Open File Envelope No. 4314

PEL 5 & 6

EROMANGA, COOPER AND WARBURTON BASINS

1980 BOOLKA AERIAL MAGNETIC/RADIOMAGNETIC SURVEY TOOLACHEE AND NAPPACOONGEE–MURTEREEE BLOCKS

FINAL REPORT

Submitted by

South Australian Oil and Gas Corp. Pty Ltd

1981

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PRIMARY INDUSTRIES AND RESOURCES SA

ENVELOPE 4314

TENEMENT: PELs 5 and 6, Toolachee and Nappacoongee-Murteree Blocks; Eromanga, Cooper and Warburton Basins

TENEMENT HOLDER: South Australian Oil and Gas Corp. Pty Ltd (operator), Santos Ltd, Delhi Petroleum Pty Ltd, Vamgas Ltd and Pursuit Oil NL

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END OF CONTENTS

SOUTH AUSTRALIAN OIL & GAS CORPORATION PTY. LTD.
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Our Ref.
5.CPOOO.AEOl

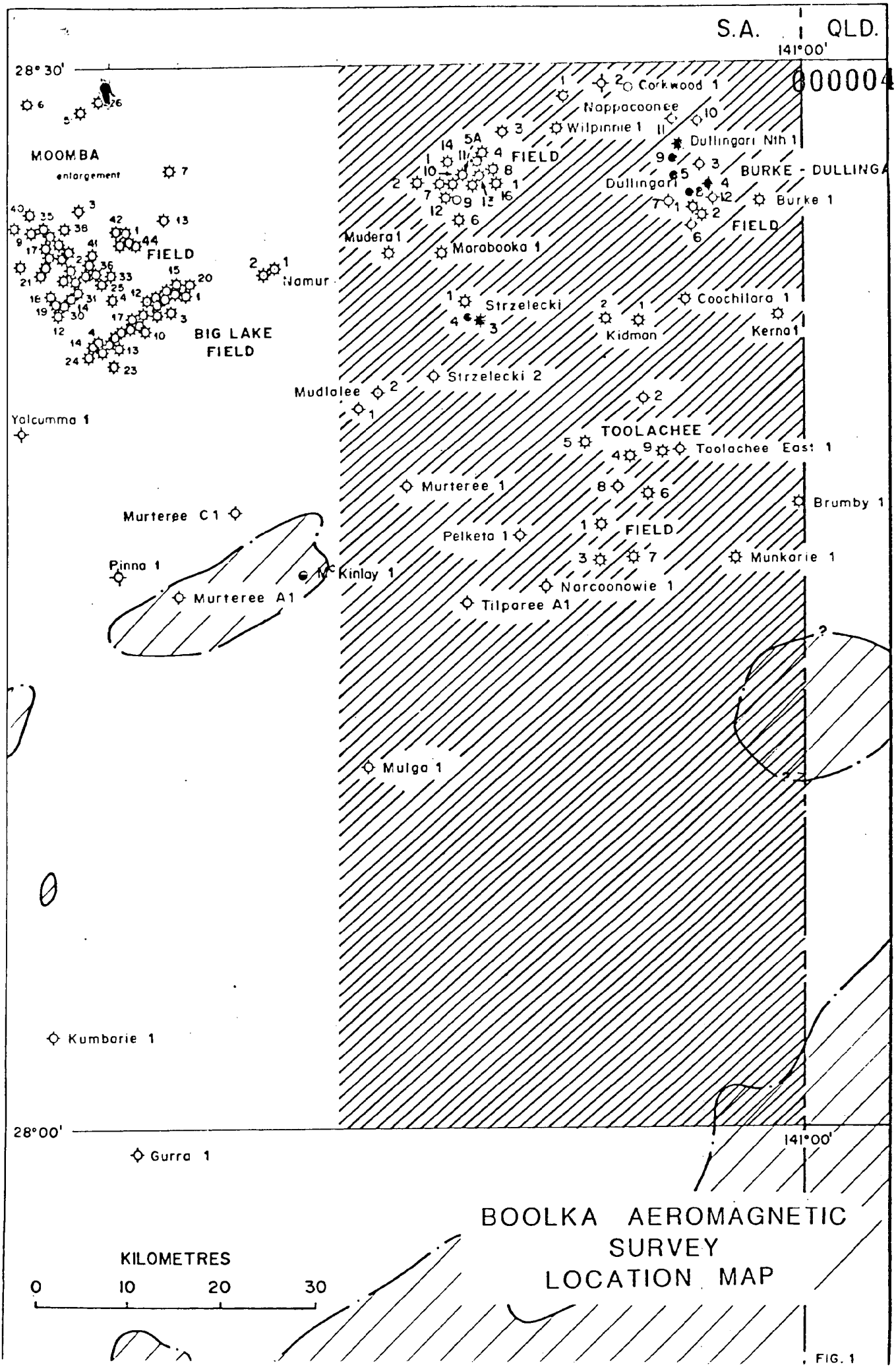
OPEN FILE

BOOLKA AEROMAGNETIC SURVEY
COOPER BASIN, SOUTH AUSTRALIA,
FLOW N FOR

S.A. OIL AND GAS CORPORATION

11TH-30TH AUGUST 1980

CONTRACTOR : GEOEX PTY. LTD.
50 MARY STREET,
UNLEY S.A. 5061


S.A.
QLD.
141°00'
28°30'
000004
MOOMBA
enlargement
FIELD
BIG LAKE
FIELD
Namur
Yolcumma 1
Corkwood 1
Nappacoonee
Wilpinnie 1
Dullingari Nth 1
FIELD
BURKE - DULLINGA
Dullingari
Burke 1
FIELD
Mudera 1
Marobooka 1
Strzelecki
Coochilara 1
Kidman
Kerna 1
Strzelecki 2
Mudlalee
TOOLACHEE
Toolachee East 1
Murteree 1
Brumby 1
Murteree C1
Pelketa 1
FIELD
Munkarie 1
Pinna 1
Kinlay 1
Murteree A1
Narcoonowie 1
Tilparee A1
Mulga 1
Kumbarie 1
28°00'
141°00'
Gurra 1
KILOMETRES
0
10
20
30
BOOLKA AEROMAGNETIC
SURVEY
LOCATION MAP
FIG. 1

1. Coordinates of Area

Latitudes: 28° 00' 00" S to 29° 00' 00" S

Longitudes: 140° 30' 00' E to 141° 00' 00" E

Equivalent to Dullingari and Bollard 1:100,000 standard sheet areas

2. Survey Specifications

1)	Survey type	:	Magnetic and Radiometric
2)	Survey location	:	Cooper Basin, S.A.
3)	Total line length	:	4403 km
4)	Flight line spacing	:	1500 metres
5)	Flight line direction	:	East-West
6)	Tie line spacing	:	12 km
7)	Detector height	:	150 metres
8)	Type of aircraft	:	Cessna 185E
9)	Scale of final map presentation	:	1:100,000
10)	Magnetometer sample rate	:	0.8 seconds
11)	Data Sample interval	:	38m
15)	Contour interval	:	2nT

3. Equipment Specifications

Geometrics G803 proton precession magnetometer with towed bird sensor

Geoex magnetic tape digital acquisition system

Century 444. 6 channel light beam recorder

Kontron, 3 pen, 25cm wide strip recorder

Geoex Intervalometer

Vinten 16mm ground tracking camera

Bonzer Mark 10 radar altimeter

McPhar Spectra II Spectrometer

McPhar 1024 channel Analyser, 24 litre
NaI (Tl) detector

Digital recording on 9 track 800 bpi industry standard magnetic tape

Ground station - digital proton diurnal magnetometer, crystal clock controlled with analogue recorder

4. Final Data Supplied

Plates 1,2	Contours of residual total magnetic intensity (2 sheets)
Plates 3,4	Contours of total radiometric intensity (2 sheets)
Plates 5,6	Flight path plots (2 sheets)
Plates 7 to 11	Magnetic intensity stacked profiles (5 sheets)
	Original flight chart records in book form
	½"magnetic tape containing located survey data

Plates 1 to 6 Are enclosed in pocket.

5. Data Collection

The area covered is illustrated in figure 1.

The nominal flight line separation was 1500 metres and the nominal tie line bearing was 0 degrees. The observed mean sample interval in the flight direction was 38 metres achieved with a nominal aircraft speed of 100 knots and a reading interval of 0.8 seconds. The mean sensor height was 150 metres using a towed bird configuration. The magnetometer accuracy was 1.0 nT and the resolution 0.5 nT.

Navigation control was by reference to photo mosaics and/or photo strips. Flight path analysis was achieved by identification of 16mm ground tracking photographs on the navigation control. The ground

tracking camera was operated at a rate of one camera frame for two data samples such that successive frames overlap. An attempt was made to recover fiducials at intervals of 1.0 kimometre and only recovered fiducials are shown on the map. The survey was flows using 1:88,000 aerial photographs supplied by S.A. Department of Lands. During processing, the photo mosaic was controlled using the Australian metric grid control points (Plates 5,6).

6. Data Presentation

The magnetic data is presented as residual magnetic intensity after subtracting the International Geomagnetic Reference field from the observed Total Magnetic Intensity (Plates 1,2). The data was corrected for diurnal drift using a base station monitor at Moomba airfield.

Latitude	28.106 S
Longitude	140.198 E
Altitude	38 metres

The sensor height was 3 metres. The adopted value for this location was 56143 nT.

Final detailed levelling of the data was performed using tie-line crossover analysis. A simple 3 point filter was applied to the data which was then gridded and contoured using a 100m by 100m mesh cell and a 2 nT interval.

Stacked magnetic profiles are presented in plates 7 to 11.

Total count radiometric data was contoured using an interval of 20 counts per second. (Plates 3,4)

7. Data Magnetic Tape

The reduced survey data is also stored on a standard 9 track 800 bpi magnetic tape. The format of the tape is as specified by the S.A. Department of Mines and Energy specifications for magnetic tape storage of airborne data as at 1st July 1980. It should be noted that data locations on this tape refer to a scale of 1:100,000 plotted on an Australian Metric grid.

16th July 1981

INTERPRETATION OF AN AIRBORNE MAGNETIC AND RADIOMETRIC SURVEY IN THE SOUTHERN COOPER BASIN, S.A.

(1980 BOOLKA AEROMAGNETIC SURVEY)

for

THE SOUTH AUSTRALIAN OIL AND GAS CORPORATION, LTD.

by

C.G. Anderson

February, 1981

CONTENTS

LIST OF FIGURES

Plans

1.0 INTRODUCTION

At the request of the South Australian Oil and Gas Corporation (SAOG), an interpretation of a combined aeromagnetic and radiometric survey of a portion of the South Australian section of the southern Cooper Basin was undertaken. The survey was flown by Geoex Pty. Ltd. under contract to the SAOG Corporation in August, 1980 as part of an initial appraisal of the southern half of the survey area for potential hydrocarbon accumulations. The potential of the area under investigation had previously been downgraded because of the relative paucity of Permian age sediments, the source and reservoir rocks for the major gas fields of the Cooper Basin. The recent discovery of economic hydrocarbon accumulations in the Jurassic sequence, however, has generated new interest in areas of marginal Permian development within the basin.

The principal aim of the magnetic interpretation was the determination of the geophysical expression of major basement structures. Known hydrocarbon accumulations in the northern half of the area (Toolachee, Strzelecki, Della and the Burke-Dullingari fields), are associated with major anticlinal structures. Although the relationship between detailed structure and hydrocarbon accumulations is complex, it was considered that the magnetic method, possibly in conjunction with the radiometric data and existing gravity data, may offer some insight into any similar major structures in the southern half of the survey area.

During the course of the interpretation, discussions were held in the Adelaide office of SAOG with Messrs. D. Roberts and G. Lucke, concerning the nature of potential target structures and the availability of information in the area, particularly gravity and seismic data.

.../2.

2.0 SURVEY AREA

The survey (Figure 1.) covers a portion of the southern Cooper Basin, bounded by latitudes 28 and 29 degrees south and longitudes 140.5 and 141 degrees east. The northern half of the area contains several major accumulations of Permian gas and has been investigated with relatively intense levels of seismic surveying. Figure 1. includes a summary of the major structures in the Cooper Basin and illustrates the consistent association between major anticlinal structures and hydrocarbon occurrence. Within the area under consideration, the Nappacoongee, Della and Strzelecki fields occur on the north-east trending Nappacoongee Structure, the Toolachee field occurs on the north-south trending structure of the same name and the Burke-Dullingari field occurs near the convergence of the Wolgolla and Tickalara anticlinal features.

The southern half of the survey area straddles the southern margin of the Permian Cooper Basin. Major basement highs are indicated on the eastern margin of the survey area, near the southern end of the 'Toolachee Trend', and in the extreme south-eastern corner. No other information on structures within the southern half of the survey area is available.

3.0 SURVEY SPECIFICATIONS AND DATA QUALITY

3.1 Airborne Survey

The airborne magnetic and radiometric data were acquired on lines oriented east-west at a nominal separation of 1 500 metres and ground clearance of 150 metres. Contour plans of total magnetic intensity (Plan 1.) and total count gamma radiation values (not presented) were generated after the application of a 3-point filter and interpolation to a 100 by 100 metre grid used for contouring. In addition to the contour plans, analog charts of magnetic field and four-channel radiometric data, stacked profiles of reduced magnetic values were available for the interpretation.

.../3.

3.2 Gravity and Seismic Data

Gravity data have been acquired along many of the seismic lines surveyed in the area and a contour plan of gravity data for the area of the airborne survey was available. The density of gravity stations is quite high in the northern area of closely-spaced seismic surveying, but in the southern half of the area, data are less regularly spaced and contouring of gravity features is much more subjective.

Seismic coverage north of (approximately) 28 degrees 35 minutes latitude has been compiled by Delhi International Oil Corporation and a structural interpretation of depth to the basal-Permian (?) "P" Horizon in this portion of the survey area was also available.

3.3 Data Quality

The general noise level of the aeromagnetic data is approximately ≠ 2 to 2.5 nanoTeslas, which is above current accepted levels. Some relief evident on the analog charts is apparently due to very near surface sources, as it occurs across several data values, and this undoubtedly contributes to the high 'noise' level. The 'noise' level detracts significantly from the accuracy of depth determinations made from the magnetic data and it is suggested that if any future surveys are contemplated, it may be necessary to increase the ground clearance to reduce the effects of near surface sources. The crystal size and sampling rate (0.8 secs.) are sufficient to ensure adequate sampling of radiation levels.

NB Geoex

No quantitative information on the accuracy of gravity data was sought as the data were acquired over a number of years and presumably by various operators. The general accuracy of topographic levelling required for seismic surveys, however, is such that the elevation values should have introduced little error in the gravity reductions. As mentioned above, the major problem with interpreting the gravity data is allowance for areas of limited data, where contouring becomes highly subjective.

.../4.

4.0 INTERPRETATION

4.1 Qualitative Features of the Magnetic Field

The contour plan of total magnetic field intensity is presented in Plan 1. Magnetic relief in the northern half of the area is restricted to three major features - a northern anomaly in the vicinity of the Nappacoongee trend, a central anomaly in the Toolachee area and a partly defined anomaly on the eastern margin of the survey area.

A major change in basement lithology is indicated in the magnetic data for the area south of (approximately) $28^{0}30'$ latitude. Magnetic relief in this region is more consistent over the area with a large central area of complex anomalies flanked to the east and south-west by areas of slightly more intense, narrower features which appear to be due to shallower source material. In terms of basement lithologies, it is likely that the southern half of the survey area represents a more regionally metamorphosed and magnetite rich "gneissic" basement than low susceptibility material comprising the bulk of the northern half of the survey area. At first inspection, the increased relief in the south, particularly the central complex zone, does not appear to be related directly to a pronounced decrease in depth to magnetic material.

The magnetic expression of the known major structures in the northern half of the area is highly unpredictable. Of the major fields outlined above, the Toolachee and Nappacoongee areas have similar, reasonably coincident magnetic expressions compatible with a basement 'high' due to more resistant, magnetic basement.

The magnetic high in the latter area extends to the south-west and incorporates the Della area, although the magnetic expression is much weaker and the correlation with the known structure is much less evident. The Strzelecki and Burke-Dullingari Fields, however, occur in areas of no substantial magnetic relief at all and it is immediately apparent that the structures in these areas are not related to basement lithology variations.

The situation becomes further complicated on consideration of the magnetic data on the eastern margin of the northern survey area. The solitary magnetic feature in this region occurs within the Tennapera Trough and the structure tested by the Brumby No. 1 well to the south of this magnetic high is not indicated in the magnetic data.

4.2 Depth to Basement

It is apparent that in the northern half of the survey area at least, little information on basement structure over the area can be obtained from the magnetic data. It is, however, worthy of note that in the Toolachee and Nappacoongee areas, the magnetic data appear to reflect structural highs which are due to more magnetic, more resistant basement lithologies.

The depth values and contours presented in Plan No. 2 were calculated from average values for anomalies using graphical estimators on suitable profiles for each anomaly considered. The number of reliable values obtained is small, due to the lack of relief in the northern half and occasional interference between adjacent features in the southern half. Consequently, the contouring is subjective to a large extent and is based on considerations of known structures, gravity data and the qualitative features of the magnetic field.

In spite of these limitations, the interpreted depth values do give some insight into the structural distribution of magnetic basement in the southern half of the survey area. The major features of the inferred distribution are:

i. The anticlinal 'Toolachee Trend' apparently continues in a north-south direction until merging with the 'shallow' basement area in the south-eastern corner of the survey area.

ii. No evidence for shallow magnetic basement is evident in the central, complex magnetic zone.

iii. Magnetic basement is within 1 000 metres of the surface in the south-western corner of the survey area.

iv. There is some indication of shallowing on the eastern margin of the area, immediately south of $28^{0}30'$ latitude.

4.3 Linear Magnetic Gradients

Several major linear magnetic gradients and angular disruptions to magnetic trends are indicated on Plan 2. The low level of magnetic relief and the general depth to magnetic sources makes the definition and

4.3 con't.....

location of these features a subjective process but some obvious major trend directions are apparent.

In the northern half of the area, the dominant north-easterly structural trend is apparent in the magnetic data, particularly on the northern margin of the Toolachee area. The trend is also apparent in the low magnetic relief areas around the Strzelecki and Murteree drilling areas. The other major trend in this area is north-south oriented and is particularly apparent on the eastern margin of the Nappacoongee and Toolachee magnetic features.

In the more magnetically complex southern area, no consistent trend directions are apparent, but one major north-easterly feature is inferred through the centre of the area.

4.4 Radiometric Data

Although the acquired radiometric data are influenced only by material within a few feet of the earth's surface and cannot be directly influenced by hydrocarbon bearing structures, it was considered possible that these structures may concentrate mobile ground waters, and thereby any contained dissolved radioactive salts, giving rise to some indication in the radiometric data. A complete consideration of the multi-channel data was not undertaken as it was considered that any likely concentration of fluids/salts is as likely to be evident in the total count data. The outlined areas (Plan 2.) of above background radiation, were determined from a contour plan of total count levels prepared by Geoex. A count rate above 750 cps was considered as anomalous and major areas with rates above this value are outlined.

No striking coincidence of these areas and producing fields is apparent in the northern half of the area, although an unusually narrow linear feature coincides with the Brumby No. 1 Well and a second area occurs immediately south of the Toolachee field. The major area of increased activity occurs in the north-western corner of the survey area and is presumably related to surface drainage systems. Within the southern half of the survey area, a major area of anomalous count rate coincides with the inferred continuation of the Toolachee anticlinal trend.

.../7.

4.5 Comparisons with Gravity Data

Locations of major positive gravity axes are indicated on Plan 2. and gravity station locations and contours are included as Plan 3. (enlarged from 1:250 000 scale). Regional trends of the gravity field are oriented north-easterly across the survey area with the major features being:

i. Regional highs associated with the Nappacoongee and Tickalara-Wolgolla anticlinal structures.

ii. A regional high associated with 'shallow' basement areas on the eastern/south-eastern margins on the survey area.

iii. A north-east striking series of approximately equidimensional lows separating these regional highs and indicative of low density intra-basement sources (granites).

In the northern half of the survey area, a close relationship is apparent between observed gravity and structural trends. The relationship is complicated by the inferred intra-basement density variations, but positive gravity trends clearly indicate the Strzelecki, Della and Nappacoongee areas and the Brumby No. 1 structure.

The relationship between magnetic sources and the observed gravity field is also complicated by the inferred intra-basement sources. Magnetic highs in the Nappacoongee and Toolachee areas show a coincidence with positive gravity features and similar coincidences occur in the southern half of the survey area. Several major magnetic features, however, show no apparent gravity expression. In general, these magnetic anomalies occur in areas of steep gravity gradients arising from intra-basement sources. A number of profiles were constructed from the contour plans to evaluate the gravity expression of structural features and magnetic source material.

4.6 Composite Sections - Structure vs Gravity/Magnetic Expressions

The plotted profiles (AB, CD, EF - localities on Plan 2.) were chosen to evaluate three apparent variations in the geophysical expression of structure and/or basement lithologies:

.../8.

4.6 cont'd....

AB (Fig.2) - Crosses a major equidimensional gravity low, interpreted to arise from an intra-basement density variation, and two significant magnetic sources with no gravity expression apparent in the contoured data.

CD (Fig. 3) - Crosses the Nappacoongee structure and coincident gravity and magnetic highs.

EF (Fig. 4) - Crosses the Della field, where the gravity data apparently reflect known structure, but magnetic relief is minimal.

The lowermost profile on each section is taken from Delhi's compilation of depths to the seismic 'P' horizon, and the profiles include indications of interpreted depths to magnetic sources. The profiles illustrate the following points:

Profile AB - The major gravity low cannot be accounted for in terms of any structure which is reflected in the 'P' horizon. The source for this anomaly is, therefore, considered to be intra-basement. There is a suggestion of a weak residual anomaly due to the southern magnetic anomaly, but the steep 'regional' gradient effectively obscures the feature.

The Toolachee field is associated with an anticlinal structure which is reflected in the gravity data. The relative contributions of the magnetic source and basement topography to the observed gravity anomaly have not been resolved.

The northern magnetic anomaly has no apparent expression in the gravity field, but it occurs between seismic lines and the gravity coverage is, therefore, restricted.

Profiles CD and EF - The gravity profile across the Della field (EF - Fig. 4) shows the interpreted 'P' horizon (Delhi) and observed and theoretical gravity profiles. The theoretical curve was calculated assuming no contribution from intra-basement density variations and also assuming that the topography of the 'P' horizon reflects 'basement' topography. This fairly basic approach yielded a reasonably acceptable 'fit' between the two curves, with a desnity contrast between 'basement' and sediments of 0.47 gms/cc. This value was used

to evaluate the gravity expression of the Nappacoongee structure (Fig. 3). From the derived theoretical anomaly, it was apparent that a significant component of the observed anomaly is due to intra-basement density variations associated with the magnetic source material.

The approximate source model for the observed magnetic anomaly was computed, using a susceptibility contrast of 1600 x 10^{-6} cgs units for a prism-shaped model at 2 400 metres depth. The theoretical gravity profile shown in Fig. 3 is the sum of the profiles for this model (with density contrast of 0.13 gms/cc) and the basement structure. Although this provided a reasonable agreement between observed and theoretical profiles, some discrepancies remain, and it is probable that the density distributions within basement are more complex than the simple distribution inferred from the magnetic interpretation. It was anticipated that this combined approach to quantitative interpretation may give some guide to the structural component of gravity anomalies observed in the southern half of the survey area, but it is apparent that the assumed density distribution within basement is a critical factor. Without any quantitative information on the magnetic and desnity properties of basement, it is unlikely that meaningful quantitative conclusions about basement structure can be made in the southern area, particularly because of the more complex nature of basement in this region.

4.7 Prospective Structures - Southern Area

Three major considerations are apparent from the above comparisons of structure and geophysical data - firstly, that all known major structures are reflected in the gravity data; secondly, that the majority of magnetic sources have an associated gravity expression and, thirdly, that a relationship between magnetic basement material and anticlinal structures exists in two major areas. The other significant factor recognised is that gravity features due to structure and/or magnetic source material may be obscured by major gravity gradients arising from intra-basement density variations, particularly in areas of limited gravity coverage.

Using these criteria, and considering the areas of deeper basement outlined in Plan 2 to be more prospective than areas of shallower basement, five prospective areas (G1-G5) have been outlined in the southern half of the survey area (Plan 4). Areas G1 to G4 are indicated as

.../10.

4.7 cont'd....

positive residual gravity features in the existing gravity and the fifth area, G5, occurs in an area of limited gravity coverage in the vicinity of an isolated magnetic high. Seismic sections over the areas G1 and G2 were examined by D. Roberts and interpreted 2-way travel-time sections are included on the compiled profiles for these areas (Fig. 5 and 6 - location on Plan 2).

G1 : SEISMIC SECTIONS EY, QK, VV

Area G1 is a SSW-trending area of coincident magnetic and gravity highs on the western flank of the interpreted southern continuation of the Toolachee anticlinal trend. Seismic traverse VV crosses the northern end of the magnetic feature (Plan 2). Geophysical data for seismic lines EY, QK and VV are presented in Fig. 5, in addition to a theoretical gravity profile. The latter profile was computed from the travel time profile, using a value of 8 000 ft/sec. to convert the two-way times to depth. The profile crosses a major gravity low (in the area of seismic line QK) and this was incorporated in the theoretical model as a low density basement unit. It is apparent that the theoretical gravity expression of the structure G1 (immediately west of an area of poor quality seismic data), again using a density contrast of 0.47 gms/cc., does not account for the observed anomaly of 1.5 to 2.0 mgals. A similar structure near SP100 has no magnetic expression and the gravity expression, although obscured by the regional 'low', is also diminished. The latter area is poorly defined in the gravity data and has not been included in Plan 4.

G2 : SEISMIC SECTIONS EZ, VB

Area G2 is a positive gravity feature in a region between two interpreted major low-density basement bodies. The gravity profile (Fig. 6) and interpreted section suggest a possible structure between (approximately) SP70 and SP 79. The profiles indicate a shallowing to the east, consistent with the observed gravity gradient.

G3, G4, G5

Areas G3 and G4 occur in similar positions relative to major "intra-basement" gravity lows and, particularly in the latter case, the areas outlined are only partially defined by existing gravity data. Area G3 is nearly coincident with an isolated magnetic high, while G4 occurs near the southern margin of the central zone of complex magnetic relief. Area G5 has been included because of the limited gravity

.../11.

4.7 cont'd....

coverage in the region which includes a major isolated magnetic feature. A very weak inflection is indicated in the gravity contours and the prospective area outlined incorporates this inflection and an area of magnetic relief in which no gravity information is available.

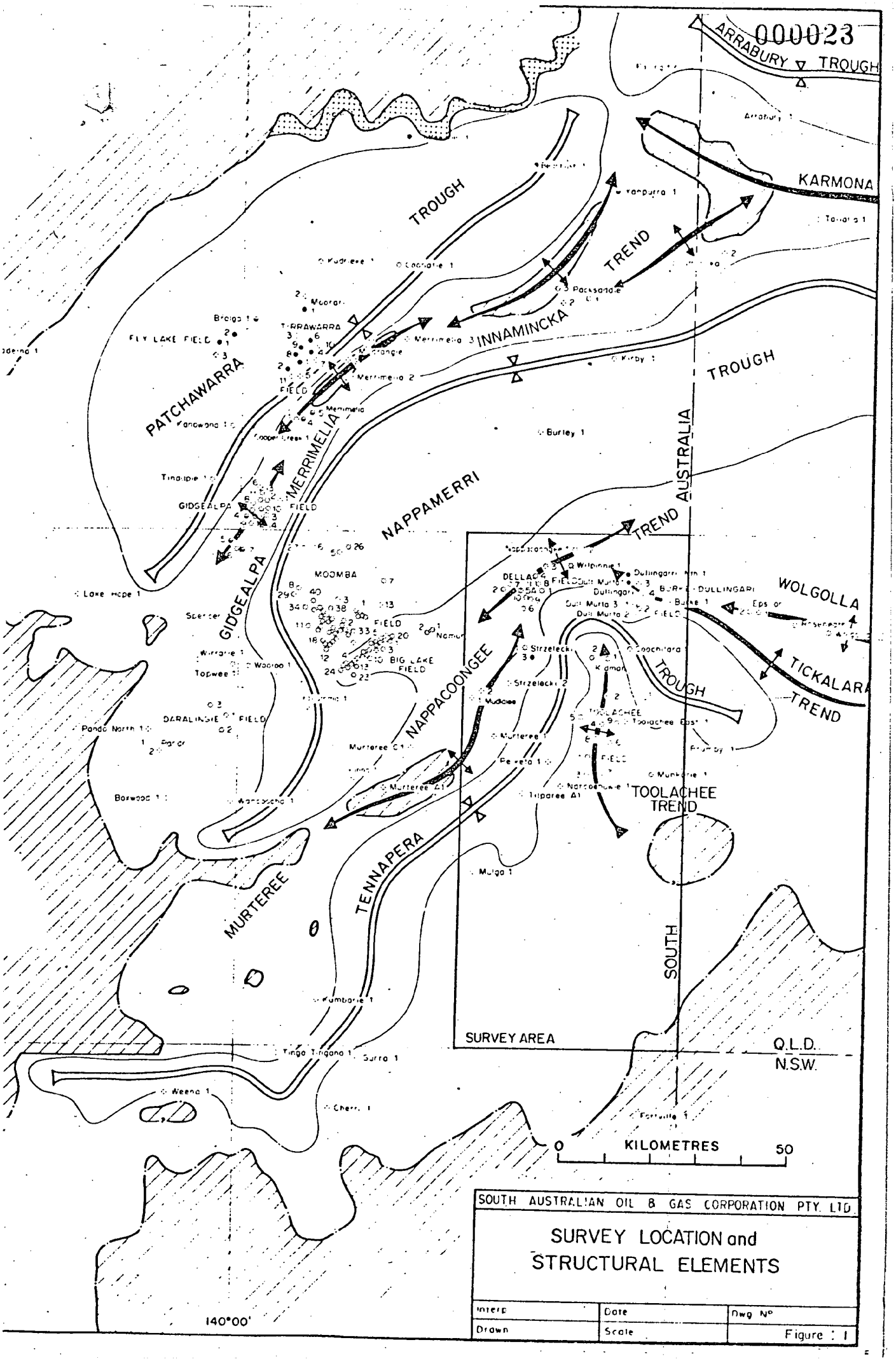
5.0 CONCLUSIONS

Interpreted depths to magnetic material in the southern half of the survey area outlined a central area of possibly greater sediment thickness, bounded to the south-west and east by areas of relative shallow basement. Consideration of the data in the northern half of the area indicated that, although fields with no magnetic expression exist, structure is generally reflected in the gravity field. This expression is obscured by limited data coverage and/or gradients due to intra-basement sources. The relationships between magnetic sources and structure is variable, but structures in the Nappacoongee and Toolachee areas can be attributed to basement highs arising from magnetic, dense basement lithologies.

Because efforts to evaluate the component of observed gravity attributable to structure, (in areas of magnetic relief), proved to be largely dependent on chosen values for basement densities, it was not possible to differentiate in a qualitative sense, between gravity anomalies in the southern area which are due to intra-basement sources and those due to structure.

Five prospective gravity/magnetic features have been outlined and seismic data over two (G1 and G2) indicate associated structures. An additional area of interest is indicated in the seismic data and gravity profile (rather than contours) near shot-point 100 on Line VV. Areas G2 to G5 occur in areas of interpreted linear magnetic features, possibly related to faulting. Area G1 occurs on the interpreted southern continuation of the Toolachee trend and also lies in a region of above background total count radiation levels. The significance of these factors to hydrocarbon potential is not known.

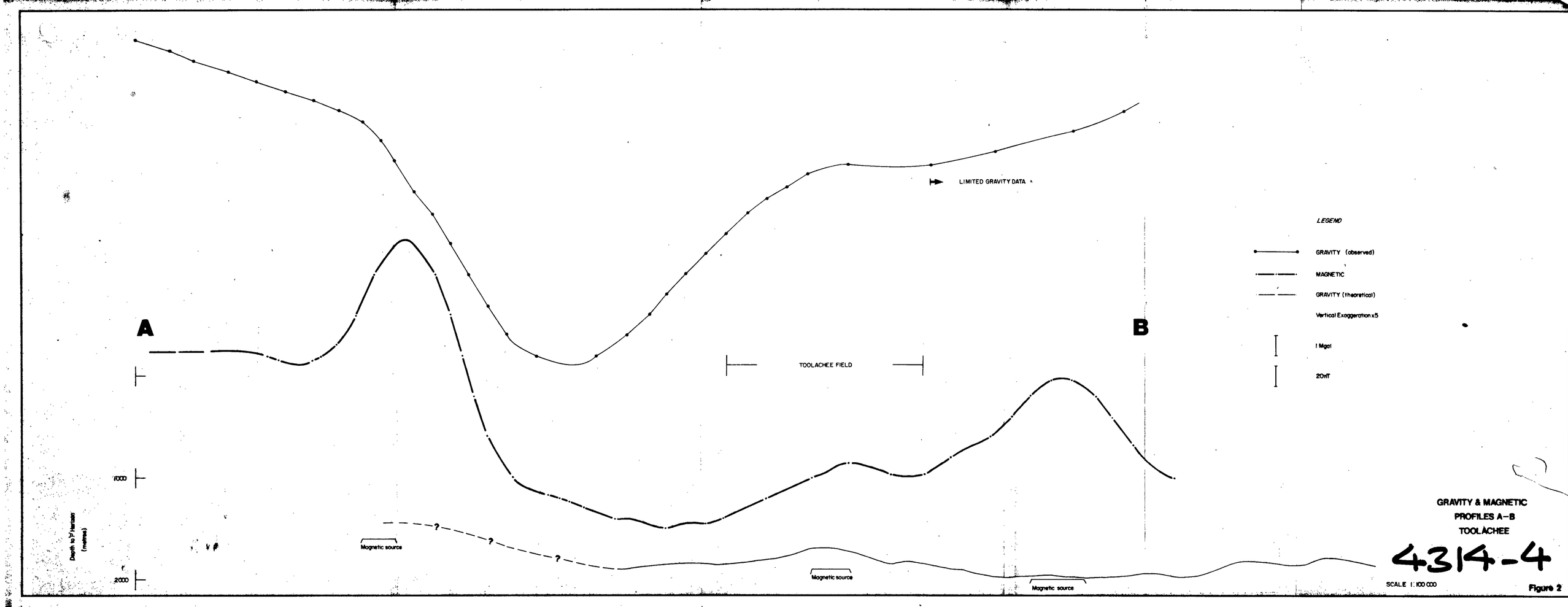
The areas G1, G3 and G5 are poorly defined by existing gravity data and it is suggested that additional gravity coverage would be useful in the continuing evaluation of these areas. Data other than that presented (both gravity profiles and seismic sections) are available in areas G2 and G4 and should be reviewed prior to any additional appraisal.

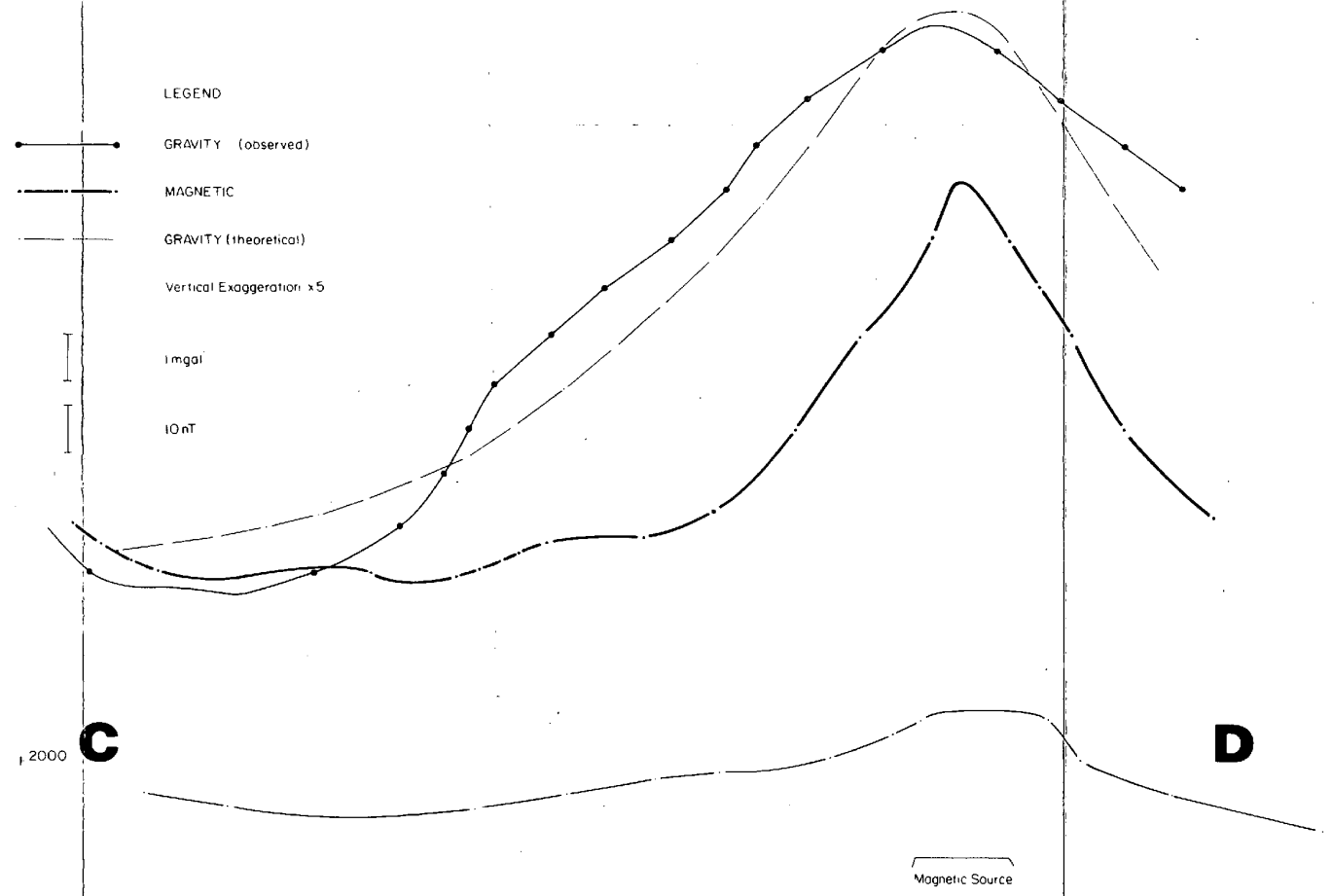


SOUTH AUSTRALIAN OIL & GAS CORPORATION PTY. LTD.

SURVEY LOCATION and STRUCTURAL ELEMENTS

Interp.	Date	Dwg No.
Drawn	Scale	Figure : 1


A
B
LIMITED GRAVITY DATA
TOOLACHEE FIELD
LEGEND
GRAVITY (observed)
MAGNETIC
GRAVITY (theoretical)
Vertical Exaggeration x5
1 Mgal
20nT
1000
2000
Depth to 'F' Horizon (metres)
Magnetic source
Magnetic source
Magnetic source
GRAVITY & MAGNETIC
PROFILES A–B
TOOLACHEE
4314-4
SCALE 1:100 000
Figure 2



SCALE 1:100,000

GRAVITY & MAGNETIC PROFILES C--D

NAPPACOONGEE

000024

Figure 3

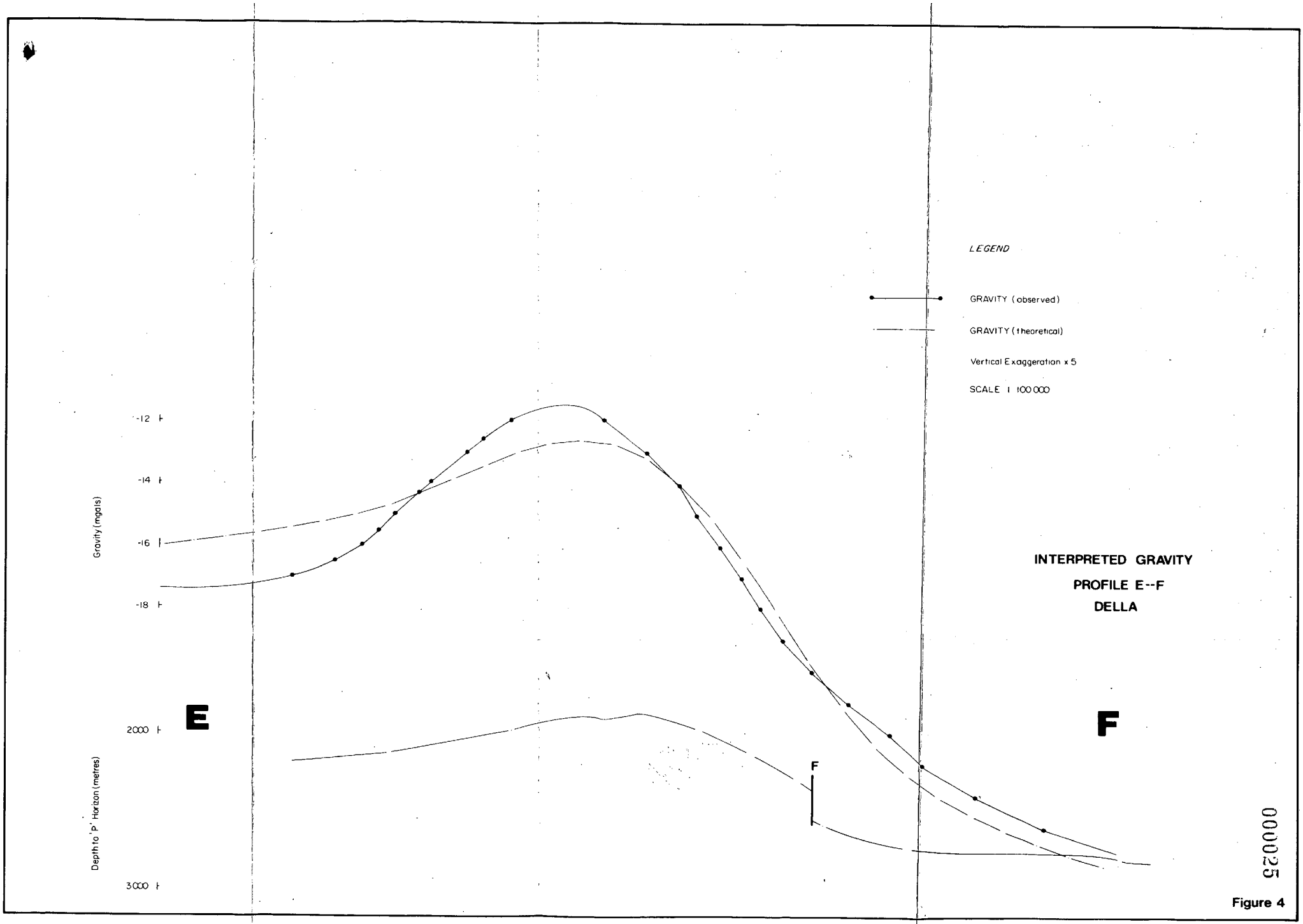
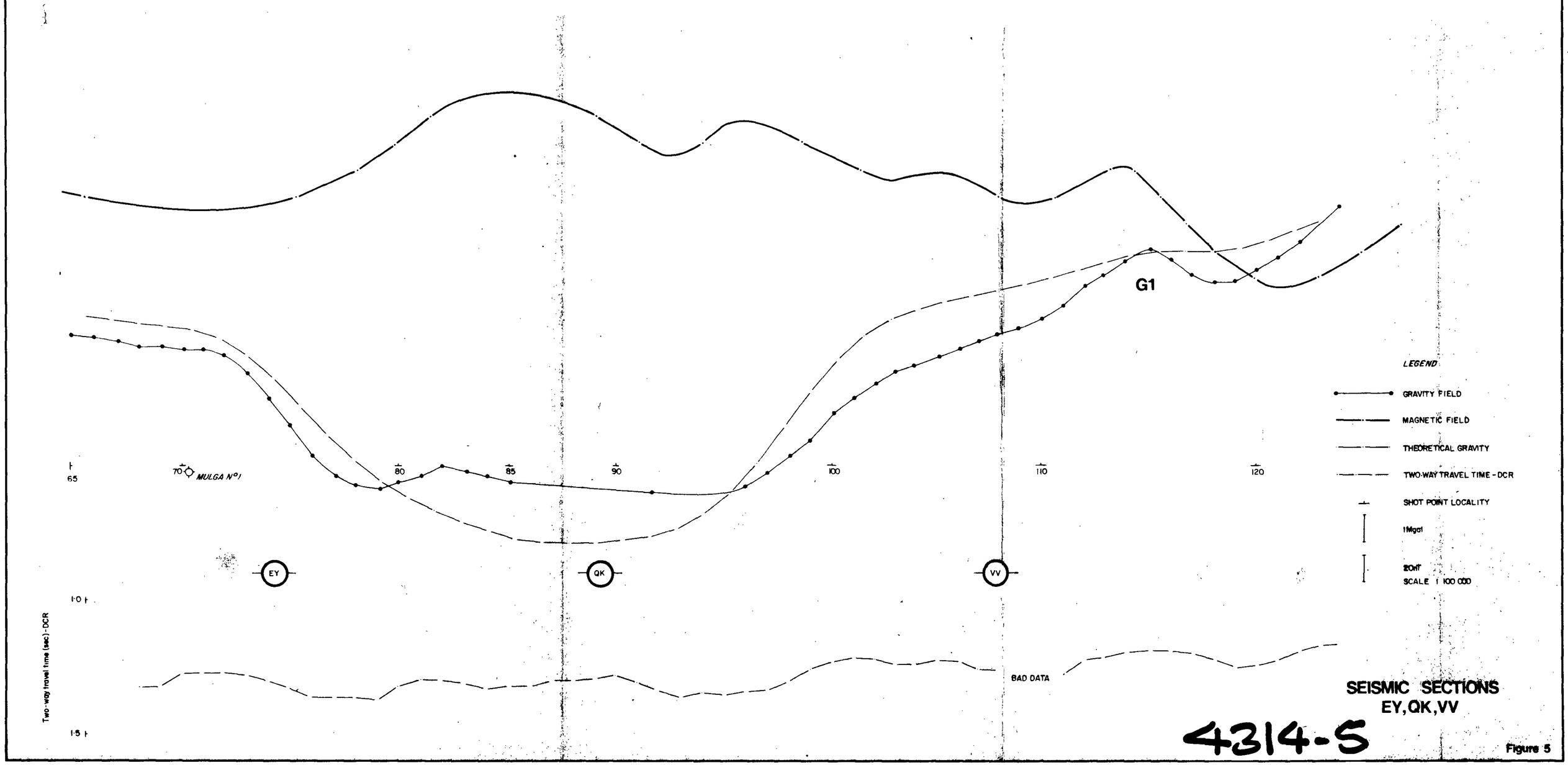

LEGEND
GRAVITY (observed)
GRAVITY (theoretical)
Vertical Exaggeration x 5
SCALE 1 100 000
-12
-14
-16
-18
Gravity (mgals)
2000
3000
Depth to 'P' Horizon (metres)
E
F
F
INTERPRETED GRAVITY
PROFILE E--F
DELLA
000025

Figure 4

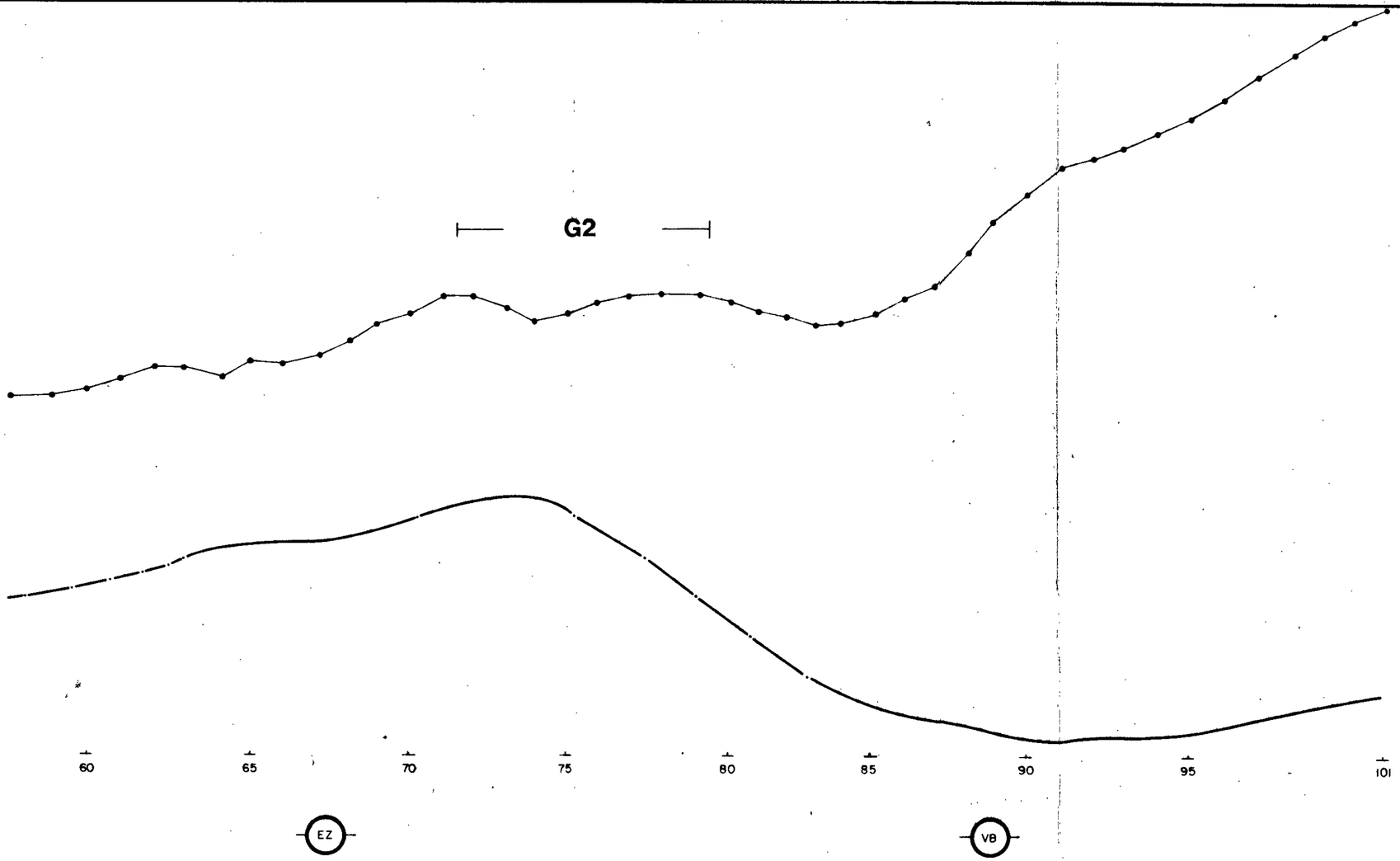


SEISMIC SECTIONS
EY, QK, VV

4314-5

Figure 5

G2



LEGEND

GRAVITY FIELD

MAGNETIC FIELD

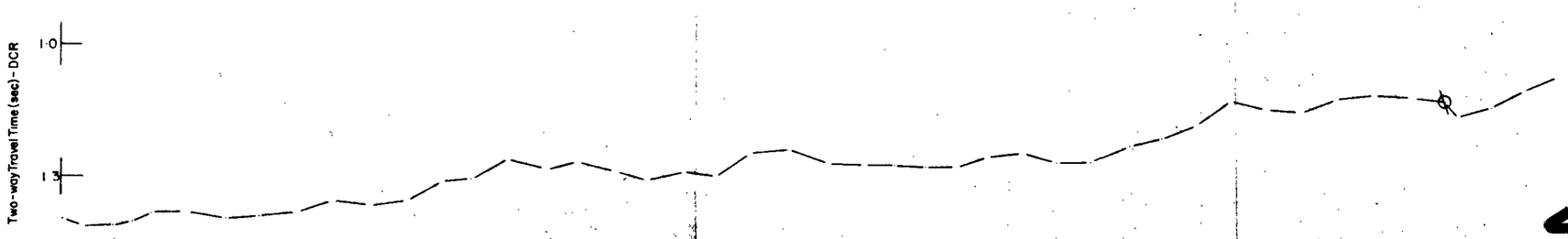
TWO-WAY TRAVEL TIME - DCR

SHOT POINT LOCALITY

1Mgal

20nT

SCALE 1 100 000



SEISMIC SECTIONS

EZ,VB

4314-6

Figure 6

Enlarge to 20 cms 1:60000 scale bar

Reduce to 8 cms 1:250,000 scale bar

140°30' (450 838 mE)

141° 00' (500 000 mE)

28°00' (902 686mN)

28°00' (500 000mE 902 787mN)

28°30' (451 067mE 847 295mN)

28°30' (847 397mN)

29° 00' (791 900 mN)

29°00' (792 003 mN)

140°30' (451299mE)

141° 00'

900000 N
890000 N
880000 N
870000 N
860000 N
850000 N
840000 N
830000 N
820000 N
810000 N
800000 N
790000 N

450000 E
460000 E
470000 E
480000 E
490000 E
500000 E
510000 E

SOUTH AUSTRALIA
QUEENSLAND

Airborne Geophysical Survey and Compilation by GEOEX PTY LTD

for

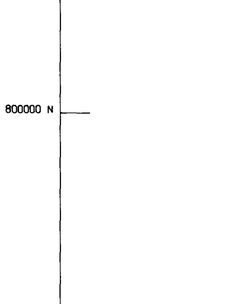
SOUTH AUSTRALIAN OIL & GAS CORPORATION

COOPER BASIN AREA SOUTH AUSTRALIA

CONTOURS OF RESIDUAL TOTAL MAGNETIC INTENSITY

SCALE 1:100000

0 2000 4000 6000 8000 10000 METRES



SURVEY LOCATION

SHEET INDEX

4314-1

The data presented is the residual magnetic intensity, after subtracting the International Geomagnetic Reference Field from the observed Total Magnetic Intensity. The data was corrected for diurnal drift using a base station monitor at MOOMBA Airfield. Latitude 28.106 S, Longitude 140.198 E, Altitude 38 Metres. The sensor height was 3 metres. The adopted value for this location was 56143 nT. Final detailed levelling of the data was performed using tie-line crossover analysis. A simple 3 point filter was applied to the data, which was then gridded and contoured using a 100m by 100m mesh cell.

THIS SURVEY FLOWN USING 1:88000 AERIAL PHOTOMOSAICS.

SURVEY BOUNDARY — CONTOUR INTERVAL 2nT

PROJECT NUMBER 81444 — SURVEYED AUGUST 1980

EQUIPMENT SPECIFICATIONS
Cessna A185E Aircraft
Geometrics G803 Magnetometer
McPhar SPECTRA 2 Spectrometer
McPhar 1024 Channel Analyser
24 Litre NaI(Tl) Detector
Bonzer Mark 10 Radar Altimeter
16mm Ground Tracking Camera
Digital Recording on 9 track 800 bpi Industry Standard Magnetic Tape
Analogue Recording on Century 444 6 channel Recorder

The nominal flight line separation was 1500metres, and the nominal tie-line bearing was 0 degrees. The observed mean sample interval in the flight direction was 38 metres, achieved with a nominal aircraft speed of 100 Knots, and a reading interval of 0.8 seconds. The mean sensor height was 150 metres, using a towed bird configuration. The magnetometer accuracy is 1.0 nT, and the resolution 0.5 nT.

880000 N
870000 N
860000 N
850000 N
840000 N
830000 N
820000 N
810000 N
800000 N
790000 N
450000 E
460000 E
470000 E
480000 E
490000 E
500000 E
510000 E

Airborne Geophysical Survey and Compilation by GEOEX PTY LTD

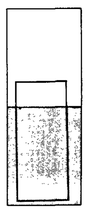
for

SOUTH AUSTRALIAN OIL & GAS CORPORATION

COOPER BASIN AREA SOUTH AUSTRALIA

CONTOURS OF TOTAL RADIOMETRIC INTENSITY

SURVEY LOCATION



SHEET INDEX

SCALE 1:100000

0 2000 4000 6000 8000 10000 METRES

4314-2

SURVEY BOUNDARY

CONTOUR INTERVAL 20c.p.s.

PROJECT NUMBER 81444

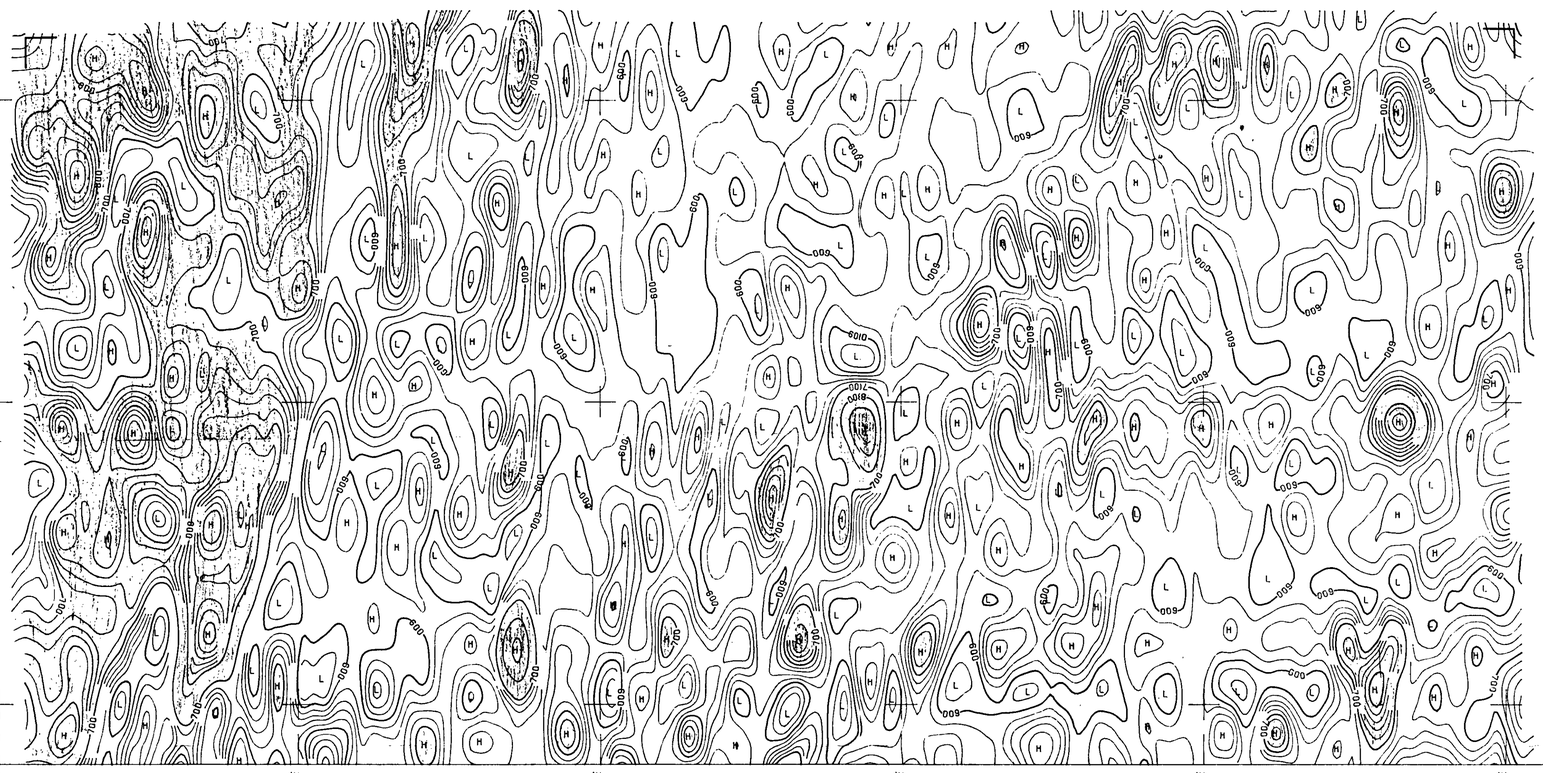
SURVEYED AUGUST 1980

EQUIPMENT SPECIFICATIONS
Cessna A185E Aircraft
Geometrics G803 Magnetometer
McPhar SPECTRA 2 Spectrometer
McPhar 1024 Channel Analyser
24 Litre NaI(Tl) Detector
Benzer Mark 10 Radar Altimeter
16mm Ground Tracking Camera
Digital Recording on 9 track 800 bpi Industry Standard Magnetic Tape
Analogue Recording on Century 444 6 channel Recorder

The nominal flight line separation was 1500metres, and the nominal tie-line bearing was 0 degrees.
The observed mean sample interval in the flight direction was 38 metres, achieved with a nominal aircraft speed of 100 Knots, and a reading interval of 0.8 seconds. The mean sensor height was 150 metres, using a towed bird configuration. The magnetometer accuracy is 1.0 nT, and the resolution 0.5 nT.

970000 N
960000 N
950000 N
940000 N
930000 N
920000 N
910000 N
900000 N
890000 N
880000 N

450000 E
460000 E
470000 E
480000 E
490000 E
500000 E
510000 E



Airborne Geophysical Survey and Compilation by

GEOEX PTY LTD

for

SOUTH AUSTRALIAN OIL & GAS CORPORATION

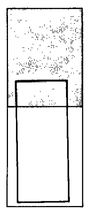
COOPER BASIN AREA SOUTH AUSTRALIA

CONTOURS OF TOTAL RADIOMETRIC INTENSITY

SCALE 1:100000

0 2000 4000 6000 8000 10000 METRES

SURVEY LOCATION



SHEET INDEX

4314-3

SURVEY BOUNDARY

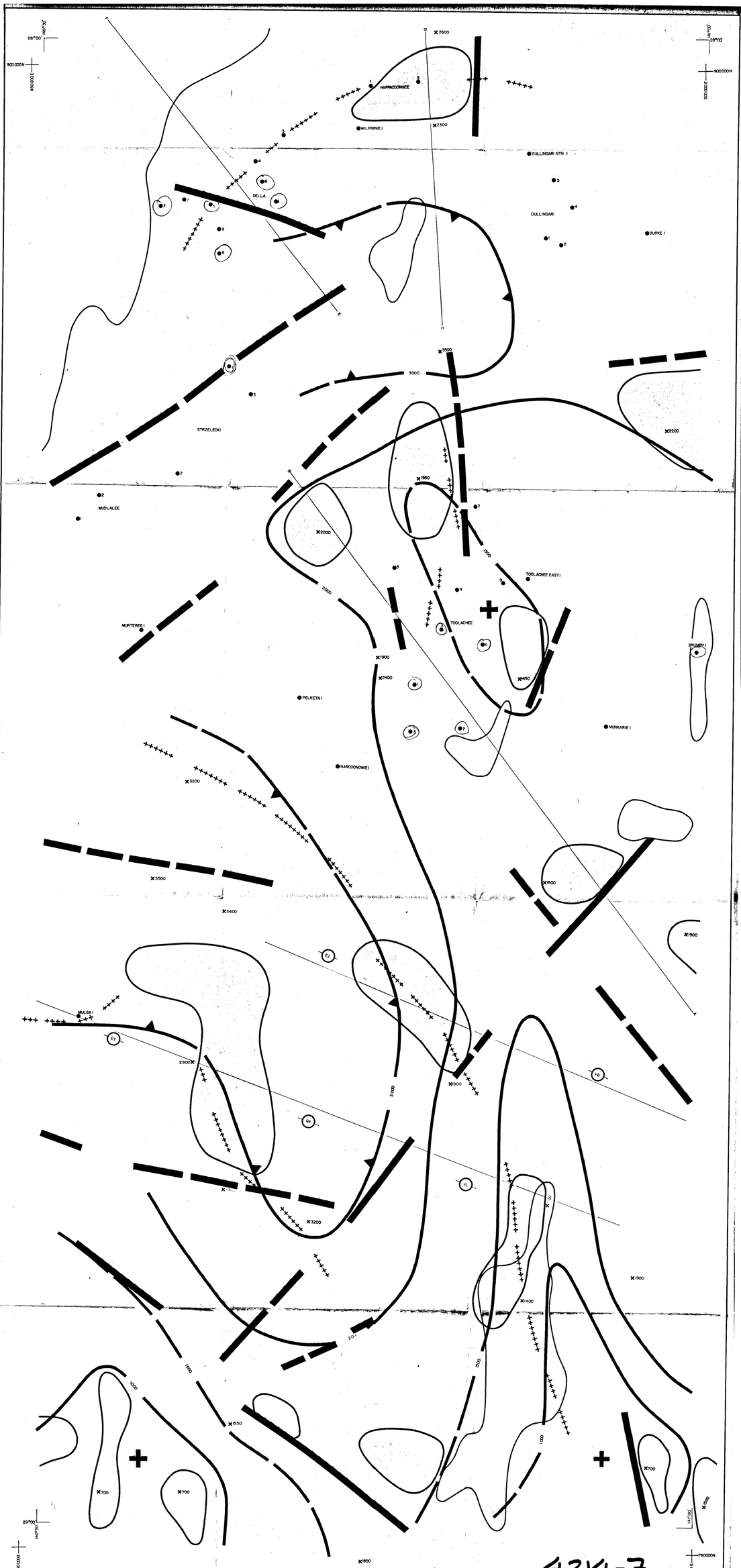
CONTOUR INTERVAL 20 cps.

PROJECT NUMBER 81444

SURVEYED AUGUST 1980

EQUIPMENT SPECIFICATIONS
Cessna A185E Aircraft
Geometrics G803 Magnetometer
McPhar SPECTRA 2 Spectrometer
McPhar 1024 Channel Analyser
24 Litre NaI(Tl) Detector
Bendix Mark 10 Radar Altimeter
16mm Ground Tracking Camera
Digital Recording on 9 track 800 bpi Industry Standard Magnetic Tape
Analogue Recording on Century 444 6 channel Recorder

The nominal flight line separation was 1500 metres, and the nominal tie-line bearing was 0 degrees.
The observed mean sample interval in the flight direction was 38 metres, achieved with a nominal aircraft speed of 100 Knots, and a reading interval of 0.8 seconds. The mean sensor height was 150 metres, using a towed bird configuration. The magnetometer accuracy is 1.0 nT, and the resolution 0.5 nT.



4314-7

LEGEND

DELLA 1	WELL LOCATION and NUMBER
2300	INTERPRETED DEPTH TO MAGNETIC SOURCE (metres)
	MAJOR MAGNETIC FEATURE
	RADIOMETRIC HIGH
	LINEAR MAGNETIC GRADIENT
	POSITIVE GRAVITY AXIS
1000	DEPTH TO MAGNETIC SOURCE
	LOW
+	HIGH
A — B	SECTION LOCATION
VL	SEISMIC SECTION

SCALE : 1:100 000

SOUTH AUSTRALIAN OIL & GAS CORPORATION

SOUTHERN COOPER BASIN

MAGNETIC & RADIOMETRIC SURVEY

INTERPRETATION

DATE : 17/3/1981 DRAWN : ARON DRAFTING SERVICES Ph. PERTH 4588992. COMPILED : C.G.A. PLAN N° : 2