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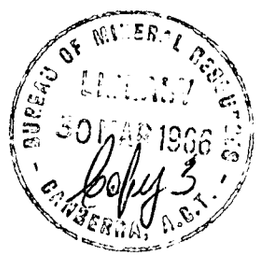
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS



RECORD No. 1966/12

BONAPARTE GULF BASIN AEROMAGNETIC SURVEY, 1958

by

J.H. QUILTY

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SUMMARY

The aeromagnetic survey results support the proposition of a large thickness of unmetamorphosed sediments in the Bonaparte Gulf Basin. Depths of up to 15,000 - 20,000 feet to the metamorphic or igneous Precambrian basement were estimated. The sparse anomalies of which depth estimates could be made precluded the construction of a detailed basement contour map. The areas of deep sedimentation have been delineated and the approximate thickness of sediments in the shelf areas is shown. Subsequent seismic work and drilling have confirmed the magnetic interpretation in the southern parts of the Basin.

1. INTRODUCTION

Between June and September 1958, an aeromagnetic survey was made by the Bureau of Mineral Resources (BMR) over the Bonaparte Gulf sedimentary basin in the Northern Territory and Western Australia. The location and extent of the survey is shown in Plate 1.

The purpose of the survey was to determine the basement structure of the basin and the thickness of the overlying sediments. Prior to the aeromagnetic survey, a limited amount of geophysical work had been done in the area and the geology of the area had been summarised by Traves (1955). Since 1958 a considerable amount of geological and geophysical work has been done, and is still continuing. The geological information to date has been compiled and reviewed by Drummond (1963), and a compilation and review of the geophysical work has been made by Bigg-Wither (1963).

This record describes the interpretation of the aeromagnetic survey data made largely in the light of information available at the time of the survey, but extracts from the above reviews have been studied to determine whether the interpretation conflicts with later information on the stratigraphy and basin structure.

Details of the survey operations are included in Appendix 1. Appendix 2 shows the method of interpretation used.

2. GEOLOGY

The following geological notes on the aeromagnetic survey area and adjacent areas are due mainly to Drummond (1963).

The Bonaparte Gulf Basin lies partly in Western Australia and partly in the Northern Territory and includes the Palaeozoic rocks bordering the Joseph Bonaparte Gulf. Excluding its seaward extension (the Sahul Shelf), it covers about 8000 square miles bounded by the Precambrian rocks of the Kimberley Block and the Halls Creek Mobile Zone (Plate 1).

Precambrian rocks in the area range from unmetamorphosed sediments to granites. Basic and other intrusives also occur; most of them may be Precambrian. Excluding thin Mesozoic or more recent deposits, Phanerozoic sediments have an estimated cumulative thickness of about 20,000 feet and range in age from Cambrian to probable Triassic, with only the Silurian period unrepresented. As much as 20,000 feet of sediments can be expected in some areas. Except perhaps for the uppermost few thousand feet, the sediments are predominantly marine. Shales are known to occur throughout the section although their proportion cannot be gauged at present.

The following igneous rocks have been mapped in the area:

(a) Dolerites, believed to be Precambrian, east of Port Keats Mission;

(b) Precambrian gabbros, south-west of the Kimberley Research Station in the southern part of the area;

(c) Local trachytes (?Phanerozoic);

(d) Rhyolites in two limited exposures in the Keep River area (?Phanerozoic);

(e) the Lamboo Complex of granites, granodiorites on the eastern and southern margins of the Basin, and basic intrusives;

(f) Antrim Plateau Volcanics (?Lower Cambrian basalts), which are widespread in the Ord-Victoria region.

The category of Precambrian metamorphosed sediments and lavas includes rocks assigned to the Halls Creek Metamorphics, which, in this area, are sandstones, quartzites, slates, and schists. Associated with these are the granites, granodiorites, and gneisses, probably of the Lamboo Complex. The category of Precambrian unmetamorphosed sediments includes undifferentiated low-grade metamorphics of probable Upper Proterozoic age, which form the Pincombe Range and underlie the area directly to the south. East of the Basin, the Precambrian sediments are mainly sandstones, shales, and dolomites, probably of the Upper Proterozoic Victoria River Group. In the south-west, most Precambrian rocks belong to formations that may be correlative with the Victoria River Group.

Cambrian rocks are widely distributed south of Bonaparte Gulf. In the Gulf area, Cambrian sediments crop out in a strip between Cambridge Gulf and Pincombe Range. They include sandstones and limestones within the Carlton Group with an estimated total thickness of more than 2000 feet. Devono-Carboniferous sediments include: Cockatoo Sandstone (maximum thickness about 4000 feet); the Burt Range Formation, which includes exposures of limestone, shale, and sandstone and which has a possible total thickness of 3000 - 4000 feet; Enga Sandstone, possibly 400 feet thick; Septimus Limestone, approximately 400 feet thick; Milligans Beds (shale) at least 5900 feet thick in Bonaparte Well No. 1 (Alliance Oil Development Australia N.L., 1964); Point Spring Sandstone, 300 - 600 feet thick; and Border Creek Sandstone, up to several thousand feet thick.

Rock units of doubtful validity or assignment include : Nigli Gap Sandstone, which is tentatively equated with the Cockatoo Sandstone and has maximum thickness of at least 1000 feet; Spirit Hill Limestone, about 500 feet thick; and Flapper Hill Sandstone, 140 feet thick.

Permo-Triassic sediments include Keep Inlet Beds, which are described as calcareous quartz sandstone, pebbles, and boulders of unknown thickness, and the Port Keats Group of sandstone, siltstone, and shale with an estimated thickness of about 2500 feet near Cape Ford.

The estuary of the Victoria River (Queens Channel) divides the Palaeozoic sediments into two areas - the southern and northern portions of the Basin. Cambrian, Ordovician, Devonian, Carboniferous, and probably Permian sediments crop out in the southern portion, but only Permian, Lower Triassic, and undifferentiated younger sediments are known north of Queens Channel.

Thin lateritised deposits of possible Mesozoic age form caps on mesas between Queens Channel and the north of the area. North of Queens Channel there are Tertiary laterites, and Quaternary deposits are widespread.

The Spirit Hill Well No. 1 was drilled to a total depth of 3003 feet (Westralian Oil Ltd. & Oil Development N.L., 1961). It penetrated 786 feet of Milligans Beds with some oil staining, then Septimus Limestone to a depth of 1215 feet, Enga Sandstone to a depth of 1561 feet, Burt Range Formation to 2506 feet, and Cockatoo Sandstone to the total depth. A possible fault was intersected at 2469 feet. Bonaparte Well No. 1 (Alliance Oil Development Australia N.L., 1964) drilled to a total depth of 10,530 feet, ended in Burt Range Formation. Bonaparte Well No. 2 (Alliance Oil Development Australia N.L., 1965) was drilled to a depth of 7008 feet. The age of the lowest formation penetrated was Upper Devonian to lower carboniferous.

Dealing with the possible shape and extent of the Basin, Drummond (1963, p. 81) says that the area of Phanerozoic sediments on land coincides closely with a general physiographic 'low', and that present-day marine 'lows' may correspond to sedimentary areas. The eastern side of the Basin may be controlled by a structure trending north-north-east and paralleling the Cockatoo and Moyle River Faults, the Pincombe High, and a gravity anomaly over Queens Channel (Plate 1). There are two consistent fault trends in the area: one, in the east and south, runs north-north-east and the faults are downthrown to the west; the other trend is shown by strike-faulting in the Carlton area, within the main Basin. The Carlton faults may, however, be normal faults with downthrow to the Basin and related to Basin subsidence.

The Pincombe High is considered to have had its origin in the Precambrian and has influenced deposition during the Cambro-Ordovician, Devonian, and later periods.

Folding appears to be rare and poorly developed in the Basin. All known steep dips and folds occur near faults or suspected faults. The most important folds are the Burt Range Syncline, the Spirit Hill anticline, and a syncline in Permian beds south of Port Keats (Plate 1). Lesser folds are reported near Nigli Gap and within the Burt Range Formation. The Burt Range Syncline is the largest fold structure in the area. The west limb is well defined, but the entire limb could be related to tilting of strata by downthrow on the Cockatoo Fault.

Drummond (1963, p. 1) says that the development of the Basin apparently resulted from non-compressive downwarp of one geotectonic block against another. Minor lateral movement of the blocks possibly took place and a subsidence pattern was maintained most of the time. Several lines of weakness between the blocks, on a north-north-east trend, yielded vertically on different occasions and may have tended to yield from west to east with the passage of time. Because of these movements, sediment thicknesses of different periods vary within the Basin, where the fault trends now conform to basement 'highs'. Most of the Basin today is sub-marine.

Deposition may have been widespread in the Lower Palaeozoic, but from Devonian to Permian or Triassic times, it was probably largely confined to the present-day Basin limits. Because the overall tectonic pattern was tensional, compressive folds will probably be absent in the area. In spite of this, prospects for the area are considered very attractive. Types of traps that may be present are reefs, erosional cut-offs, and to a lesser extent, fault traps. Anticlines may be absent or poorly developed because of the lack of compressive folding (Drummond 1963, p. 2).

3. INTERPRETATION OF SURVEY RESULTS

The central and north-western parts of the survey area are almost entirely free of magnetic anomalies (Plate 2) but from an examination of the recorded magnetic profiles, there are a small number of low-amplitude anomalies on which estimates of depth to magnetic basement rock can be made. The locations and estimates made are shown in Plate 2.

The magnetic basement is shown to be at depths of at least 10,000 feet and possibly up to 20,000 feet below sea-level. This magnetic basement could represent the surface of the Precambrian, in which case the depths indicate the thickness of Palaeozoic sediments. An alternative interpretation is that the magnetic basement corresponds to a metamorphic or igneous horizon deep within the Precambrian and that the base of the Palaeozoic lies at much shallower depth above an unknown thickness of non-magnetic Precambrian sediments.

These two interpretations cannot be fully resolved on the evidence of the magnetic data alone, but the magnetic character of Precambrian shallow 'basement' rocks near the edges of the Basin, supported by the results of seismic investigations discussed later, does support the proposition of magnetic basement being overlain by a substantial thickness of Proterozoic unmetamorphosed sediments with overlying Palaeozoic sediments.

Eastern part of Basin

East of Port Keats Mission, in the Moyle River area, lies a type area for a study of the magnetic basement character. The pattern of the aeromagnetic contour map is here one of rounded, irregularly oriented, low-intensity anomalies (not exceeding 50 gammas). None of the anomalies shows distinct lineation. The pattern generally is typical of a moderately magnetic metamorphic rock and is correlated with a partly metamorphosed ?Upper Proterozoic layer that crops out on the eastern and southern margins of the Basin.

To the north of this area, an anomaly-free zone surrounding Mount Greenwood is correlated with unmetamorphosed Proterozoic or granitic rocks of the type that crop out east of the margin of the Basin.

Offshore, north of Cape Scott, is a prominent anomaly with distinct northerly lineation, typical of basic intrusives. This anomaly appears to be the only indication that the basic intrusive rocks, which crop out and show distinctly in the magnetic pattern near the southern boundary of the Basin, do pass through the Basin at depth and emerge at Anson Bay.

Southward from the Moyle River area of magnetic anomalies to the mouth of the Victoria River lies another anomaly-free zone, which is correlated with the outcropping, partly-metamorphosed Proterozoic rocks, and between the Victoria River and the Keep River a number of isolated low-intensity anomalies are ascribed to the same geological horizon.

Thus the magnetic basement along the length of the eastern boundary of the survey area corresponds to a Proterozoic partly metamorphic rock layer, which contains contrasting magnetic elements in the vicinity of Moyle River, but is virtually non-magnetic or uniformly magnetic in the areas north and south of the Moyle River zone. Near Mount Greenwood, in the north, granitic rocks may contribute to the non-magnetic character

of the basement. In the extreme north, near Cape Scott, basic intrusives appear to be present at shallow depth.

East of longitude 129°45', the basement is shallow, the depth estimates being generally less than 5000 feet below sea level, but west of this longitude all reliable estimates of basement depth are much greater. The interpreted structure is a shallow platform between the Basin boundary and longitude 129°45', along which the basement surface drops sharply to the west. This structural interpretation is supported by gravity data (Bigg-Wither, 1963), which show a trough developed west of this longitude. The seismic results (Bigg-Wither, 1963) reveal consistently deep horizons at all points of measurement west of this longitude, e.g., 9500 feet south of Port Keats Mission, 12,000 feet off Tree Point in Hyland Bay, 11,200 feet west of Cape Hay and 13,200 feet north-west of the Cape, 9700 feet west of Tohindi Beach, and 17,500 feet near longitude 129°15', latitude 13°45'. South-east of Port Keats Mission, the seismic estimate is 8000 feet at Sugarloaf Range and 4250 - 5000 feet south of the Kurriyippi Hills.

The northern part of the survey area is crossed by the southern-most traverses of the Anson Bay aeromagnetic reconnaissance survey conducted by Adastra Hunting Geophysics Pty Ltd for Mines Administration Pty Ltd (1964). The estimated depths from the results of the survey are in agreement with those from the BMR survey in the area of longitude 130°00', latitude 13°30', each survey indicating depths in the range 2000 - 4000 feet. Northward, the traverses indicate that shallow basement persists westwards from the coastline to at least longitude 130°00'. A further traverse, by Aero Service Ltd (Woodside (Lakes Entrance) Oil Co. N.L. & Mid-Eastern Oil N.L., 1964), which extended north-westwards from longitude 130°30', latitude 13°00', showed shallow basement as far west as 129°30'.

The Adastra traverses between latitudes 13°30' and 14°00' showed shallow estimates east of longitude 129°45' (with one exception eight miles south of Cape Scott) and smooth profiles westward with no depth estimates shown.

The above aeromagnetic work also points to a structure of shallow basement east of longitude 129°45', and deep basement west of it.

Southern part of Basin

In the southern part of the survey area, the most prominent magnetic anomalies lie in the south-western corner, in the Deception Range area. There is little doubt that these intense lineated anomalies have their origin in basic intrusives within the Lower Proterozoic. Their magnetic expression terminates at the northern end of the tongue of Proterozoic outcrops that comprise the Cave and Pincombe Ranges. The magnetic influence of Cambrian volcanics is seen in the southern part of the area. In one sense, the presence of the Cambrian volcanics assists in determination of Palaeozoic sedimentary thickness, but in the deeper parts of the Basin it leads to some doubt as to whether estimated depths refer to a Palaeozoic or a Proterozoic geological horizon.

One of the most convincing arguments in favour of the existence of a large sedimentary thickness in the central part of the survey area is the absence of anomalies due to the abovementioned basic intrusives. South of Bonaparte Gulf, the basic intrusives crop out continuously along the eastern and southern boundaries of the rectangular Kimberley Basin and it is possible that they extend northward beneath the Gulf. If these are at shallow depth, they would certainly have prominent magnetic expression; the lack of these lineated-type anomalies is a good indication of a deep Lower Proterozoic basement.

The depth estimates in the southern part of the survey area generally conform with the structure inferred from the known geology. Shallow depths are confined to the outcrops of the Proterozoic or to Lower

Palaeozoic outcrops marginal to the Basin. For example, in the "Carlton Hill" area, the shallow basement does not extend northward beyond the Cambro-Ordovician outcrop that borders the Proterozoic. The outcrop of the Cave-Pincombe Ranges is well delineated by the magnetic results. Within the embayment of Palaeozoic sediments surrounding Mount Septimus, the deepest estimate was 4400 feet, near the edge of the embayment.

Western part of Basin

The western boundary of the survey area does not quite reach the Proterozoic outcrops at Cambridge Gulf. Some estimates of shallow depth were obtained over Palaeozoic outcrops on the eastern side of Cambridge Gulf. A second magnetic horizon possibly exists in this area, within the Palaeozoic sequence. For information on the magnetic character of basement rocks on the western side of the Basin, attention is drawn to the following reconnaissance aeromagnetic traverses.

The aeromagnetic survey over the north-west continental shelf carried out by Aero Service Ltd for Woodside (Lakes Entrance) Oil Co. N.L. and Mid-Eastern Oil N.L. (1964) included several traverses flown north-north-west from Wyndham over Proterozoic outcrops on the western side of Bonaparte Gulf. The magnetic profiles are continuously disturbed by anomalies originating from shallow basement (estimated to be less than 1000 feet below sea level, with the exception of an area about 20 miles north-north-west of Wyndham where basement depths of up to 7000 feet were estimated in the vicinity of Upper Proterozoic sediments).

North of the coastline, shallow basement persisted along a traverse near longitude 127°15', but east of longitude 127°30' the basement deepened offshore to greater than 10,000 feet and possibly 20,000 feet near latitude 13°30'.

Central part of Basin

The recorded magnetic profiles in the central and northern parts of the survey area disclosed very few anomalies on which depth estimates could be made. Particular attention was given to an area in the vicinity of longitude 129°00', latitude 14°40', where a single traverse of seaborne gravity measurements indicated a possible gravity 'high'. In this area, a magnetic anomaly of very low intensity produced a depth to magnetic basement rock of the order of 10,000 feet. In the north-western part of the survey area at approximately longitude 128°40', latitude 14°15', a more intense anomaly, which is evident on the aeromagnetic contour map, is estimated to originate from a magnetic basement surface at 15,000 - 20,000 feet. No other estimates lie between the two mentioned above, nor between the location of the 10,000-ft estimate and the eastern limit of the Basin as defined by outcrop. North of Bonaparte Well No. 1 there is an estimate of 15,000 - 20,000 feet. South of latitude 15°00', there are isolated depth estimates in the 3000 - 6000 feet range, and an estimate of 7500 feet near the junction of Sandy Creek and Red Bank Creek. The area of possible shallow basement east of Cambridge Gulf has already been discussed.

Four near-surface depth estimates shown 'boxed' in Plate 2, are ascribed to an intermediate magnetic horizon of unknown origin. They are not considered significant in the delineation of Basin structure.

4. CONCLUSIONS

In assigning a geological age to the magnetic basement, which is interpreted to lie at depths of up to 20,000 feet below sea level in the central part of the Basin, and to the overlying formations, the following facts are to be reconciled.

The strongly magnetic character of Lower Proterozoic basic intrusives on the southern margin of the Basin suggests that they would have prominent expression if they were present at shallow depth within the Basin. By contrast, the partly metamorphic formations, assigned to the ?Lower Proterozoic, cropping out on the eastern margin of the Basin, vary from weakly magnetic to non-magnetic. The Upper Proterozoic sediments that crop out east of the Basin and the Palaeozoic sediments within it are presumed to be non-magnetic, but the magnetic influence of Cambrian volcanics is seen on the Basin's southern margins.

The conclusion is reached that the magnetic basement corresponds to that horizon within the Lower Proterozoic which comprises basic intrusives and metamorphics of a degree sufficient to produce magnetic contrasts measurable at the level of observation. The overlying non-magnetic material would comprise Lower and Upper Proterozoic sediments and part metamorphics, and Palaeozoic sediments. The Proterozoic is believed to account for the major part of the section, though there is no magnetic evidence for this proposition.

5. REFERENCES

ALLIANCE OIL DEVELOPMENT AUSTRALIA N.L.	1964	Bonaparte Well No. 1 completion report*.
	1965	Bonaparte Well No. 2 completion report*.
BIGG-WITHER, A.L.	1963	Compilation and review of the geophysics of the Bonaparte Gulf Basin, 1962. Bur. Min. Resour. Aust. Rec. 1963/165.
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MINES ADMINISTRATION PTY. LTD.	1964	Anson Bay aeromagnetic survey*.
TRAVES, D.M.	1955	The geology of the Ord-Victoria region, Northern Australia. Bur. Min. Resour. Aust. Bull. 27.
WESTRALIAN OIL LTD. and OIL DEVELOPMENT N.L.	1961	Spirit Hill Well No. 1 completion report*.
WOODSIDE (LAKES ENTRANCE) OIL CO. N.L. and MID-EASTERN OIL N.L.	1964	A reconnaissance aeromagnetic survey over the Rowley Shoals, Scott Reef, and Sahul Bank areas of the north-west continental shelf of Australia*.

* Unpublished report on a Commonwealth-subsidised operation.

APPENDIX 1

Operational details

Staff

Party leader	:	J. K. Newman
Geophysicists	:	W.A.L. Forsyth
		L. Cookson
		Miss C. Leary
Assistants	:	P. Grimsley
		F. Clements
		G. Walker
		D. Walker
		L. Geenan
		K. Mort
		C. Braybrook
		H. Hertzog
		H. Voss
Primary equipment	:	Magnetometer ASQ-1
Ancillary equipment	:	Shoran, strip camera, instrument camera.

Control

Altitude	:	1500 feet a.s.l.
Line Spacing	:	1 mile
Speedomax chart speed	:	3 inches/minute
Chart sensitivity	:	500 gammas full scale deflection
Arc flying		

APPENDIX 2

Method of Interpretation

Depth estimation

The parameter used was the horizontal extent of the maximum gradient of the anomaly. This parameter was multiplied by a factor of 1.5 to give the depth.

This empirical relation is based on the properties of the anomaly produced by an elongated vertically-sided prismatic body of magnetised material.

The depth estimates, classed as reliable, may be in error by 15%. Unreliable estimates, which are quoried, may be in greater error.

PLATE I

GEOLOGICAL STRUCTURE

PROVEN OR PROBABLE FAULT

INTERPRETED FAULT

LARGE OR MODERATE AMOUNT OF THROW

SMALL OR UNKNOWN AMOUNT OF THROW

APPROXIMATE STRUCTURAL BOUNDARIES

SYNCLINAL AXIS — ANTICLINAL AXIS

(GEOLOGY FROM TRAVES (1955) AND DRUMMOND (1963))

JOSEPH BONAPARTE GULF

BONAPARTE GULF BASIN

KIMBERLY BLOCK

MOBILE ZONE

HALLS CREEK

CAMBRIDGE GULF

QUEENS CHANNEL

WESTERN AUSTRALIA
NORTHERN TERRITORY

PINCOMBE HIGH

IVANHOE FAULT

BURT RANGE SYNCLINE

SPIRIT HILL ANTICLINE

NIGLI GAP FAULT

COCKATOO

Port Keats

WYNDHAM

Carlton Hill HS

Ivanhoe HS

Ninbing HS

Legune HS

Spirit Hill No 1

Auvergne HS

Daly River

Moyle River

Fitzmaurice River

Ord River

Keep River

Victoria River

128°

130°

14°

15°

16°

10 0 10 20 30 40

MILES

Bureau of Mineral Resources,
Geology and Geophysics. January, 1963.

D52/B1-38

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To accompany Record No 1966/12

JOSEPH BONAPARTE GULF A/B, 1958 - QUILTY

PLATE 2

AIRBORNE SURVEY, BONAPARTE GULF, WA-NT 1958

TOTAL MAGNETIC INTENSITY

MEASURED BY AIRBORNE MAGNETOMETER

AND

BASEMENT CONTOURS

INTERPRETED FROM MAGNETIC DATA

MILES 5 0 5 10 15 20 25 MILES

KILOMETRES 5 0 5 10 15 20 25 30 35 KILOMETRES

MAGNETIC CONTOUR INTERVAL 20 GAMMAS

MAGNETIC BASEMENT CONTOURS AND DEPTH ESTIMATES ARE SHOWN IN FEET

GEOPHYSICAL DATA

- Magnetic contours with flight-line intersections
- Magnetic "Low"
- Possible fault
- •7000 Magnetic basement depth estimate
- •[1400] Intermediate magnetic horizon depth estimate
- •4000? Doubtful magnetic basement estimate
- 5000 Basement contour

GEOLOGICAL DATA

- Basement outcrops
- Volcanics

TOPOGRAPHICAL DATA

- River or creek
- Highway or main road
- Secondary road
- Road or track
- Named place
- Homestead
- Hill feature
- Swamp
- Mine
- Aerodrome or landing ground
- Borehole

LOCATION DIAGRAM

Darwin, Perth, NT, WA, SA, QLD, NSW, VIC, CAPE SCOTT, MEDUSA BANKS, PORT KEATS, CAMBRIDGE GULF, AUVERGNE, 13°00', 14°00', 15°00', 16°00', 125°30', 126°00', 126°30'

▨ = Area covered by airborne survey

EXPLANATORY NOTES

This map was compiled from an airborne survey of the Bonaparte Gulf sedimentary basin carried out by the Bureau of Mineral Resources in 1958. The object of the survey was to delineate magnetic anomalies indicating the depth and principal structural features of the basin.

The total magnetic intensity was recorded by an airborne magnetometer in a DC 3 aircraft flown at an altitude of 1500 feet above sea level. The height of the aircraft was controlled through a radio altimeter. A Shoran navigation system was used to control a flight-line spacing of one mile. The lines were flown in a series of arcs about selected ground control beacons.

The data have been corrected for a regional gradient of 10·5 gammas per mile in a direction south.

Geophysical Branch, Bureau of Mineral Resources, Geology and Geophysics.

TO ACCOMPANY RECORD No. 1966/12

D52/BI-28

TIMOR SEA

ANSON BAY

JOSEPH BONAPARTE GULF

CAMBRIDGE GULF

DEEP BASEMENT

POSSIBLE SHALLOW BASEMENT

SHALLOW BASEMENT

BASEMENT OUTCROP

ABORIGINAL RESERVE

DALY RIVER

MEDUSA BANKS

Bonaparte No1 Well

Bonaparte No2 Well

Spirit Hill No1 Well

NIGLI GAP