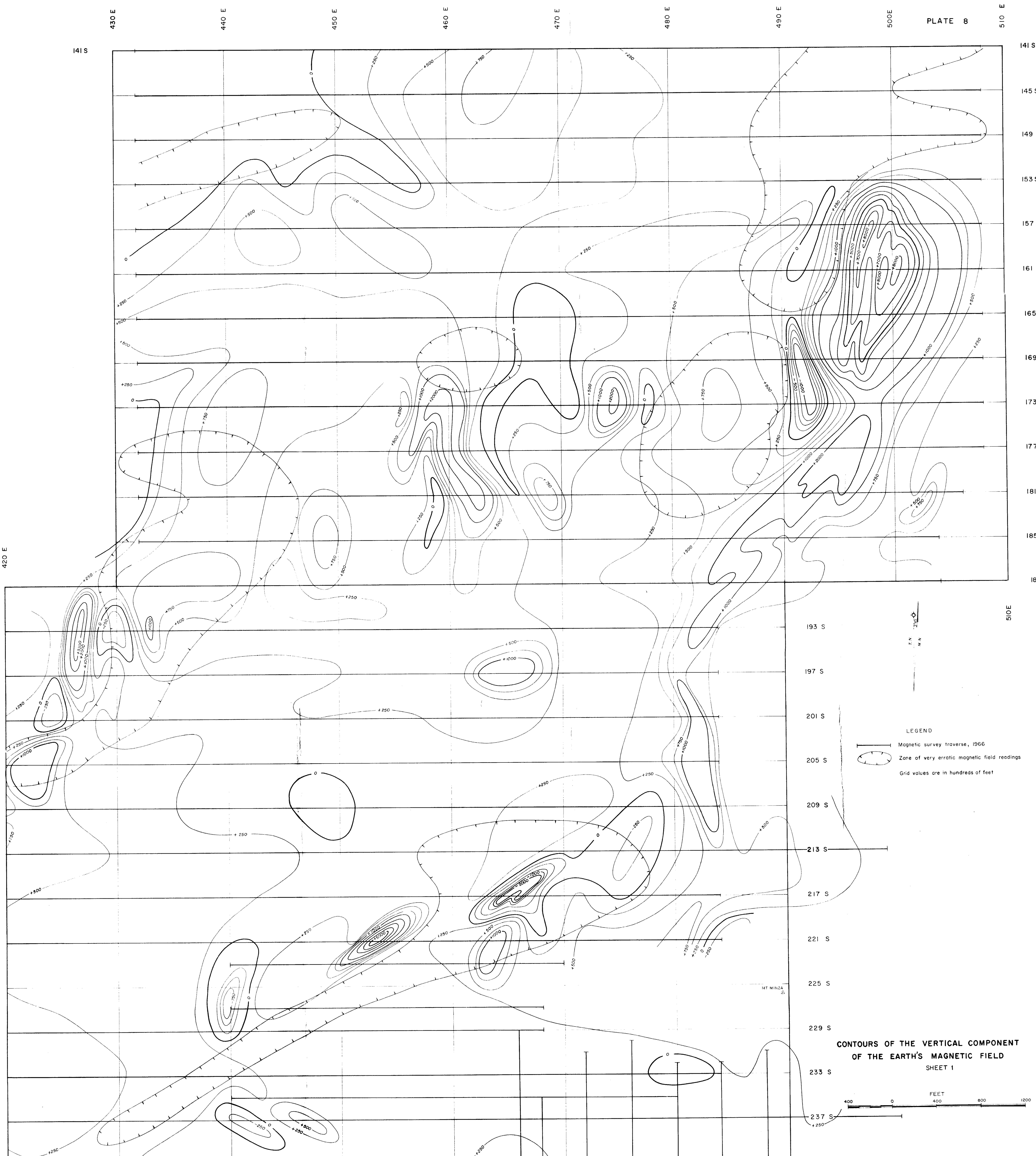
RADIOMETRIC CONTOURS

SHEET 2

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. D52/B7-219

To accompany Record No.1967/97

PLATE 8

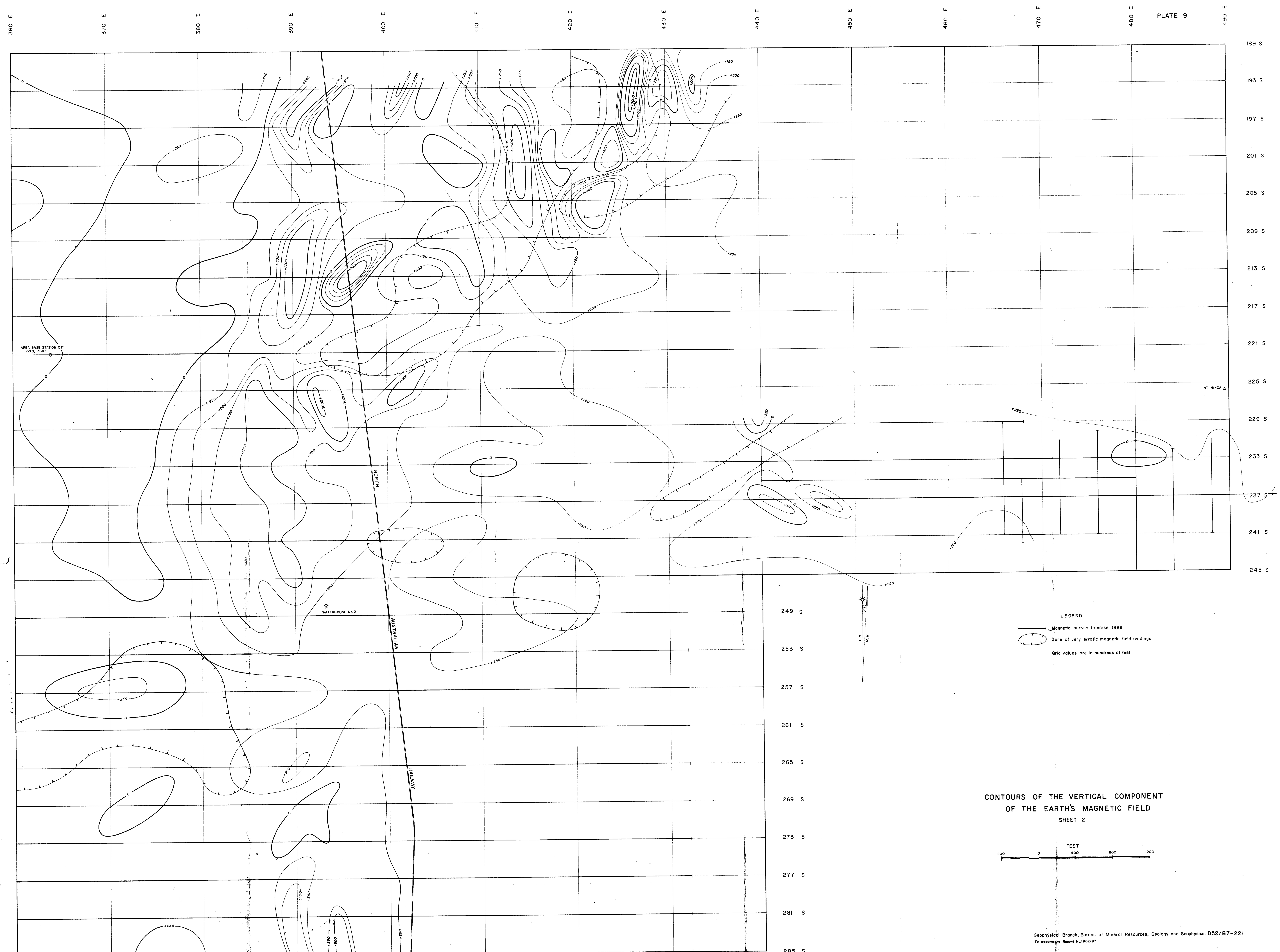


CONTOURS OF THE VERTICAL COMPONENT OF THE EARTH'S MAGNETIC FIELD

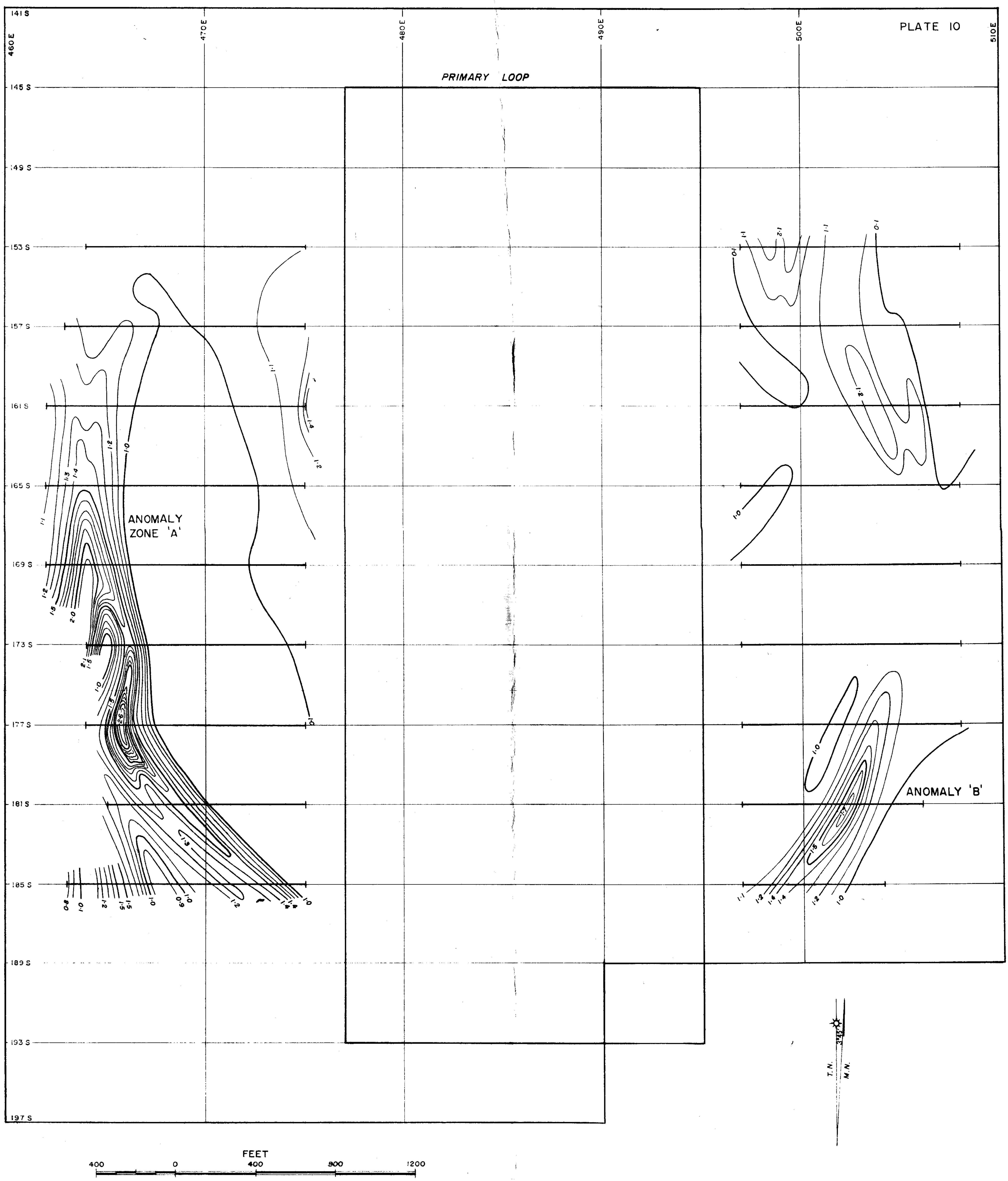
SHEET 1

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics. D52/B7-220

To accompany Record No. 1967/97



CONTOURS OF THE VERTICAL COMPONENT
OF THE EARTH'S MAGNETIC FIELD
SHEET 2



Frequency 220 c/s   Coil separation 50 ft   Contour interval 0·1

Traverse surveyed with Turam method 1966

Grid values are in hundreds of feet

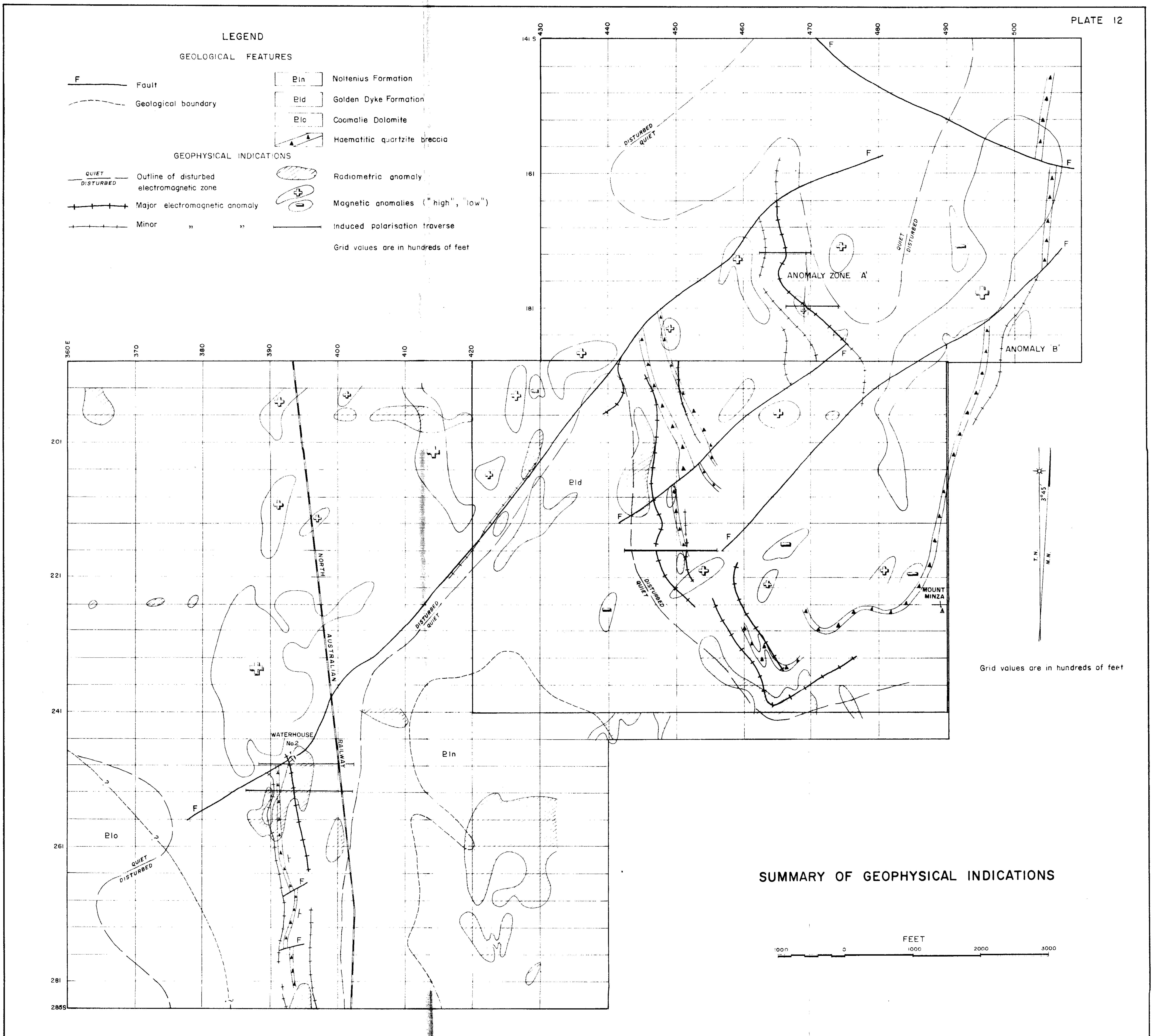
TURAM REDUCED RATIO CONTOURS

To accompany Record No.1967/97

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics.   D52/B7-222

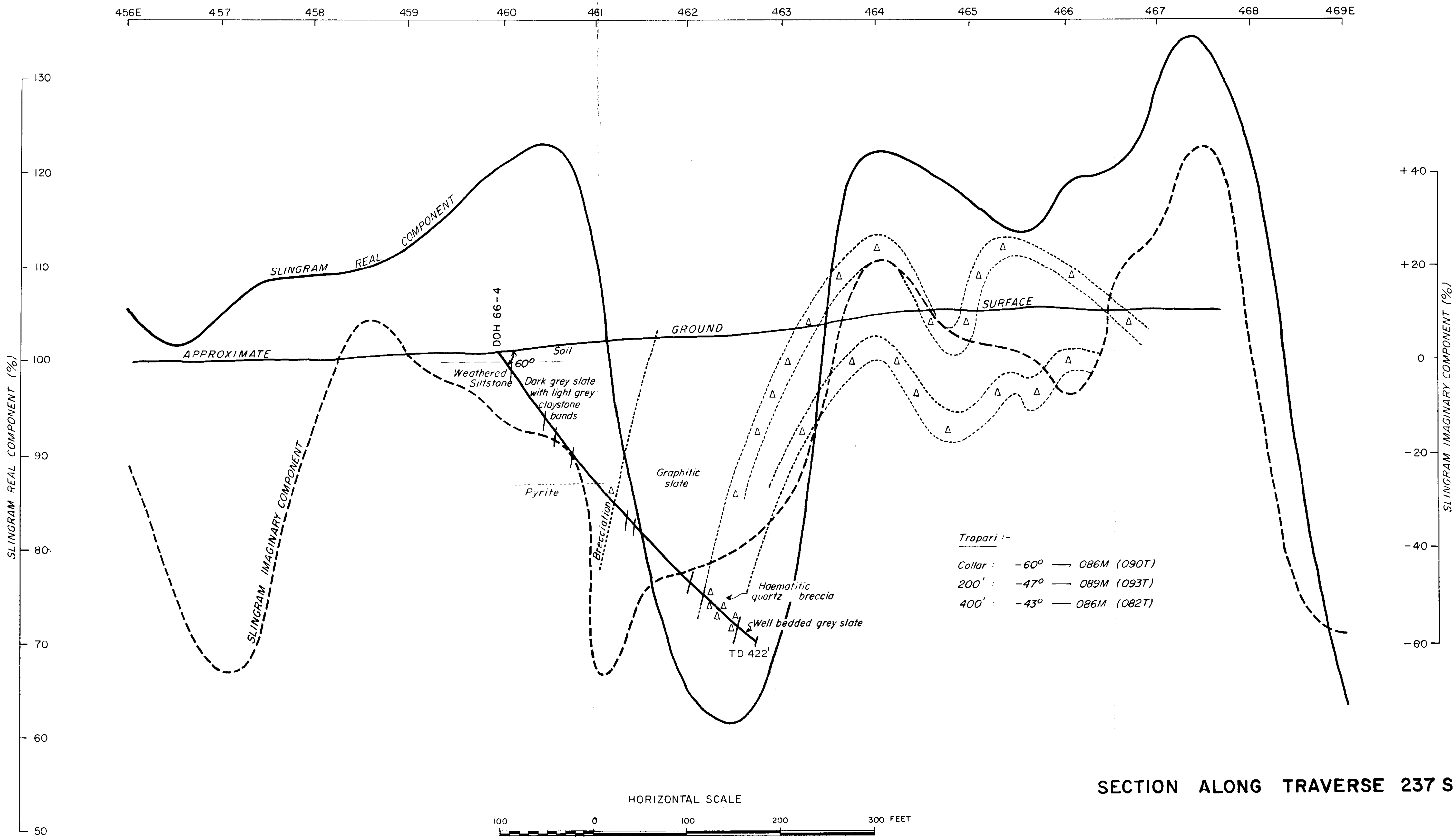

PLATE II
WATERHOUSE No. 2
TRAVERSE 253 S
TRAVERSE 249 S
MOUNT MINZA
TRAVERSE 217 S
ANOMALY ZONE A
TRAVERSE 181 S
TRAVERSE 173 S
E.M. GUN
REAL COMPONENT %
IMAGINARY COMPONENT %
REAL
IMAGINARY
RAILWAY
Dipole-dipole electrode array for IP measurements
ℓ Dipole length (100 ft)
n Dipole number
I IP transmitter
V IP receiver
Electrode
Plotted position of reading
INDUCED POLARISATION
RESISTIVITY (OHM-M)
FREQUENCY EFFECT (%)
METAL FACTOR
GEOLOGY (SIMPLIFIED)
FAULT
SECTION HYPOTHETICAL
LEGEND
Amphibolite
Black shale
Shale
Haematitic quartz breccia
Banded iron formation
Tremolitic siltstone, sericitic schist
Conducting horizon within black shale
INDUCED POLARISATION PROFILES
FEET
200 0 200 400
To accompany Record No. 1967/97
Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics.
D52/B7-224

PLATE 12



SUMMARY OF GEOPHYSICAL INDICATIONS

PLATE 13

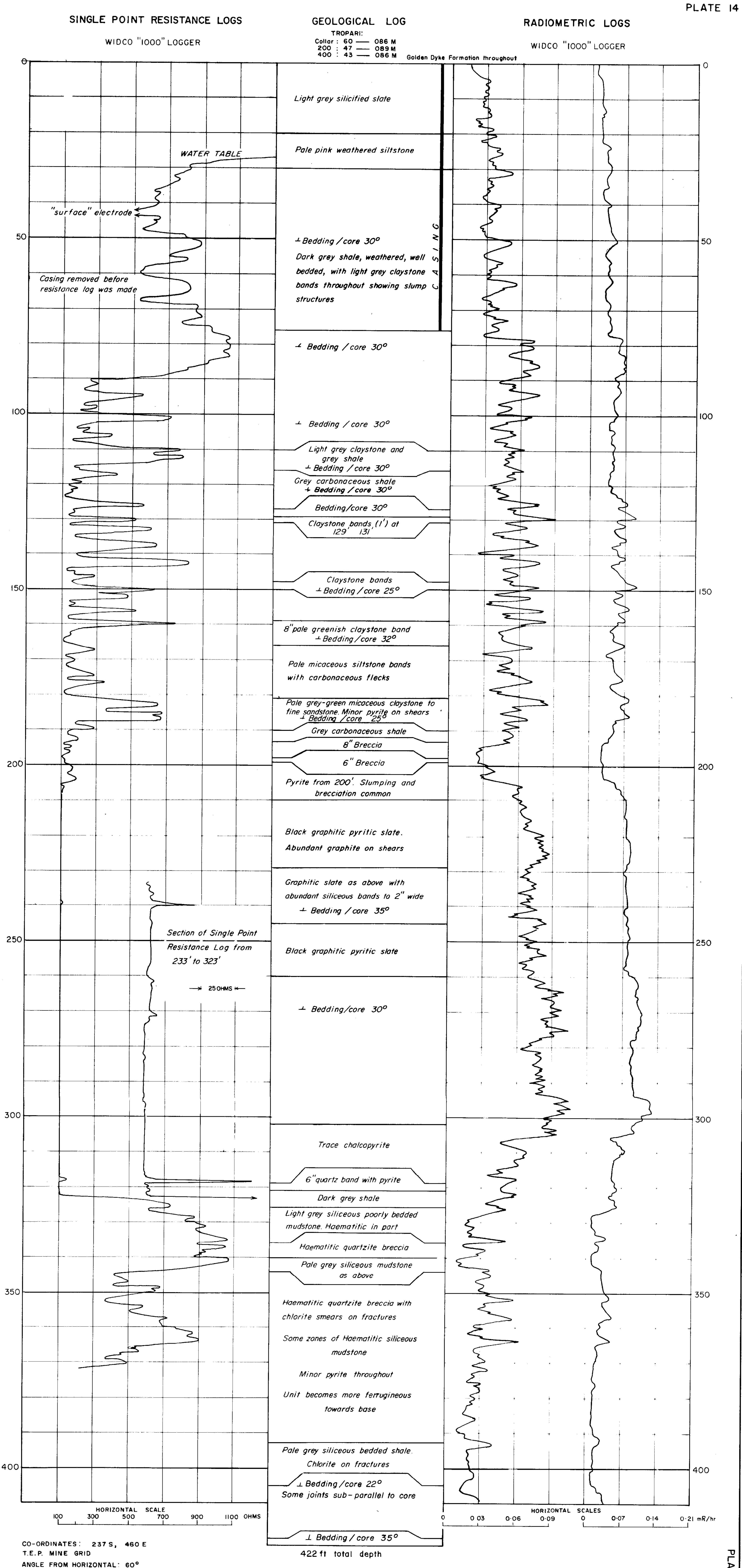


SECTION ALONG TRAVERSE 237 S

To accompany Record No. 1967/97

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics

D52 / B7-239



CO-ORDINATES: 237 S, 460 E
T.E.P. MINE GRID
ANGLE FROM HORIZONTAL: 60°
DIRECTION: 090 GRID

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics

D52 / B7 - 240

To accompany Record No. 1967/97

PLATE 14