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DEPARTMENT OF
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BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1974/42

AEROMAGNETIC INTERPRETATION OF NORTHERN EROMANGA AND GALILEE BASINS QUEENSLAND

by

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SUMMARY

Results of the aeromagnetic surveys in the northern Eromanga and Galilee Basins, Queensland by the Bureau of Mineral Resources, Geology & Geophysics (BMR) in 1966 and by three private companies between 1960 and 1962 are presented.

As a result of quantitative interpretation of the aeromagnetic data, depths to magnetic basement units have been determined at a number of places. Control available from drill-hole information has enabled magnetic basement depths to be divided into two categories termed upper and lower magnetic basement. Contours of depth to the upper magnetic basement are considered to indicate broadly the depths to the crystalline basement and thereby reflect structural trends within this basement. The contours indicate a large basement depression in the BUCHANAN and GALILEE Sheet areas, where no wells have penetrated crystalline basement. The total thickness of Drummond and Galilee Basin sediments there may exceed 6000 m.

The upper magnetic basement has been divided into ten magnetic provinces according to characteristics of the magnetic anomalies. These provinces agree broadly with features delineated by earlier gravity surveys. Some of the structural trends delineated by the upper basement depth contours agree with known geological structures.

1. INTRODUCTION

This Record describes the results from a detailed study of the aeromagnetic data in the northern Eromanga and Galilee Basins in Central Queensland.

The aeromagnetic data were collected in surveys flown by the Bureau of Mineral Resources (BMR) and by three companies as indicated in Figure 1. CHARTERS TOWERS* has no aeromagnetic coverage at present. Parts of WINTON and MANUKA have been surveyed for a company but as the survey was not subsidized under the Petroleum Search Subsidy Act (PSSA) the data are unavailable for interpretation.

The survey data referred to have been subjected to previous interpretation by a number of workers; the results are available in PSSA Reports (Magellan Petroleum Corporation, 1963; and Exoil N.L., 1962) and the report on BMR's 1968 Central Great Artesian Basin survey (Waller, 1968).

In addition to the independent interpretation of these data carried out by the writer, results were also considered from areas not previously reported upon. This detailed study involved four stages of investigation, namely:

Determination of magnetic basement depths;

Separation of magnetic basement depth estimates into two groups using drill-hole results for control. One group represents the upper magnetic basement, whilst the other represents the lower, or intra, magnetic basement;

Delineation of structural trends within the upper magnetic basement;

Delineation of magnetic basement provinces on the basis of magnetic anomaly character.

Between 1959 and 1963, several reconnaissance helicopter gravity surveys were made in the area by BMR, and the results of these surveys have been presented by Gibb (1968). The gravity interpretation is compared with the aeromagnetic interpretation in SECTION 3.

* Throughout this Record the names of 1:250 000 sheet areas will be written in capitals to distinguish them from ordinary place names.

2. GEOLOGY

Basins (Plate 1)

The following summary is taken from the report on the northern Eromanga Basin by Casey (1970).

> 'The northern Eromanga Basin is a portion of the Great Artesian Basin. It overlies parts of the Georgina, Drummond and Galilee Basins. Sedimentation began in the Lower Jurassic and ceased in the Upper Cretaceous; the strata are mainly mudstone, siltstone and sandstone, and total thickness is about 1800 m (6000 ft). Regional structure is essentially a sheet of strata dipping gradually towards the middle of the basin. Local structure is mainly of two types: drape folds over basement ridges, and basement faults which may grade to monoclines at the surface. The principal economic resource is groundwater. Petroleum exploration has not been successful, and the best prospects in the region seem to be in the underlying Galilee Basin'.

A number of geologists from BMR and the Geological Survey of Queensland have mapped the basin (Casey, 1968 and 1969; Clarke & Paine, 1970; Jauncey, 1964 and 1967; Olgers, 1970; Vine, 1963, 1964a, 1964b, 1970a, 1970b, 1970c).

Vine (in prep.) defines the Galilee Basin as the basin formed by periodic downwarping of a large area west of the Anakie Inlier during Carboniferous, Permian, and Triassic times and filled by compensating clastic sediments.

Basement (Plate 1)

In JULIA CREEK, McKINLAY, MACKUNDA, and BRIGHTON DOWNS, a number of water bores have been drilled. From the borehole information, contour maps of the probable crystalline basement surface have been constructed. The basement rocks as described by drillers include granite, diorite, schist, slate, and quartzite. Such a variety of rock types suggests that many of the local magnetic anomalies in this region are associated with variation in the basement lithology. Ooroonoo No. 1 drilled in BRIGHTON DOWNS intersected Precambrian granite beneath Mesozoic sediments at a depth of 1040 metres below sea level (b.s.l.).

In parts of MANUKA, WINTON, TANGORIN, and MUTTABURRA, several exploration wells have been drilled. Of these, Brookwood No. 1 (Exoil N.L., 1963) and Corfield No. 1 (Queensland Dept of Mines, 1961) struck granite basement and Beryl No. 1 (Associated Australian Oilfields N.L., 1964) struck metamorphic basement of ?Devonian age. An average depth to basement in these wells and in three water bores which also entered basement in 1100 m b.s.l.

In BUCHANAN and GALILEE, no water bores or exploration wells have actually penetrated crystalline basement. Lake Galilee No. 1 (Exoil N.L., 1964) was completed in the sedimentary beds below the Galilee Basin at a depth of 3406 m b.s.l. so the crystalline basement is at a greater depth in that area.

In the eastern part of BUCHANAN and GALILEE, the Anakie Metamorphics are known to be the oldest rocks which probably form the basement of the Drummond Basin. Little is known about the basement beneath the Galilee Basin.

Several exploration wells have been drilled in MANEROO, LONGREACH, and the region to the south. In MANEROO, Penrith No. 1 entered ?Upper Silurian to Middle Devonian recrystallized sediments at 1030 m b.s.l., Fermoy No. 1 and Mayneside No. 1 struck phyllite and slate of Upper Cambrian age at 1360 and 1440 m b.s.l. respectively. This indicates that the basement rocks are probably low-grade metasediments.

In LONGREACH, Longreach No. 2 and Cleve No. 1 bottomed in ?Lower Palaeozoic granite at 780 and 720 m b.s.l. respectively. Both Hulton No. 1 and Saltern Creek No. 1 penetrated Lower Carboniferous quartzite but at different depths - 427 m and 1280 m b.s.l. respectively - and substantiate the Hulton-Rand Structure as shown in Plate 4. In Maranda No. 1, phyllite was intersected at 1700 m b.s.l., and it may be contemporaneous with quartzite in Hulton No. 1 and Saltern Creek No. 1 but of higher metamorphic grade according to Vine (1972).

3. MAGNETIC DATA AND QUANTITATIVE INTERPRETATION

Total magnetic intensity contours

The magnetic data are presented as contours in Plate 2 at a scale of 1:1 000 000. The source material for this composite contour presentation includes 12 aeromagnetic maps published by BMR and contour maps obtained from exploration companies under the terms of the Petroleum Search Subsidy

Act (PSSA). Because the surveys were flown at different heights and the data so required were reduced and regionally corrected on different bases, the contour values are unrelated from one survey to another and contour lines are therefore discontinuous across survey boundaries. However, the arbitrary datum and contour discontinuities do not represent problems in the magnetic interpretation.

Owing to the survey altitude and line spacing selected the aeromagnetic data tend to accentuate magnetic disturbances caused by sources with considerable depth extent and large linear dimension. With respect to the former, the survey were nominally flown at 500 to 600 m above sea level, which corresponds to an average terrain clearance of about 300 to 400 m. At such an altitude, magnetic disturbances caused by thin horizontal sheet-like magnetic sources are usually too weak to be detected unless the sources are extremely magnetic in contrast to the surrounding rocks. As the probability of detecting a magnetic unit also depends upon its size in relation to flight-line spacing, the nominal line spacing of 6 km applied in most surveys restricts the chance of recording anomalies from sources of lesser strike length normal to flight-line direction.

Most of the magnetic disturbance in the area appears to originate from sources at the surface of, or within, the basement rocks. Therefore, the magnetic response is in general diagnostic of the variation of magnetic physical properties of these basement rocks. There are notable exceptions such as the magnetic disturbance apparent in the northern part of RICHMOND and HUGHENDEN, which is due to outcropping Tertiary basalt.

Magnetic basement - upper and lower

Plate 3 shows the results of depth determinations obtained from anomalies attributed to basement magnetic sources. Accordingly these depths are referred to as magnetic basement depths. Different symbols have been used to indicate the method of depth determination employed (see Appendix A). For the spectral method, the degree of accuracy for a depth estimate has also been indicated. All depth estimates are in metres below sea level (b.s.l.).

The crystalline or Metamorphic* basement depths known from drill-hole information as shown in Plate 1 have been compared with the magnetic basement depth estimates presented in Plate 3. Around each crystalline basement depth observation there are invariably a few magnetic depth estimates in agreement with it. For example, Saltern Creek No. 1 in

* Hereafter crystalline or metamorphic basement will be referred to as crystalline basement

LONGREACH penetrated crystalline basement of Lower Carboniferous quartzite at 1280 m b.s.l., and the nearby depth estimate is 1100 m b.s.l. Mayneside No. 1 in MANEROO bottomed in phyllite/quartzite at 1440 m b.s.l., whereas the depth estimates around it have an average of about 1400 m b.s.l.

A number of magnetic bodies apparently occur at depths well below the surface of the crystalline basement as indicated by the depth estimates. These deep-seated magnetic bodies (so-called intrabasement units) could represent geological units of different age and lithology from those near the crystalline basement surface. For this reason, it is necessary to separate the depth estimates into two groups, one which forms the upper magnetic basement and includes all depth estimates consistent with known crystalline basement, and the other the lower magnetic basement which includes all deeper-seated magnetic bodies.

To illustrate this point, all available geological and magnetic information relevant to section AB is shown in Plate 4 the latter being derived from the smoothed contours of upper magnetic basement shown in Plate 5. Depth estimates on, and adjacent to, this section tend to fall into the two groups referred to above. The upper magnetic basement depths do not always coincide with the profile of the interpreted crystalline basement because most of the estimates are off section. Variance in the depths determined by different methods and even by a given method also accounts for some of the scatter, which is taken into account when producing the smoothed contour forms shown in Plate 5.

As the separation of the magnetic basement depths was based on available drill-hole data, the upper magnetic basement contours should be considered as information which complements the drill-hole results, allowing the extrapolation of crystalline basement into areas which lack any similar form of geological control.

Several depth estimates in Plate 3 appear to indicate that some magnetic anomaly sources occur above the crystalline basement. These supra-basement magnetic bodies could be magnetic sediments, basement relief, basic intrusives, or extrusives.

A generalized upper magnetic basement contour map is shown in Figure 2. The basement contours broadly agree with known crystalline basement depths and variations in accordance with the geological control used. The rise of upper magnetic basement to the north in HUGHENDEN is consistent with that of crystalline basement. The trough GD shown in the same figure can be correlated with increasing thickness of Drummond and Galilee sequences.

These two sequences and underlying sediments possibly have a total thickness in excess of 6000 m, which is consistent with the depth estimates of 6000 to 6700 m in GALILEE and BUCHANAN.

4. QUALITATIVE INTERPRETATION

Magnetic anomaly shapes and intensities are the two observed variables used to differentiate the various magnetic basement provinces. Magnetic intensity as referred to in the definition of a basement province is specified below.

Anomalous magnetic intensity	Range in gammas
Intense	Above 1000
Strong	1000-500
Moderate	500-100
Weak	Below 100

Plate 6 shows a delineation of magnetic basement based on the two observed variables mentioned above. Five types of magnetic basement have been classified in the northern Eromanga and Galilee Basin area.

Magnetic Province Type A

This type of magnetic basement province comprises moderate to intense magnetic lineaments with a preferred strike orientation.

Province A1 is the southeastern extension of the Precambrian Cloncurry Fold Belt. It consists of many intense elongated magnetic anomalies which strike NNW and thus reflect the strike of the Precambrian rocks. At the southeast edge of this basement block, some magnetic lineaments strike northeast, parallel to the province boundary. These anomalies appear to be directly associated with the truncation of this block.

Province A2 lies on the eastern side of JULIA CREEK and McKINLAY and includes moderately intense magnetic trends which approximately parallel those evident in A1, i.e. the general strike direction of the Cloncurry Fold Belt.

Province A3 lies in the northern parts of RICHMOND and HUGHENDEN. The intense magnetic trends in this province have a somewhat random orientation although there is evidence of some conformity in strike, which varies from northwest to the east of HUGHENDEN through northeast in RICHMOND to northwest in the northwest part of RICHMOND. On the basis of magnetic intensity, this basement province could be considered as part of the Precambrian basement.

The highly disturbed pattern in the northwest of HUGHENDEN, which tends to obscure the magnetic basement responses, could be due to widespread Tertiary basalt.

Magnetic Province Type B

This type of magnetic basement province is characterized by the presence of isolated broad and moderately intense magnetic anomalies and the lack of short-wavelength disturbance.

Province B1 lies between A1 and A2 in JULIA CREEK and McKINLAY. At least five broad and slightly elongated anomalies occur in a random fashion in the basement. Although this basement is known to be of Precambrian age, it has a very different magnetic expression from that of type A. The presence of granite on a regional scale within the basement might explain the lack of magnetic disturbance. The large magnetic bodies which are well below the crystalline basement surface probably represent parts of older basement or large basic intrusives at depth.

Province B2 coincides with the trough GD shown in Figure 2. Magnetic anomaly form and intensity are similar to those apparent in B1. The relation between B2 and B1 in terms of basement age and lithology is in general unknown; however, results from boreholes suggest that parts of the crystalline basement in B2 consist of low-grade metasediments which would be quite different from the rock types found in province B1.

Magnetic Province Type C

This type of magnetic basement province is characterized by moderately intense magnetic disturbance with little evidence of well developed trends.

Province C1 is a broad zone elongated in a NW direction. Magnetic anomalies which are elongated in this zone predominantly strike northeast. This strike is more obvious in TANGORIN and MUTTABURRA than in LONGREACH and JERICHO.

Province C2 is enclosed by provinces A2, A3 and C1. The magnetic field over this province appears to involve a grouping of magnetic anomalies which are in general randomly oriented with some suggestion of a set of superimposed orthogonal trends (northwest and northeast). The crystalline basement within this province could well be the junction, or an intermediate zone, between A3 and C1 basements. The weak northeast and northwest trends possibly represent structural trends associated with these provinces.

There appears to be a good correlation between the Galilee Basin and provinces C1 and C2. This implies that the crystalline basement of Galilee Basin has a characteristic magnetic signature which is probably different from those of the Precambrian basement to the west, the Anakie Metamorphics to the east, and low-grade metasediments to the south. The basement may consist of a regionally folded metasedimentary and igneous rock sequence as distinct from the low-grade metasediments in province D.

Magnetic Province D

Magnetic anomalies within this province are relatively minor with a background variation less than 50 gammas. Magnetic trends are ill-defined in general.

The province forms a triangular-shape block between provinces A1 and C1. In the west, two discontinuous weak magnetic trends closely parallel the northwest boundary of the province. This suggests that the factor responsible for these magnetic lineaments is associated with the truncation of province A1. Several isolated magnetic anomalies occur near the central and eastern parts of MANEROO and LONGREACH. In Plate 2 anomalies X1 to X6 appear to be basic intrusive bodies within the crystalline basement, whereas anomalies Y1 to Y8 are probably caused by minor variations in basement lithology. The southwestern part of province C1 apparently abuts this province in LONGREACH, and seems to form a significant basement feature.

Magnetic Province E

In the west of this province, several intense magnetic anomalies are apparent with short strike length and approximate north-south orientation. To the east are a number of circular and elliptical anomalies with moderate to high magnetic intensity. The former anomalies have short wavelengths, implying that their sources are near or at the surface. In contrast the sources of circular and elliptical anomalies appear to be deep-seated and of a different nature.

Comparison of magnetic and gravity data

Gibb (1968) subdivided the northern Eromanga Basin and the so called Drummond Basin into five gravity provinces as shown in Plate 7. A comparison of the gravity and magnetic results indicates similarities between the gravity and magnetic provinces as summarized in Table 1.

TABLE 1

GRAVITY PROVINCE	MAGNETIC PROVINCE	REMARKS
Cloncurry Regional Gravity High	Province A1	The Precambrian rocks in the basement explain the gravity high and magnetic trends.
Anakie Regional Gravity High	Province E	Anakie metamorphics appear to be the source of the circular and ellipical anomalies. The Silver Hill volcanics are probably the source of the narrow trends. The metamorphics and/or volcanics could give rise to the observed gravity high.
Muttaburra Gravity Ridge	Province C1	Metasediments and granites gave rise to a gravity high and moderate magnetic responses.
Flinder Regional Gravity Low	Province B2	Great thickness of sediments in the Drummond and Galilee Basins could result in gravity lows and the burial of magnetic units to great depths.
	Provinces A2 & C2	Provinces A2 and C2 lie within the Flinders Regional Gravity Low, which may imply that the basement rocks in these two provinces are different from those in provinces A1 and C1 respectively.
Thomson Regional Gravity Low	Province D	Low-grade metasediments (phyllite) contribute to the basement of the northern Eromanga Basin within this gravity low.

Structure

An interpretation of structure based on magnetic information is presented in Plate 6. Is should be noted that magnetic basement contour discontinuities do not necessarily represent faults in the crystalline basement nor do crests and troughs in the former surface necessarily represent anticlines and synclines in the latter. As pointed out previously, non-magnetic crystalline rocks could overlie the upper magnetic basement and thus not be represented in form by the magnetic basement contours. Furthermore an intrasediments magnetic unit could give rise to an erroneous impression that an uplift occurs in the upper magnetic basement. Thus, all interpreted structures remain hypothetical until substantiated from other data sources.

There is some magnetic evidence to support the major basement structure termed the Belyando Feature (Vine, 1972) in JERICHO and southeast GALILEE. A change of magnetic anomaly form and intensity is noticeable across this postulated feature in JERICHO. A number of short-wavelength (or near-surface) anomalies which could be caused by volcanic vents have been noted near this postulated linear feature in both GALILEE and JERICHO. In southeast HUGHENDEN, the upper magnetic basement appears to deepen rapidly in coincidence with a belt of anomalous dips in Triassic sediments which in turn are associated with the Belyando Feature.

The boundary between provinces A1 and D is extremely well defined and linear, suggesting a fault in the crystalline basement. Contours of the upper magnetic basement indicate that the surface of the crystalline basement steps down to the north, an observation supported by drill-hole information.

In LONGREACH, the magnetic basement depth estimates support the structural interpretation that the Hulton-Rand Structure is a basement fault with downthrow to the north of the discontinuity.

In MANEROO, a rise in the upper magnetic basement suggests the presence of an anticline with axis 'aa'. This is not inconsistent with seismic results, which show a general rise in the transition beds over the postulated anticline (Australian Aquitaine Petroleum Pty Ltd, 1963 & 1964). Similarily, an uplift in the upper magnetic basement contours in JULIA CREEK coincides with a rise of the crystalline basement interpreted from borehole data.

5. CONCLUSIONS

From the detailed study of the aeromagnetic data in the northern Eromanga and Galilee Basins in Central Queensland, it is apparent that the aeromagnetic data interpreted with the use of drill-hole information as control yield meaningful magnetic basement contours which broadly correspond to the probable crystalline basement. This basement surface is termed the upper magnetic basement in contrast to the lower magnetic basement(s) which include intrabasement anomaly sources.

It is possible to subdivide the area into ten magnetic provinces based on the form and intensity of their magnetic anomalies. These magnetic provinces broadly agree with the gravity features delineated by Gibb (1968). Furthermore the observed magnetic characteristics of some provinces can be explained qualitatively in terms of known geology. A number of interesting basement structural trends have been delineated from the upper magnetic basement contours; some of these can be correlated with known geological structures.

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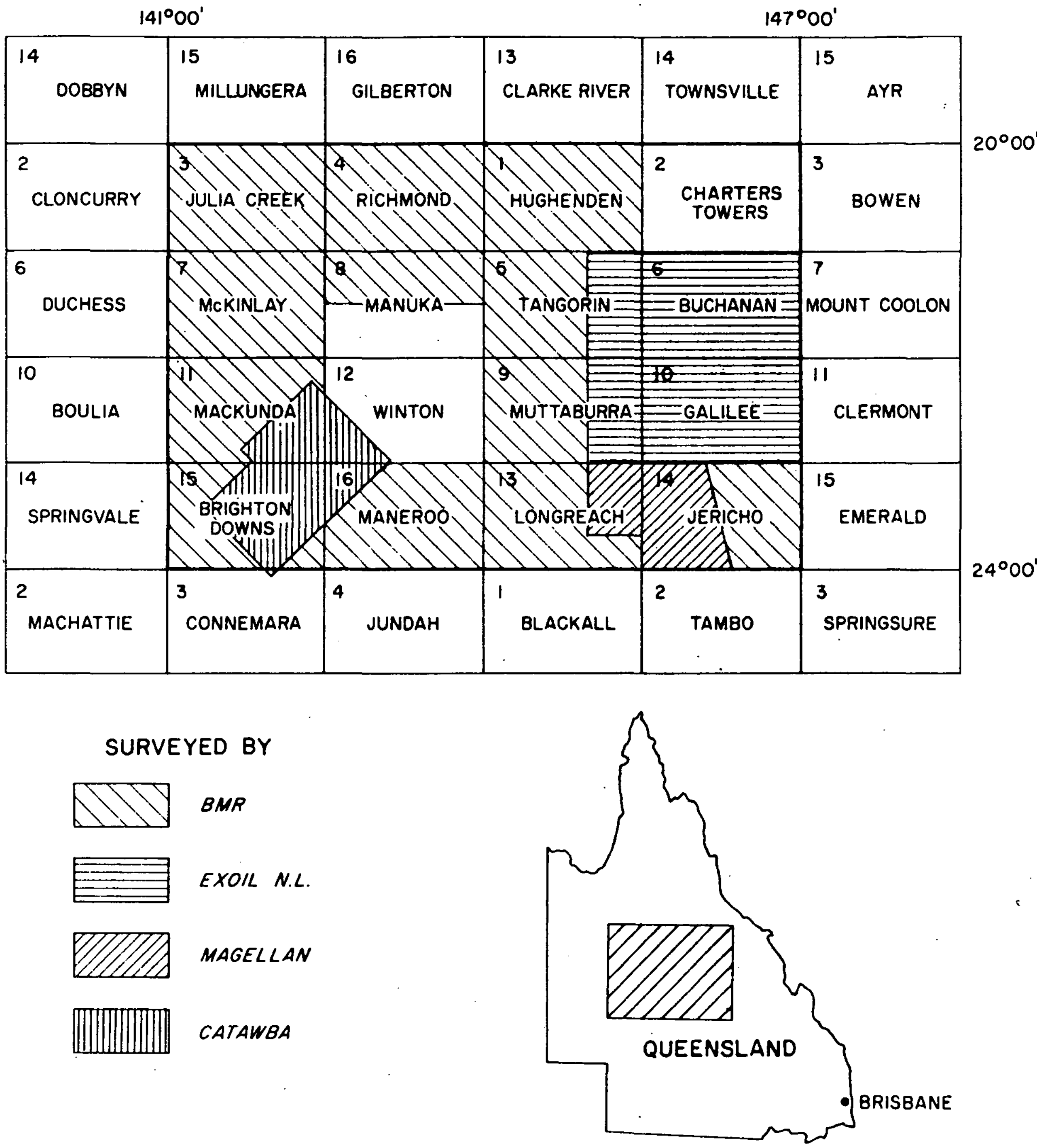
APPENDIX A

Methods of Depth Determination

The methods of depth determination used in this detailed study of the aeromagnetic data included the half-slope method, curve analysis methods, and the spectral method.

The first two methods are commonly used and require no further comment. The spectral method has been described by Gudmundsson (1966), and a computer program based on this technique has been developed by the writer.



AEROMAGNETIC SURVEYS

NORTHERN EROMANGA AND DRUMMOND BASINS

LOCALITY AND COVERAGE MAP

To accompany Record No 1974/42

To accompany Record No 1974/42

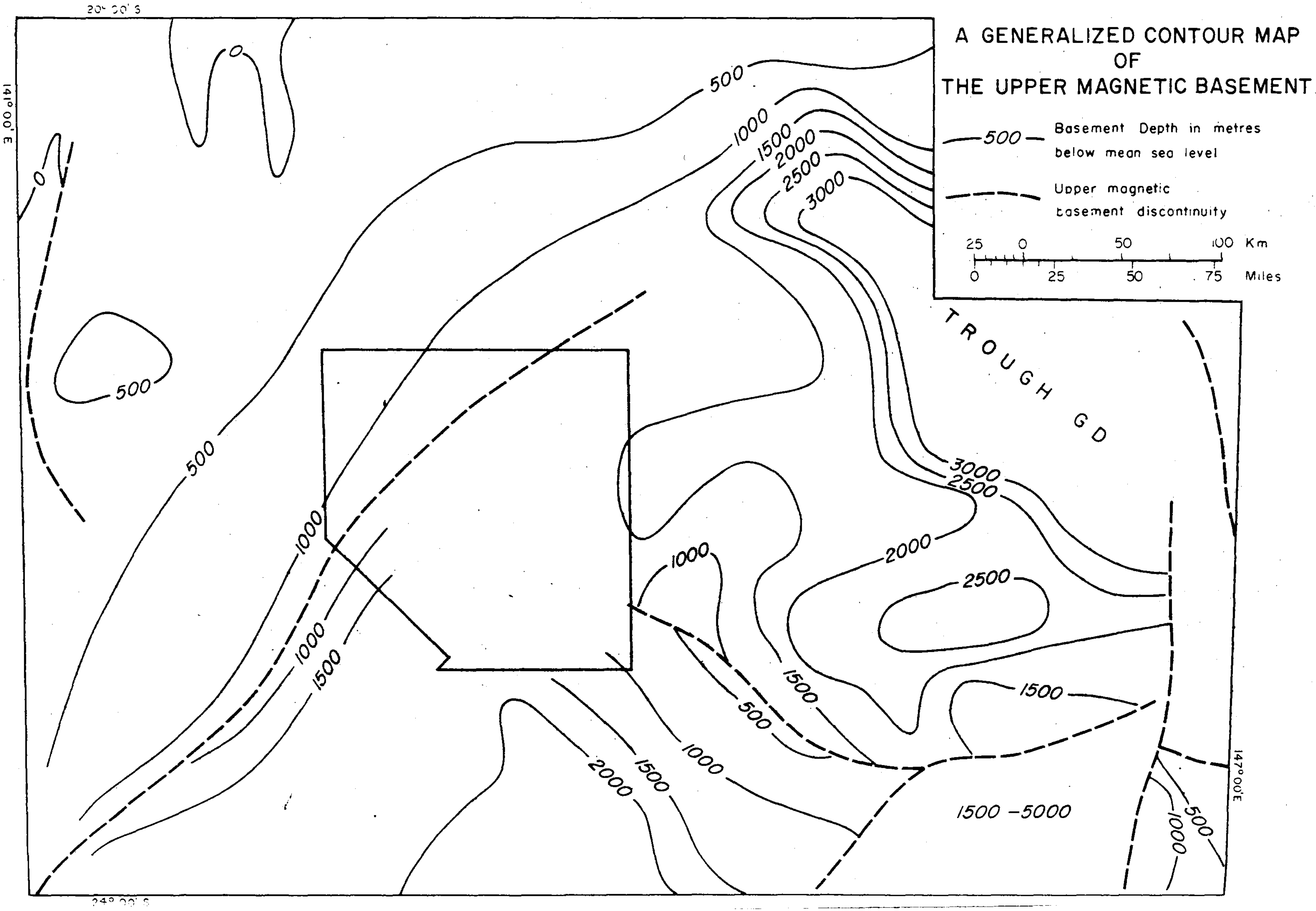


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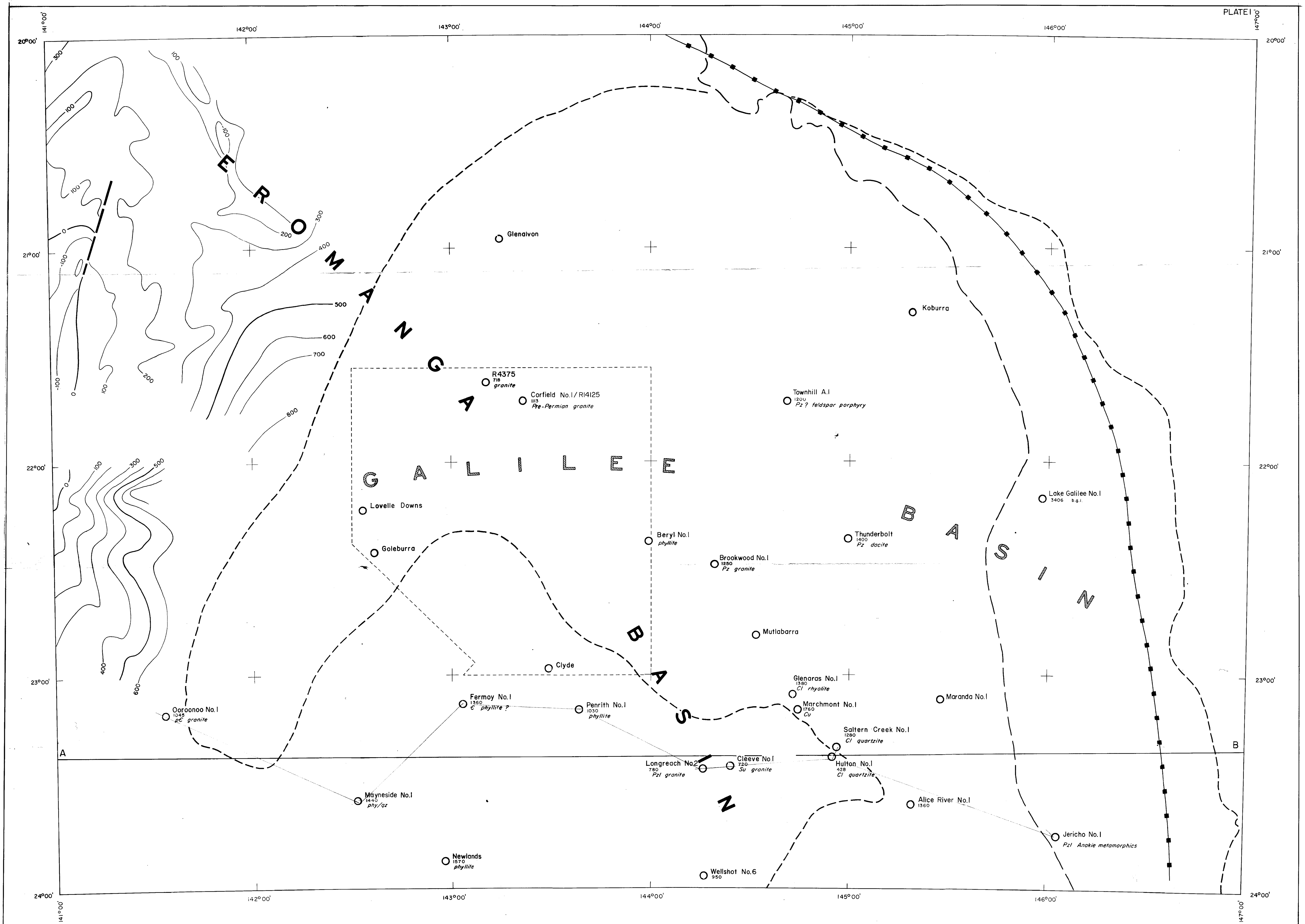
FIGURE 2

PLATE I



LEGEND

○	Water-bore or exploration well location
Fermoy No.1	Name of drill hole
780	Depth in metres below mean sea level to crystalline basement
Su granite	Probable age and rock type of crystalline basement based on water bores and exploration wells
—0—	Contours on the probable crystalline basement (in metres below mean sea level)
— —	Boundary of Eromanga Basin
— —	Boundary of Galilee Basin
— —	Fault
—■—■—	Approx. position of Belyando Feature

Pz	Palaeozoic
Cu	Upper Carboniferous
Cl	Lower Carboniferous
Su	Upper Silurian
Pzl	Lower Palaeozoic
€	Cambrian
p€	Precambrian
Qz	Quartzite
Phyl	Phyllite

NORTHERN EROMANGA BASIN AND GALILEE BASIN, QUEENSLAND

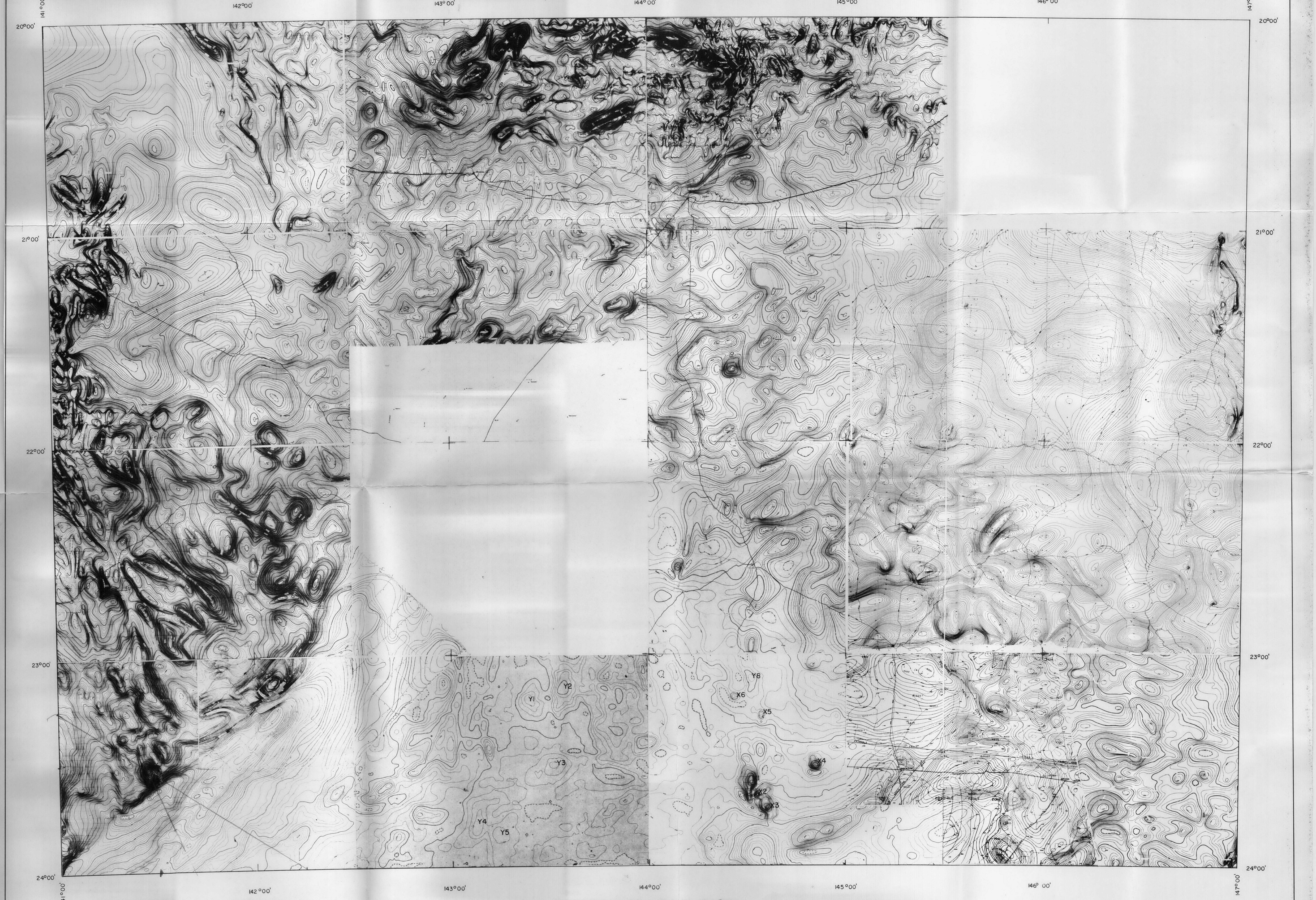
BASIN BOUNDARIES AND BASEMENT INFORMATION OBTAINED FROM WATER-BORES AND EXPLORATION WELLS

0 20 40 60 80 100 KILOMETRES
0 20 40 60 MILES

To accompany Record No. 1974/42

F54/B1 81

PLATE 2



NORTHERN EROMANGA BASIN

TOTAL MAGNETIC INTENSITY CONTOURS

1:1000 000

20 0 20 40 60 80 100 120 KILOMETRES

10 0 10 20 30 40 50 60 70 MILES

LEGEND

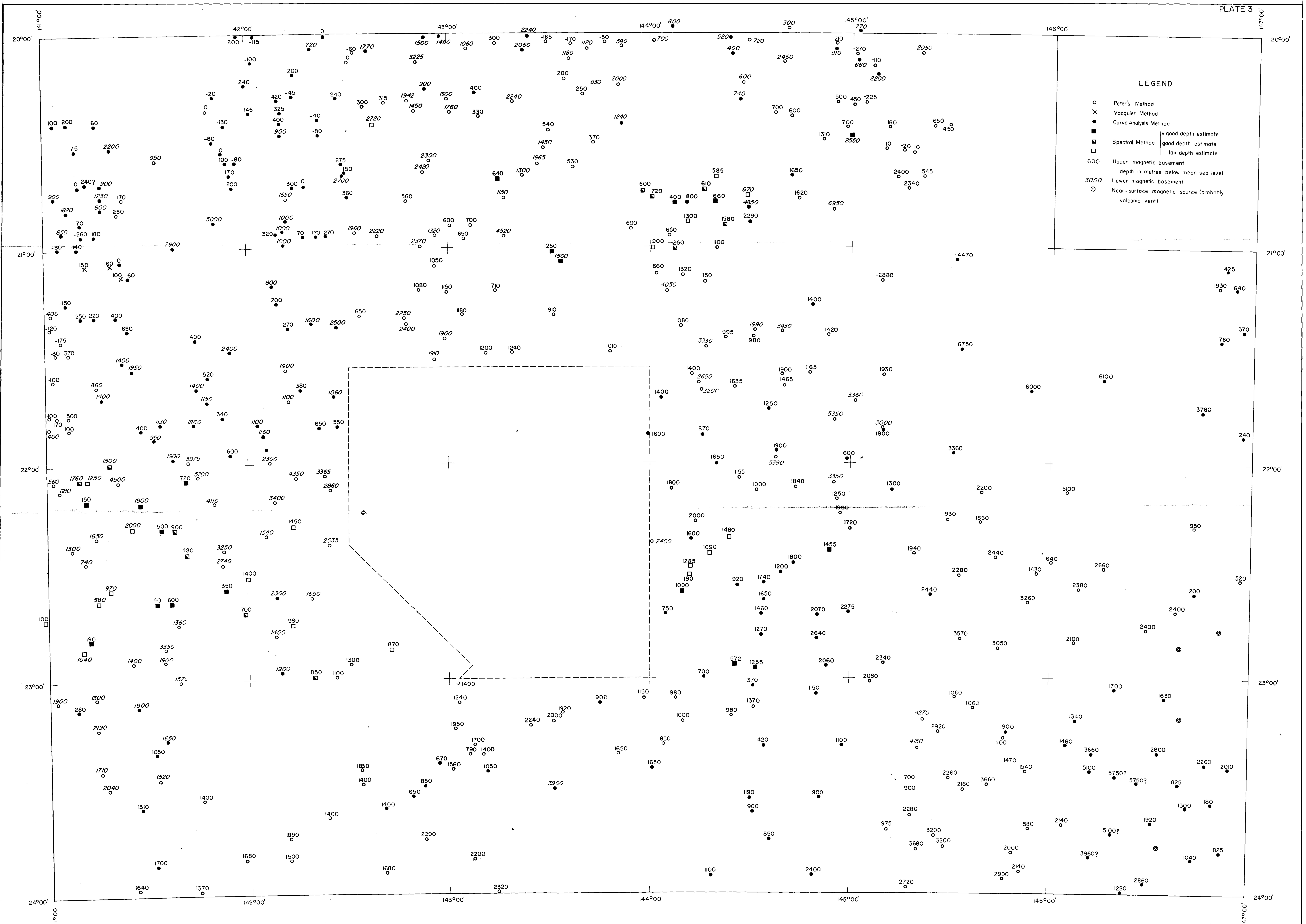
Y3, X5 Magnetic Anomalies

Contour Interval = 10 nT

F54/B1-87

To accompany Record No 1974/42

PLATE 3



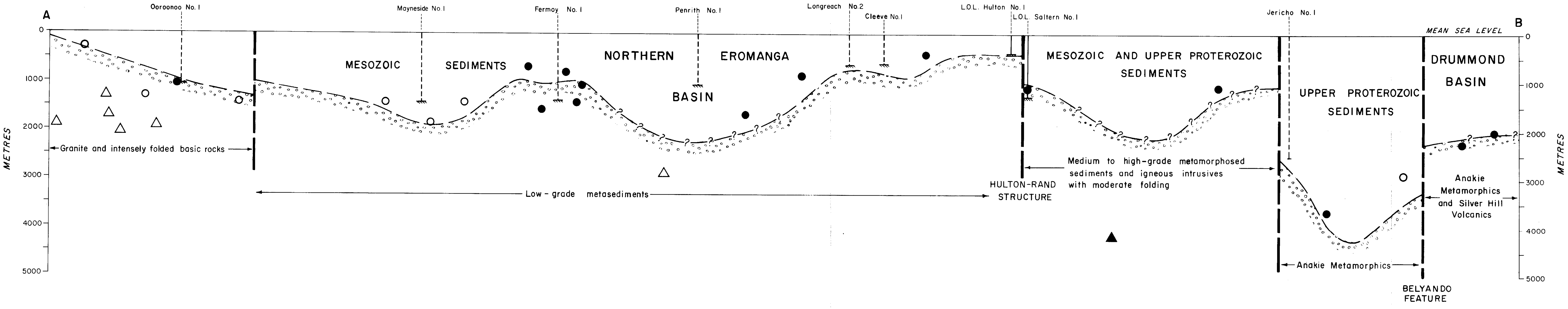
NORTHERN EROMANGA BASIN AND GALILEE BASIN, QUEENSLAND

RESULTS FROM DEPTH DETERMINATIONS

20 0 20 40 60 80 100 120 KILOMETRES

10 0 10 20 30 40 50 60 70 MILES

F54/BI-82

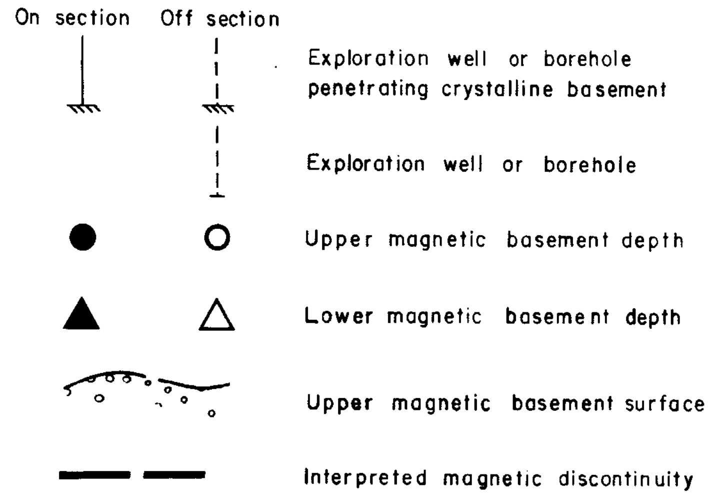


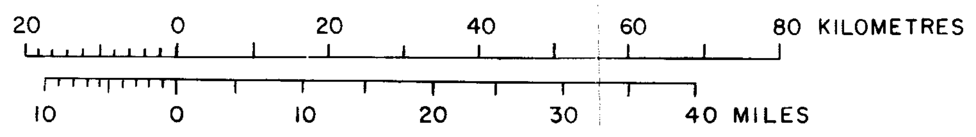
NORTHERN EROMANGA BASIN AND GALILEE BASIN, QUEENSLAND

SIMPLIFIED GEOLOGICAL CROSS-SECTION A-B

INTERPRETED FROM AEROMAGNETIC DATA AND DRILL HOLE INFORMATION

LEGEND





SECTION

Scale: $\frac{V}{H} = 20$

F54 / B1 - 88

NORTHERN EROMANGA BASIN AND GALILEE BASIN, QUEENSLAND

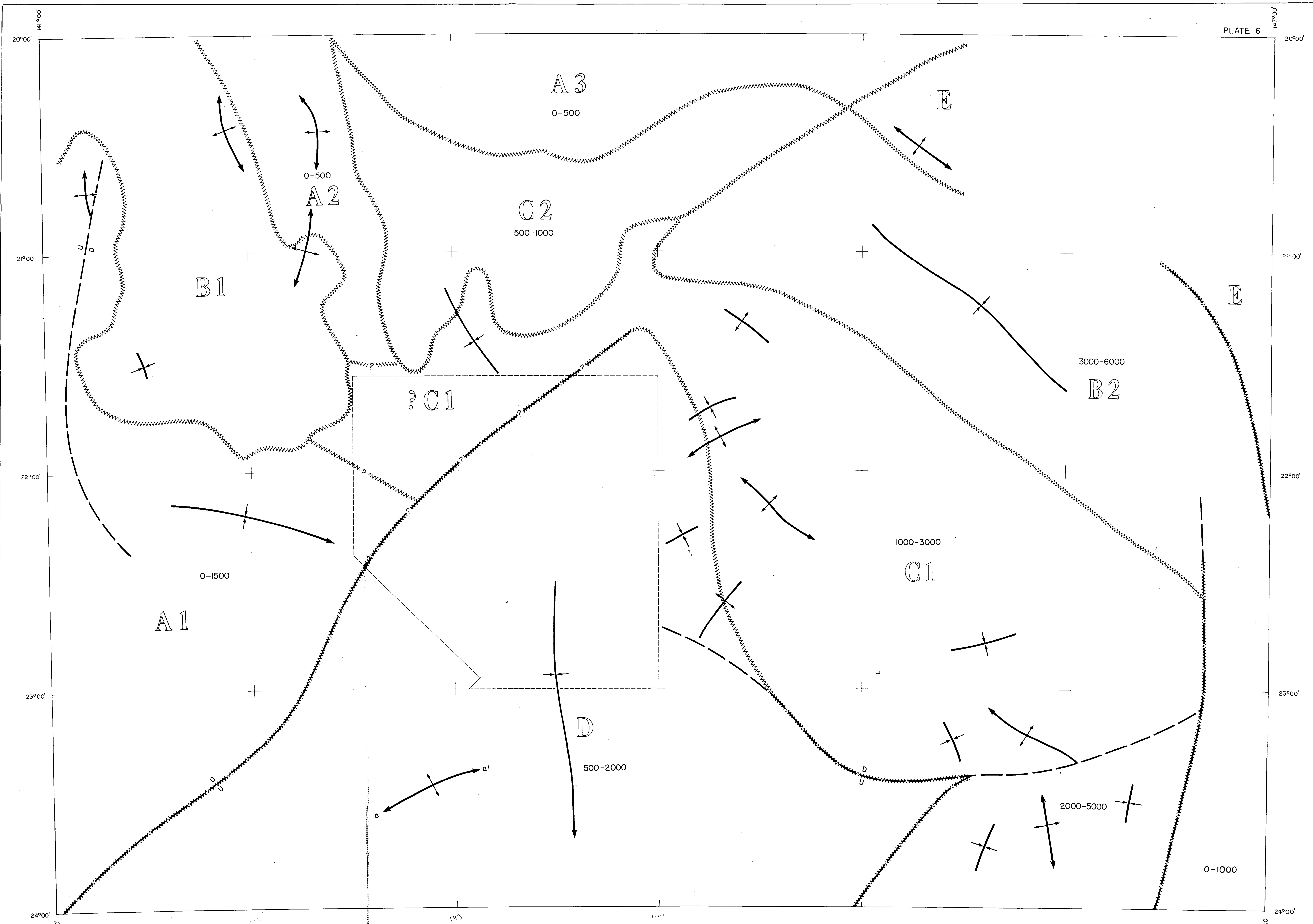
CONTOURS OF UPPER MAGNETIC BASEMENT

20 0 20 40 60 80 KILOMETRES

10 0 10 20 30 40 MILES

To accompany Record No. 1974/42

F54/B1-83



LEGEND

Boundary of Magnetic Province

Fault interpreted from magnetic data D-downward, U-upward displacement

0-1500 Range of depth to upper magnetic basement in metres below mean sea level

C1 Magnetic Province

Syncline interpreted from the upper magnetic basement contours

Anticline interpreted from the upper magnetic basement contours

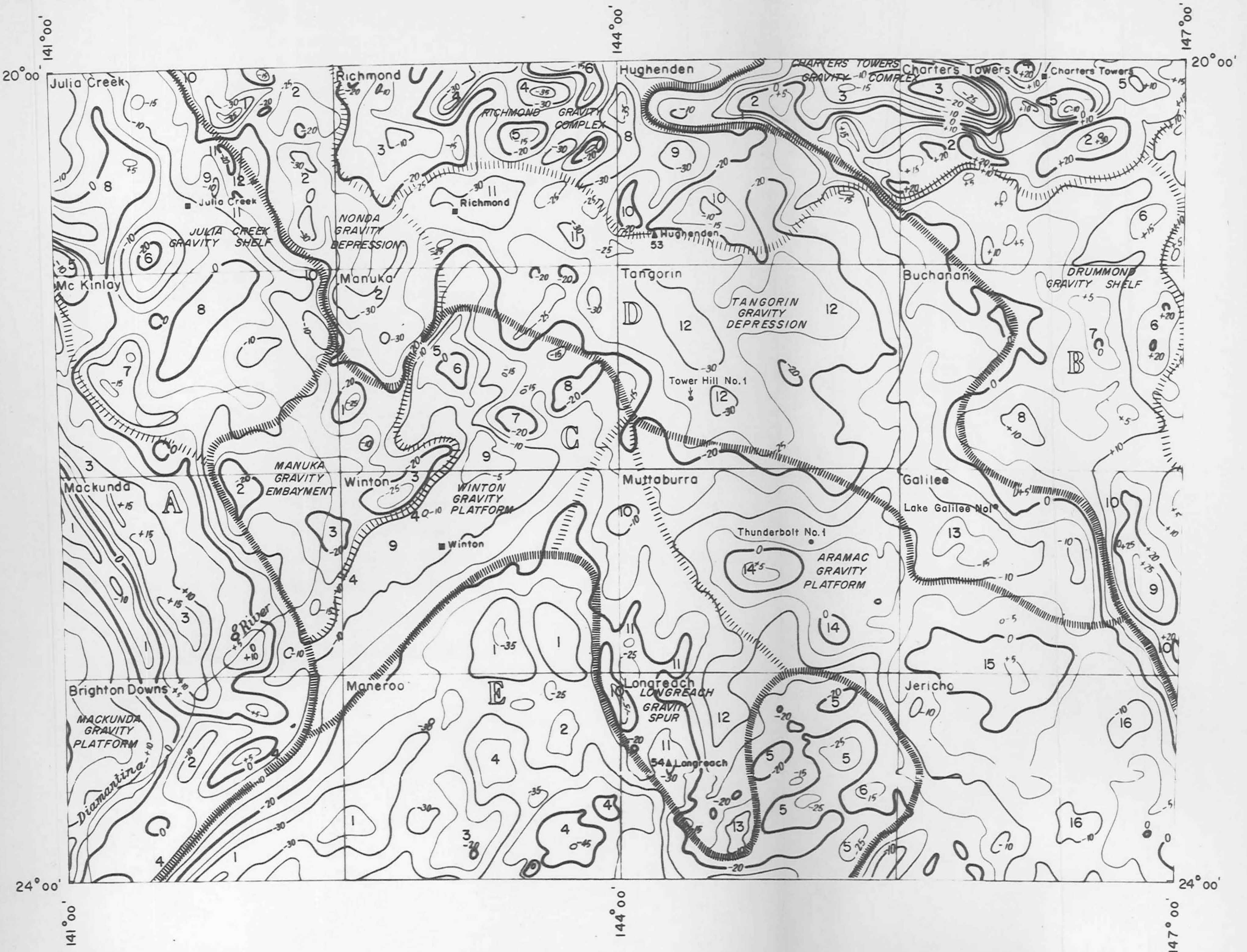
NORTHERN EROMANGA BASIN AND GALILEE BASIN QUEENSLAND

OUTLINES OF MAGNETIC PROVINCES AND UPPER MAGNETIC BASEMENT STRUCTURAL TRENDS

0 20 40 60 80 100 KILOMETRES
0 20 40 60 MILES

To accompany Record No.1974/42

F54/B1-84



	Isogals, values in milligals
▲ 53	BMR gravity pendulum station
Winton	1:250,000 map area
A	Gravity province
	Gravity province boundary
	Gravity unit boundary
15	Gravity sub-unit

A	Cloncurry Regional Gravity 'High'
B	Anakie Regional Gravity 'High'
C	Muttaburra Gravity Ridge
D	Flinder Regional Gravity 'High'
E	Thomson Regional Gravity 'High'

Bouguer anomalies are based on the observed gravity values at BMR pendulum stations:

No.50 Clermont	978,776·1 milligals	
No.51 Townsville	978,624·0	"
No.53 Hughenden	978,604·2	"
No.54 Longreach	978,790·2	"
No.55 Cloncurry	978,651·4	"
No.56 Boulia	978,793·2	"
No.57 Birdsville	979,003·0	"

For the calculation of Bouguer anomalies 1·9 g/cm³ has been adopted as an average rock density

Elevation datum - Queensland State

80 40 0 40 80 120 160 200 KILOMETRES

40 0 40 80 120 MILES

Reference - Division of National Mapping 40 miles to 1 inch topographic map

Contour interval 5 milligals

BOUGUER ANOMALIES AND GRAVITY PROVINCES

To accompany Record No. 1974/42
Based on F54/B1-43-3

F 54/B2-43-5