Report No. NT/36/98.



REPORT

ON

# GRAVITY SURVEY IN OIL PERMIT 36, NORTHERN TERRITORY.

By :

J.E. BURBURY.



Submitted to : Associated Freney Oil Fields N.L.,
31 Charlotte Street,
Brisbane.

by : Mines Administration Pty. Limited,
31 Charlotte Street,
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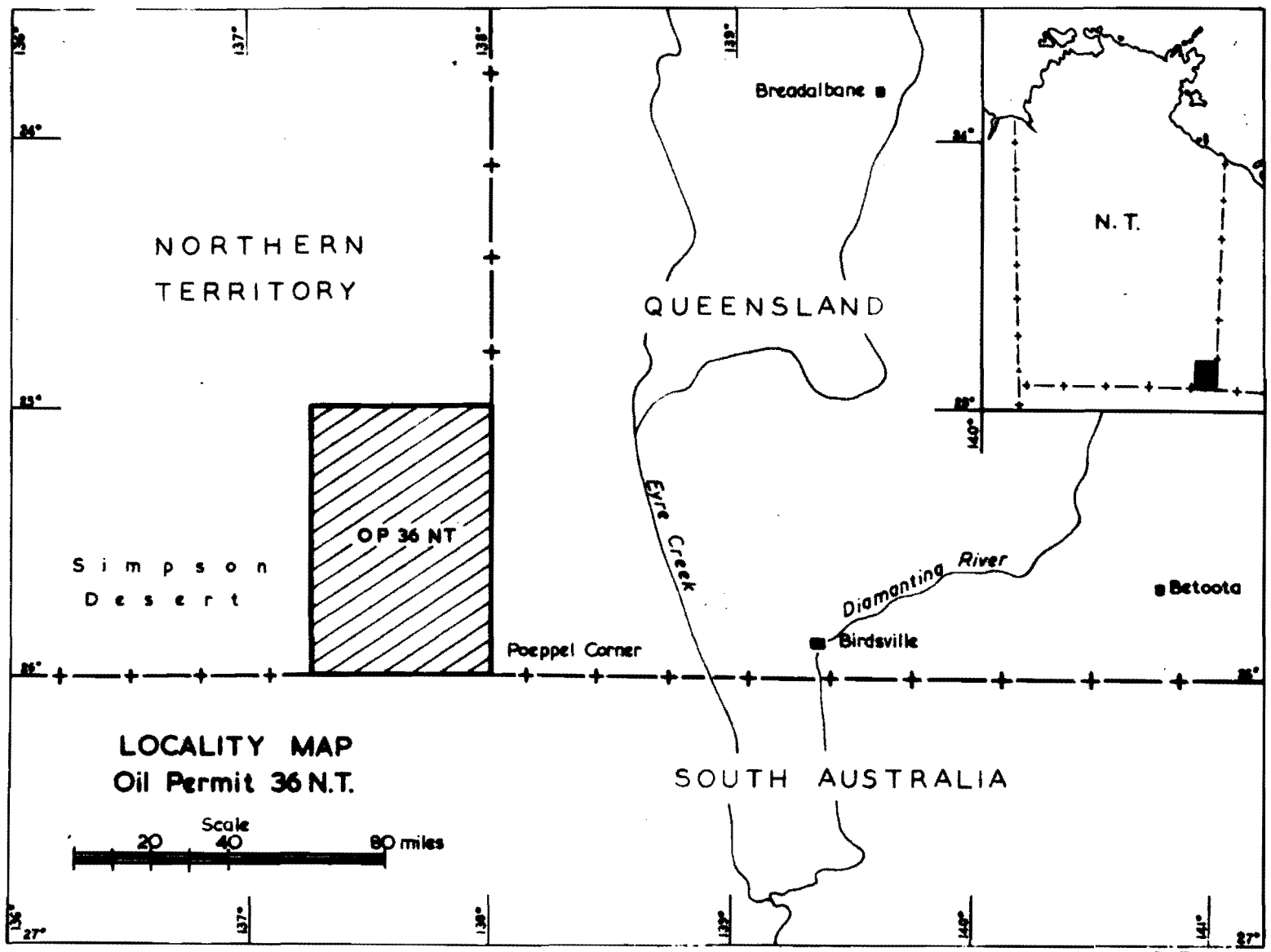
NORTHERN TERRITORY
QUEENSLAND
SOUTH AUSTRALIA
N.T.
Simpson Desert
OP 36 NT
Breadalbane
Eyre Creek
Diamanting River
Betoota
Birdsville
Poeppel Corner
LOCALITY MAP
Oil Permit 36 N.T.
Scale
20 40 80 miles

FIGURE 1.

1. INTRODUCTION :

A reconnaissance gravity survey was carried out over Oil Permit 36, Northern Territory, by Mines Administration Pty. Limited for Associated Freney Oil Fields N.L. during May, 1961. The survey was conducted in order to determine the thickness of sedimentary section in the area and to delineate any structural features within the sedimentary section.

A helicopter, chartered from Trans Australia Airlines was used for transport throughout the survey and a de Haviland Beaver monoplane, chartered from Aerial Agriculture Ltd., was used as supply plane between Birdsville and the base camp in the survey area.

2. LOCATION :

The location of Oil Permit 36 N.T. is shown on the Locality Map (frontispiece). The Permit lies approximately 100 miles west of Birdsville in the south-east corner of the Northern Territory and is situated in the central part of the Simpson Desert. The area is low (average elevation approximately 150 feet), flat and covered with seif type sand dunes that trend north-north-west, average 50 feet high and lie approximately 1/4 mile apart. Along the southern border and in the south-east corner of the Permit large salt lakes occur.

3. FIELD WORK :

Surveying over O.P. 36 N.T. was carried out during the period, 1st to 21st May, 1961. J.E. Burbury (geophysicist) was in charge of the survey and was assisted by B.H. Sell (geologist) and F. Rodriguez (field assistant and cook).

The only suitable landing strip for the Beaver aircraft was located on the edge of a salt lake approximately 2 miles east of the south-east corner of the Permit. A camp was established beside the strip and all operations were conducted from this camp. The border survey peg between Queensland, South Australia and Northern Territory, latitude 26°S, longitude 138°E, was located and the survey was commenced from that point.

Two hundred and twenty-five (225) gravity stations were established within the Permit and 13 regional gravity stations were established between the south-east corner of the Permit and the Bureau of Mineral

Resources pendulum station at Birdsville, Queensland. Stations within the Permit were positioned at 3 mile intervals along north-north-west traverses approximately 4 miles apart. The area was surveyed by a series of rectangular loops averaging 25 miles long and 4 miles wide. A series of base stations was established throughout the area, using a repeat reading technique, and the survey was based on values at those points.

Gravity readings were made with Worden Gravity Meter No.216 with a scale constant of 0.09016 milligals per scale division. This scale constant was determined by gravity meter checks in Brisbane before and after the survey, over the Bureau of Mineral Resources calibration range, established in January, 1960.

The relative heights of stations were determined with two Paulin micro-altimeters Nos. KK1422N and KK1394N, the scales of which are calibrated to 1 foot. One of the micro-altimeters was read at base stations at 12 minute intervals, while the other was read at successive gravity stations in conjunction with the gravity readings.

Positions of stations were identified and marked on 1:48,000 airphotos and then plotted onto Department of Interior photo maps at a scale of 1 mile equals 1 inch. These were photographically reduced to 2 miles to 1 inch for plotting and contouring of values and again reduced to 4 miles to 1 inch for presentation.

Permanently marked stations were established throughout the survey and along the regional traverse to Birdsville. Border survey pegs were used along the regional traverse and on the south-east side of the Permit. Easily identifiable points were chosen throughout the remainder of the area. Small perfectly flat claypans afforded good locations for permanent stations. Where the claypans were large, an inverted beer bottle was used to mark the exact position of the station. A description of these permanent stations is given in Appendix "A" and all are shown on the accompanying Bouguer Gravity Map as shown in the legend.

## 4. CORRECTIONS :

Gravity meter readings were corrected for drift by repeat readings at base stations within two to three hours. Gravity meter drift was variable, but did not exceed 3.9 scale divisions per hour. The maximum

misclosure in observed gravity around the survey loops was 0.11 milligals and the average of all loop misclosures was 0.04 milligals. These small misclosures indicate that, although the meter drift was high at times, the drift was linear.

A gravity connection was made between Station 1 (Poeppels Corner) in the south-eastern corner of the Permit and the Bureau of Mineral Resources pendulum station No.57 in Birdsville. The observed gravity value of 978.00300 gals. for this pendulum station was used as datum for the survey. The observed gravity values are estimated to be accurate to 0.06 milligals.

The theoretical gravity for each station was determined from tables based on the international ellipsoid formula. This was then subtracted from the observed gravity, after correction for loop misclosure by the method of graphic adjustment by least squares (Smith, 1951), and corrected for elevation using a combined Bouguer and Free-air correction factor of 0.06982 milligals per foot, to give Bouguer gravity values.

The correction factor of 0.06982 corresponds to a density of 1.9 gms./cc. which is the estimated value for the near surface unconsolidated sands and clays in the Permit area.

Micro-altimeter readings were corrected for temperature (instruments calibrated at 50°F) and barometric diurnal variations. No humidity corrections were applied as an average humidity factor is incorporated in the dials of the Paulin micro-altimeters. On some traverses corrections were made for difference in diurnal variations between the two altimeters. The maximum misclosure in elevation around survey loops was 13 feet and the average of all loop misclosures was 4 feet. These misclosure errors were distributed around the loops by a method of graphic adjustment by least squares (Smith, 1951).

An elevation connection was made between Station 1, in the south-east corner of the Permit, and the Department of Interior bench mark $\frac{50}{57}$ at Birdsville Post Office. The elevation of this bench mark, 161.0 feet above mean sea level, was used as datum for the survey. Elevations are estimated accurate to 5 feet.

Connections were made to 8 B.M.R. gravity stations along the northern border of the Permit. A comparison between Bureau of Mineral Resources and Mines Administration Pty. Limited values is shown in Table 1.

Some significant variations in intervals between these stations are apparent from the table. This is considered to be a result of the fact that the exact location of the Bureau of Mineral Resources stations could not be found, and hence variations in elevation and observed gravity intervals must be expected, except in the case of station D265 which was located on a small claypan.

TABLE 1.

| | ELEVATION | | OBSERVED GRAVITY | | BOUGUER GRAVITY | |
|---|---|---|---|---|---|---|
| | B.M.R. | MINAD | B.M.R. | MINAD | B.M.R. | MINAD |
| D260 | 202 | 217 | 978.93792 | 978.93814 | -18.0 | -16.4 |
| D261 | 210 | 223 | .93679 | .93703 | -18.9 | -17.0 |
| D262 | 220 | 233 | .93574 | .93580 | -19.6 | -18.1 |
| D263 | 234 | 256 | .93387 | .93390 | -20.4 | -18.4 |
| D264 | 240 | 249 | .93331 | .93329 | -21.2 | -19.8 |
| D265 | 251 | 281 | .93451 | .93453 | -18.9 | -16.5 |
| D266 | 293 | 326 | .93763 | .93733 | -13.4 | -11.2 |
| D267 | 281 | 308 | .94426 | .94437 | - 7.5 | - 5.3 |

The density factor for elevation corrections was 1.9 in both surveys.

No corrections have been made to connect the two surveys.

5. ACCURACY :

The accuracy of the survey can be estimated by considering respective accuracies of the gravity observations, the latitude corrections and the elevation corrections. These are estimated to be 0.06, 0.20 and 0.34 milligals respectively.

These give a standard error of :-

$$\left( (0.06)^2 + (0.20)^2 + (0.34)^2 \right)^{\frac{1}{2}} = 0.40 \text{ milligals.}$$

6. GEOLOGY :

The only outcrops observed during the course of the gravity survey in O.P.36 N.T. were scattered occurrences of an unconsolidated lake deposit of probable Tertiary to Recent age.

The geology of the Birdsville 4 mile sheet to the east of O.P.36

TABLE 2.

STRATIGRAPHY OF THE BIRDSVILLE 4 MILE SHEET.

| ERA | PERIOD | FORMATION AND SYMBOL | LITHOLOGY | MAX. THICKNESS | OCCURRENCE | CORRELATION | TOPOGRAPHIC EXPRESSION |
|---|---|---|---|---|---|---|---|
| Cainozoic | Quaternary | Cza, Czs, Czg, Czi. | Alluvium, sand, gibbers, ironstone. | 65'+, 50', 9", 2". | outcrop | | Alluvial flats, sand-dunes, gibber plains and ironstone "patches". |
| | Tertiary | Unit equivalent to Austral Downs Limestone (Ta) | Silicified limestone (chalcedony) | 10' | outcrop | | Mostly as gibbers on the plains. |
| | | Marion Formation (Tm) | Conglomeratic sandstone and siltstone. | 5' | outcrop | Eyrian Series (Woolnough and David, 1926) | Tops of hills and scarps and as gibbers on the plains. |
| Mesozoic | Upper (?)-Cretaceous | Winton Formation (KU?W) | Arkose and clay-stone (partly silicified) | 500' (?) | outcrop | | Plains and areas of moderate relief. |
| | Lower-Cretaceous | Wilgunya Formation (Klw) | Mainly dark shales | 2800' (?) | In Adria Downs bore | Tambo and Roma Formations (Whitehouse, 1926). | No outcrop |
| | | Sandy unit equivalent to the Longsight Sand-stone (Kll) | Sandstone and sandy shale. | 20'+ | In Adria Downs bore | Upper part of the Blythesdale Group (Jack, 1895). | No outcrop |

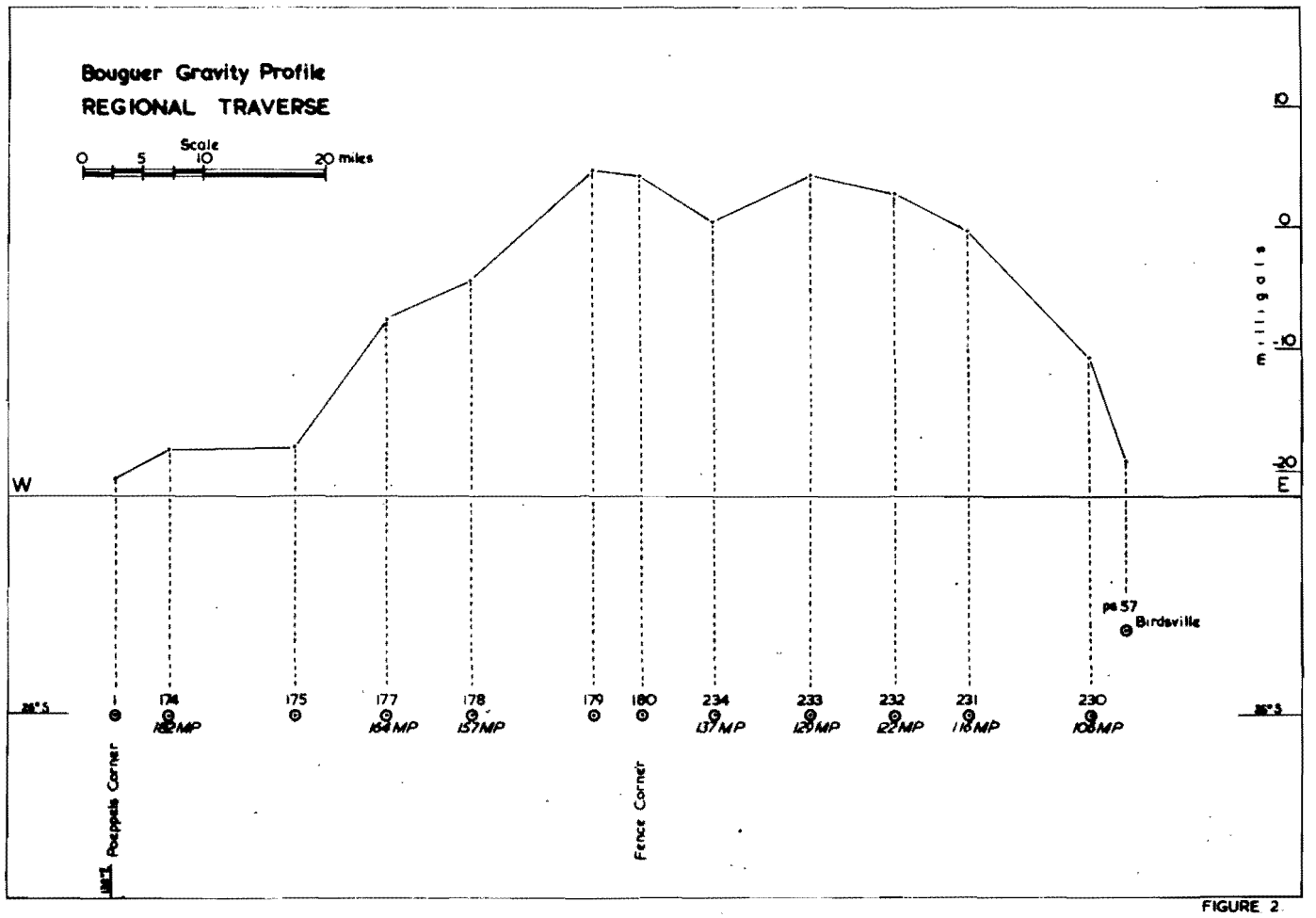
Bouguer Gravity Profile
REGIONAL TRAVERSE
Scale
0 5 10 20 miles
10
0
-10
-20
milligals
W
E
pk 57
Birdsville
38°S
38°S
1
174
182 MP
175
177
184 MP
178
187 MP
179
180
234
137 MP
233
129 MP
232
122 MP
231
116 MP
230
108 MP
Poeppels Corner
Fence Corner

FIGURE 2

N.T. is described in B.M.R. Records, 1961/62, "The geology of the Birdsville 4 mile sheet area, Queensland" by F. Olgers. Table 2 (opposite) taken from that report, summaries the known rock units that occur in the Birdsville area.

Adria Downs bore (34 miles north-west of Birdsville), and the recently completed Birdsville town bore are the only deep holes that have been drilled in the Birdsville 4 mile sheet area. Adria Downs bore reached a depth of 3090 feet, penetrated the Winton and Wilgunya Formations and bottomed in the Longsight Sandstone aquifer. The Birdsville town bore encountered the Longsight Sandstone aquifer at approximately 3850 feet and bottomed at approximately 4000 feet. The section below the Longsight Sandstone in the Birdsville 4 mile sheet area is unknown.

The Delhi, Frome, Santos Betoota No.1 well on Betoota Dome, approximately 100 miles east of Birdsville, penetrated approximately 5850 feet of Mesozoic sediments and then a steeply dipping Lower Palaeozoic? section to total depth of 9824 feet (Reynolds et al, 1961).

Seismic surveying by the Department of Mines, South Australia, over the Great Artesian Basin in the south-west of Queensland and north-east of South Australia,(Milton B.E. and Seedsman K.R., (1961) - Seismic Survey, (1960) Grt.Art. Basin in S.A. & Qld. Prelim. rept. S.A. Dept. Mines Rec. 1961/60),indicated that the thickness of Mesozoic rocks increases uniformly in all directions towards Cordillo Downs in the north-east of South Australia and that no major folding of the Mesozoic, similar to that at Betoota and Innamincka, occurs between Breadalbane (in the north), Birdsville and Betoota. Also, it was concluded from the seismic survey that the Cambro-Ordovician rocks of the Georgina Basin do not exist south of Bedourie and that the Lower Palaeozoic? rocks in the Betoota Dome do not exist more than 20 miles west of Betoota.

## 7. RESULTS AND INTERPRETATION :

The results of the survey are presented as a Bouguer Gravity Map of O.P.36 N.T., Sheet 1, and a Bouguer Gravity Profile, Figure 2, along the regional traverse between Station 1 and the Pendulum Station in Birdsville.

The Bouguer Gravity Map of O.P.36 N.T. is presented at a scale of

4 miles to 1 inch and contoured at an interval of 1 milligal.

Bouguer gravity values vary over the Permit area from a maximum value of -5.3 milligals in the north-west corner of the Permit to a minimum value of -29.4 milligals on the southern border of the Permit. The contours display a general north-west trend throughout the area except along the southern border where a pronounced negative anomaly is developing with contours trending east-west and in the south-east corner of the Permit where the contours trend north-east.

The major features of the Bouguer Gravity Map are the north-west trending gravity low feature though Stations 115 and 128 with a minimum value of -26.3 milligals and the steep negative gradient between Stations 55 and 69. Over the area north of the gravity low through Stations 115 and 128 the Bouguer contours display minor anomalous features with a general rise in Bouguer gravity values from east to west of approximately 15 milligals. South of the gravity low a gravity high anomaly occurs about Stations 47 and 56 with a maximum observed value of -11.1 milligals at Station 47. South and south-east from this high the Bouguer values fall to minimum values of -29.4 milligals at Station 69 and -25.3 milligals at Station 18. The gravity gradient between Stations 55 and 69 is one of the steepest observed throughout the Permit and is approximately 2 milligals per mile. A similar gradient occurs between Stations 168 and 171 in the north-west of the Permit area.

Figure 2 shows the Bouguer gravity profile along the regional traverse between Station 1 and the B.M.R. Pendulum Station No.57 in Birdsville. The Bouguer gravity values rise appreciably east of Station 1 to maximum values of +4.8 and +4.1 milligals at Stations 179 and 233 respectively. East of Station 233 the Bouguer values fall to a value of -19.2 milligals at Pendulum Station 57.

From a study of seismic reflection and refraction surveys, and gravity surveys in the Birdsville, Betoota and Bedourie 4 mile areas to the east of O.P.36 N.T., it is concluded that regional gravity trends are conformable with increase in thickness of sedimentary section and that major gravity anomalies are related to geological structure.

Seismic surveying between Breadalbane and Birdsville indicates an increase in depth of a lower reflecting horizon from approximately 1000

feet at Breadalbane to approximately 7000 feet at Birdsville. Refraction velocities below this horizon were found to be between 18,000 and 19,000 feet/sec. while the section above has velocities in the order of 10,000 feet/sec. At this velocity change, a considerable density contrast would be expected to exist which would influence the gravity trends. Over the same section the gravity values show a regional decrease of approximately 33 milligals from approximately +15 milligals at Breadalbane to -18 milligals at Birdsville. A density contrast of 0.4 gms./cc. at the lower reflecting horizon discussed above would result in a decrease of approximately 31 milligals from Breadalbane to Birdsville which is comparable to the observed decrease.

Anomalous gravity variations in the order of 5 - 10 milligals occur over this traverse but do not appear to be related to any geological structure within the section mapped by the reflection seismic survey and must be considered to be due to physical variations in the basement.

On the reflection seismic traverse from Birdsville to Betoota the reflecting section is, apart from very small irregularities, almost flat, except at Betoota where all reflectors show a rapid decrease in depth on the western side of the Betoota Dome. The gravity values along this traverse show no overall regional trend from Birdsville to Betoota but only variations of 5 - 10 milligals until Betoota is approached where the gravity values rise appreciably over the Betoota Dome. Allowing that the 5 - 10 milligal variations are again due to basement variations, the gravity can be considered roughly conformable with the trends indicated by the seismic results.

The prominent gravity high over the Betoota Dome is in the order of 28 milligals while structural reversal (indicated by reflection seismic), is only of the order of 1500 feet. It is considered that a dense basement core must be associated with the Betoota Dome in order to account for the size of the gravity anomaly observed.

The section expected to occur at Birdsville would be approximately 7000 feet of Mesozoic sediments overlying either dense Palaeo$_z$oic rocks - similar to those encountered in the Betoota Dome or basement rocks. Milton & Seedsman (1961) consider that Palaeozoic rocks would not occur west of a point 20 miles west of Betoota, however, proof of this is not available and

the possibility of Palaeozoic rocks below the Mesozoic at Birdsville cannot be discountered at present.

On the regional traverse of the present survey from Birdsville to Poepells Corner the gravity values show a very marked rise immediately west of Birdsville. The Bouguer values rise to a maximum of +4.9 milligals at Station 179. Both the increase in Bouguer values, approximately 25 milligals, and the gradient, approximately 1 milligal per mile, over this anomaly are similar to those observed over the Betoota Anticline and it is suggested that this anomaly is related to a geological structure similar to that occurring at Betoota.

West from the gravity maximum at Station 179 the Bouguer values decrease to a value at Poepells Corner similar to that observed at Birdsville and it is considered that a similar sedimentary thickness would occur in the Poeppels Corner area as that which is expected in the Birdsville area.

Over the Permit area the Bouguer values show anomalies in the order of 5 - 10 milligals and in the light of the previous remarks on the relation between gravity anomalies and seismic results in areas to the east it appears that the gravity anomalies over the Permit are most probably due to physical variations within the basement.

A regional increase in Bouguer values does occur towards the north-west corner of the Permit. Here Bouguer values reach a maximum of -5.3 milligals at Station D267 while in the Poepells Corner area the Bouguer values are approximately -22 milligals. Assuming a density contrast of 0.4, as discussed previously for the area to the east, the 17 milligal regional rise, from south-east to north-west through the Permit would represent a decrease in depth to the high velocity refractor (base of Mesozoic), of approximately 3300 feet. This is comparable to the north trending structural gradient observed between Birdsville and Breadalbane.

The west trending gravity high through Stations 47 and 56 has the greatest positive reversal of any of the anomalies observed throughout the Permit and could be related to geological structure within the sedimentary section. The rapid decrease in gravity to the south of this high is most probably related to increase in depth of basement in this direction.

## 8. CONCLUSIONS :

The gravity survey over O.P.36 N.T. has indicated that the sedimentary section in the Poepells Corner area would be similar to that expected to occur in the vicinity of Birdsville, namely, approximately 7000 feet of Mesozoic sediments overlying either a dense section of Palaeozoic rocks or dense basement rocks and that the depth to the base of the Mesozoic section decreases by approximately 3300 feet near the north-west corner of the Permit.

The gravity high through Stations 47 and 56 is suggested as being possibly related to geological structure in the sedimentary section while the remainder of anomalous gravity features are considered to be expressions of physical variation in the basement rocks.

The large gravity high between Poepells Corner and Birdsville is believed to be related to a geological structure similar to that occurring at Betoota.

9. REFERENCES :

MILTON B.E., and
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Prelim. Rep. S. Aust. Min. Dept. 1961/60.

OLGERS F., 1961 - "The geology of the Birdsville 4 mile sheet area, Queensland."
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JAUNCEY, W., 1961 - "Geology of the Bedourie, Machattie, Birdsville, Betoota 4 mile sheet areas in Western Queensland."
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APPENDIX "A".

PRINCIPLE FACTS.

| STATION | LATITUDE | ELEVATION RELATIVE TO M.S.L. | OBSERVED GRAVITY | BOUGUER ANOMALY |
|---|---|---|---|---|
| 1 | 26° 00.0 | 65 | 979.01403 | - 20.82 |
| 2 | 25° 58.0 | 44 | .01030 | - 23.66 |
| 3 | 55.5 | 51 | .00620 | - 24.31 |
| 4 | 52.75 | 52 | .00635 | - 20.85 |
| 5 | 50.2 | 54 | .00558 | - 18.48 |
| 6 | 46.8 | 87 | 978.99974 | - 18.02 |
| 7 | 44.3 | 67 | .99716 | - 19.05 |
| 8 | 41.5 | 143 | .98776 | - 19.87 |
| 9 | 38.8 | 118 | .98495 | - 21.26 |
| 10 | 39.0 | 118 | .98556 | - 20.88 |
| 11 | 41.3 | 127 | .98851 | - 19.99 |
| 12 | 44.1 | 110 | .99477 | - 18.21 |
| 13 | 46.15 | 105 | .99774 | - 18.00 |
| 14 | 48.7 | 134 | .99779 | - 18.91 |
| 15 | 51.1 | 114 | 979.00242 | - 18.51 |
| 16 | 53.7 | 116 | .00456 | - 19.30 |
| 17 | 56.3 | 77 | .00702 | - 22.61 |
| 18 | 26° 00.0 | 38 | .01142 | - 25.32 |
| 19 | 25° 59.8 | 39 | .01641 | - 20.02 |
| 20 | 57.1 | 43 | .01416 | - 18.80 |
| 21 | 54.1 | 54 | .01007 | - 18.58 |
| 22 | 51.35 | 95 | .00279 | - 19.76 |
| 23 | 48.7 | 89 | .00059 | - 19.26 |
| 24 | 45.4 | 111 | 978.99641 | - 18.03 |
| 25 | 41.6 | 130 | .98864 | - 20.01 |
| 26 | 38.9 | 135 | .98572 | - 19.41 |
| 27 | 38.8 | 110 | .98836 | - 18.41 |
| 28 | 41.7 | 129 | .99081 | - 18.02 |
| 29 | 44.6 | 148 | .99432 | - 16.60 |
| 30 | 47.7 | 112 | .00056 | - 16.39 |
| 31 | 50.8 | 184 | .99872 | - 16.96 |
| 32 | 54.3 | 46 | .01288 | - 16.56 |
| 33 | 57.15 | 40 | .01616 | - 17.07 |
| 34 | 59.4 | 40 | .01780 | - 18.09 |
| 35 | 25° 58.4 | 111 | 979.01258 | - 17.17 |
| 36 | 54.5 | 110 | .00955 | - 15.54 |
| 37 | 51.95 | 94 | .00874 | - 14.59 |
| 38 | 49.6 | 83 | .00723 | - 14.10 |
| 39 | 46.5 | 99 | .00276 | - 13.81 |
| 40 | 44.1 | 97 | 978.99923 | - 14.66 |
| 41 | 41.3 | 115 | .99377 | - 15.57 |

APPENDIX "A" (Contd.)

| STATION | LATITUDE | ELEVATION RELATIVE TO M.S.L. | OBSERVED GRAVITY | BOUGUER ANOMALY |
|---|---|---|---|---|
| 42 | 25° 39.25 | 119 | 978.99015 | - 16.51 |
| 43 | 37.1 | 172 | 978.98281 | - 17.64 |
| 44 | 37.9 | 136 | .98795 | - 15.94 |
| 45 | 40.05 | 146 | .99175 | - 13.97 |
| 46 | 43.8 | 157 | .99688 | - 12.47 |
| 47 | 46.75 | 138 | 979.00302 | - 11.11 |
| 48 | 49.5 | 136 | .00555 | - 11.96 |
| 49 | 52.4 | 108 | .00795 | - 14.93 |
| 50 | 55.3 | 93 | .00868 | - 18.66 |
| 51 | 59.3 | 104 | .00794 | - 23.36 |
| 52 | 58.2 | 93 | .00160 | - 29.18 |
| 53 | | | | |
| 54 | 54.0 | 104 | .00590 | - 19.14 |
| 55 | 51.0 | 126 | .00707 | - 12.90 |
| 56 | 48.1 | 137 | .00414 | - 11.65 |
| 57 | 45.95 | 178 | 978.99740 | - 13.01 |
| 58 | 43.1 | 156 | .99446 | - 14.14 |
| 59 | 40.3 | 177 | .98797 | - 15.87 |
| 60 | 38.0 | 191 | .98230 | - 17.87 |
| 61 | 37.45 | 184 | .98021 | - 19.81 |
| 62 | 40.6 | 193 | .98540 | - 17.68 |
| 63 | 43.4 | 155 | .99339 | - 15.63 |
| 64 | 46.1 | 158 | .99823 | - 13.75 |
| 65 | 48.6 | 146 | 979.00268 | - 13.08 |
| 66 | 51.3 | 155 | .00480 | - 13.50 |
| 67 | 53.7 | 119 | .00632 | - 17.33 |
| 68 | 56.1 | 132 | .00257 | - 22.99 |
| 69 | 58.0 | 103 | .00045 | - 29.39 |
| 70 | 57.8 | 125 | .00471 | - 23.34 |
| 71 | 55.4 | 137 | .00704 | - 17.34 |
| 72 | 52.6 | 137 | .00664 | - 14.45 |
| 73 | 49.25 | 177 | .00054 | - 13.82 |
| 74 | 46.5 | 179 | 978.99643 | - 14.55 |
| 75 | 42.25 | 186 | .99046 | - 15.05 |
| 76 | 38.85 | 220 | .98242 | - 16.73 |
| 77 | 35.0 | | | |
| 78 | | | | |
| 79 | | | | |
| 80 | 35.3 | 212 | .97619 | - 19.36 |
| 81 | 32.55 | 189 | .97283 | - 21.12 |
| 82 | 29.5 | 211 | .97291 | - 15.94 |
| 83 | 27.2 | 232 | .97091 | - 13.79 |
| 84 | 24.4 | 223 | .97060 | - 11.47 |
| 85 | 21.8 | 232 | .96854 | - 9.88 |

APPENDIX "A" (Contd.)

| STATION | LATITUDE | ELEVATION RELATING TO M.S.L. | OBSERVED GRAVITY | BOUGUER ANOMALY |
|---|---|---|---|---|
| 86 | 25° 18.4 | 232 | 978.96757 | - 6.90 |
| 87 | 16.7 | 230 | .96450 | - 8.14 |
| 88 | 16.7 | 244 | .96096 | - 10.70 |
| 89 | 20.15 | 229 | .96824 | - 8.48 |
| 90 | 22.65 | 215 | .97292 | - 7.58 |
| 91 | 24.85 | 208 | .97155 | - 12.11 |
| 92 | 27.8 | 201 | .97045 | - 17.12 |
| 93 | 30.7 | 176 | .97266 | - 20.03 |
| 94 | 33.9 | 237 | .97397 | - 18.19 |
| 95 | 34.7 | 149 | .97932 | - 19.93 |
| 96 | 31.4 | 162 | .97309 | - 21.40 |
| 97 | 28.85 | 161 | .96939 | - 22.20 |
| 98 | 26.2 | 217 | .96314 | - 21.44 |
| 99 | 23.9 | 204 | .96346 | - 19.36 |
| 100 | 21.1 | 214 | .96408 | - 14.79 |
| 101 | 19.0 | 214 | .96329 | - 13.14 |
| 102 | 16.6 | 217 | .95968 | - 13.76 |
| 103 | 16.85 | 239 | .96067 | - 11.53 |
| 104 | 18.3 | 223 | .96318 | - 11.81 |
| 105 | 20.95 | 211 | .96427 | - 14.64 |
| 106 | 23.0 | 211 | .96278 | - 18.50 |
| 107 | 25.6 | 193 | .96365 | - 21.92 |
| 108 | 28.2 | 200 | .96364 | - 24.46 |
| 109 | 30.35 | 178 | .96815 | - 23.99 |
| 110 | 32.95 | 151 | .97369 | - 23.38 |
| 111 | 35.5 | 140 | .98041 | - 20.41 |
| 112 | 36.4 | 163 | .97893 | - 21.33 |
| 113 | 33.0 | 162 | .97356 | - 22.79 |
| 114 | 30.6 | 160 | .96866 | - 25.03 |
| 115 | 28.0 | 172 | .96354 | - 26.28 |
| 116 | 25.3 | 187 | .96341 | - 22.22 |
| 117 | 22.6 | 193 | .96420 | - 17.87 |
| 118 | 20.1 | 206 | .96212 | - 16.15 |
| 119 | 18.1 | 205 | .96028 | - 15.74 |
| 120 | 15.9 | 227 | .95805 | - 13.88 |
| 121 | 15.5 | 204 | .95434 | - 18.74 |
| 122 | 17.9 | 209 | .95827 | - 17.23 |
| 123 | 20.3 | 199 | .96181 | - 17.18 |
| 124 | 22.8 | 173 | .96622 | - 17.48 |
| 125 | 25.55 | 164 | .96819 | - 19.34 |
| 126 | 28.15 | 145 | .96886 | - 23.02 |
| 127 | 31.1 | 132 | .97033 | - 25.90 |
| 128 | 33.95 | 133 | .97397 | - 25.50 |
| 129 | 36.2 | 142 | .97714 | - 24.35 |

APPENDIX "A" (Contd.)

| STATION | LATITUDE | ELEVATION RELATING TO M.S.L. | OBSERVED GRAVITY | BOUGUER ANOMALY |
|---|---|---|---|---|
| 130 | 25° 38.15 | 118 | 978.98130 | - 24.15 |
| 131 | 34.75 | 135 | .97806 | - 22.22 |
| 132 | 31.75 | 133 | .97690 | - 20.02 |
| 133 | 29.1 | 146 | .97529 | - 17.64 |
| 134 | 26.4 | 174 | .97084 | - 16.97 |
| 135 | 23.4 | 169 | .96744 | - 17.23 |
| 136 | 20.8 | 170 | .96228 | - 19.31 |
| 137 | 18.7 | 177 | .95804 | - 20.62 |
| 138 | 15.9 | 209 | .95262 | - 20.57 |
| 139 | 16.2 | 181 | .95495 | - 20.53 |
| 140 | 18.8 | 179 | .95865 | - 19.99 |
| 141 | 21.7 | 159 | .96469 | - 18.72 |
| 142 | 23.9 | 147 | .96864 | - 18.16 |
| 143 | 26.5 | 145 | .97344 | - 16.52 |
| 144 | 29.0 | 135 | .97882 | - 14.76 |
| 145 | 31.3 | 125 | .98261 | - 14.34 |
| 146 | 34.15 | 141 | .98673 | - 12.44 |
| 147 | 37.1 | 106 | .99112 | - 13.94 |
| 148 | 13.8 | 234 | .95505 | - 13.96 |
| 149 | 11.1 | 250 | .95009 | - 14.68 |
| 150 | 08.2 | 267 | .94495 | - 15.28 |
| 151 | 05.8 | 277 | .94206 | - 14.71 |
| 152 | 03.4 | 269 | .93861 | - 15.95 |
| 153 | 01.85 | 274 | .93725 | - 15.20 |
| 154 | 04.45 | 268 | .94154 | - 14.30 |
| 155 | 07.45 | 268 | .94553 | - 13.77 |
| 156 | 10.15 | 269 | .94840 | - 13.95 |
| 157 | 12.80 | 239 | .95365 | - 13.85 |
| 158 | 15.3 | 263 | .95663 | - 12.12 |
| 159 | 14.6 | 253 | .95219 | - 16.43 |
| 160 | 11.5 | 254 | .95037 | - 14.59 |
| 161 | 08.85 | 247 | .94858 | - 13.80 |
| 162 | 05.5 | 267 | .94549 | - 11.64 |
| 163 | 02.9 | 287 | .94073 | - 12.00 |
| 164 | 00.6 | 302 | .94052 | - 8.51 |
| 165 | 03.9 | 306 | .94437 | - 8.19 |
| 166 | 06.6 | 270 | .94597 | - 12.21 |
| 167 | 09.5 | 248 | .94794 | - 15.13 |
| 168 | 11.8 | 243 | .95196 | - 14.11 |
| 169 | 14.4 | 243 | .95455 | - 14.52 |
| 170 | 14.5 | 244 | .95766 | - 11.46 |
| 171 | 12.4 | 249 | .96030 | - 6.03 |
| 172 | 09.3 | 286 | .95379 | - 6.39 |

APPENDIX "A" (Contd.)

| STATION | LATITUDE | ELEVATION RELATIVE TO M.S.L. | OBSERVED GRAVITY | BOUGUER ANOMALY |
|---|---|---|---|---|
| 173 | 25° 07.25 | 269 | 978.95038 | - 8.62 |
| 174 | 26° 00.0 | 49 | 979.01781 | - 18.16 |
| 175 | 25° 59.9 | 88 | .01509 | - 18.04 |
| 176 | 26° 00.2 | 84 | .02550 | - 8.27 |
| 177 | 00.0 | 83 | .02585 | - 7.74 |
| 178 | 00.0 | 110 | .02732 | - 4.39 |
| 179 | 00.0 | 103 | .03707 | 4.87 |
| 180 | 00.0 | 101 | .03645 | 4.11 |
| 181 | 25° 13.0 | 227 | 978.95061 | - 17.96 |
| 182 | 10.5 | 249 | .94855 | - 15.60 |
| 183 | 07.4 | 231 | .94450 | - 17.32 |
| 184 | 04.7 | 241 | .93845 | - 19.56 |
| 185 | 00.9 | 249 | .93329 | - 19.80 |
| 186 | 01.1 | 281 | .93453 | - 16.55 |
| 187 | 00.7 | 245 | .93427 | - 18.87 |
| 188 | 03.0 | 237 | .93625 | - 20.08 |
| 189 | 05.5 | 238 | .94027 | - 18.88 |
| 190 | 07.5 | 221 | .94307 | - 19.57 |
| 191 | 10.2 | 215 | .94676 | - 19.41 |
| 192 | 12.75 | 213 | .94887 | - 20.39 |
| 193 | 13.5 | 194 | .95180 | - 19.65 |
| 194 | 10.6 | 205 | .94754 | - 19.80 |
| 195 | 7.6 | 214 | .94432 | - 18.92 |
| 196 | 4.65 | 224 | .94152 | - 17.62 |
| 197 | 01.5 | 239 | .93751 | - 16.96 |
| 198 | 00.1 | 253 | .93457 | - 17.32 |
| 199 | 00.6 | 256 | .93390 | - 18.35 |
| 200 | 00.6 | 233 | .93580 | - 18.05 |
| 201 | 02.3 | 223 | .93817 | - 18.36 |
| 202 | 04.8 | 221 | .94154 | - 17.98 |
| 203 | 07.7 | 201 | .94557 | - 18.70 |
| 204 | 11.0 | 194 | .94996 | - 18.60 |
| 205 | 13.9 | 182 | .95527 | - 17.48 |
| 206 | 16.5 | 172 | .95893 | - 17.53 |
| 207 | 16.3 | 174 | .96048 | - 15.61 |
| 208 | 13.7 | 162 | .95607 | - 17.85 |
| 209 | 10.9 | 178 | .95201 | - 17.55 |
| 210 | 08.0 | 189 | .94570 | - 19.75 |
| 211 | 05.2 | 204 | .94153 | - 19.65 |
| 212 | 02.5 | 206 | .93917 | - 18.76 |
| 213 | 00.1 | 223 | .93703 | - 16.95 |
| 214 | 54.4 | 48 | 979.00442 | - 25.00 |
| 215 | 50.15 | 99 | 978.99816 | - 22.70 |

APPENDIX "A" (Contd.)

| STATION | LATITUDE | ELEVATION RELATIVE TO M.S.L. | OBSERVED GRAVITY | BOUGUER ANOMALY |
|---|---|---|---|---|
| 216 | 25° 44.6 | 119 | 978.99381 | - 19.13 |
| 217 | 40.9 | 115 | .98647 | - 22.47 |
| 218 | 37.4 | 123 | .98726 | - 16.96 |
| 219 | 40.9 | 105 | .98676 | - 22.82 |
| 220 | 43.3 | 111 | .99125 | - 20.72 |
| 221 | 45.5 | 89 | .99628 | - 19.82 |
| 222 | 30.3 | 131 | .98252 | - 12.84 |
| 223 | 26.4 | 169 | .97318 | - 14.98 |
| 224 | 22.8 | 151 | .96849 | - 16.75 |
| 225 | 19.6 | 161 | .96324 | - 17.59 |
| 226 | 11.1 | 184 | .95123 | - 18.15 |
| 227 | 07.2 | 196 | .94577 | - 18.27 |
| 228 | 03.45 | 215 | .93962 | - 18.77 |
| 229 | 00.25 | 217 | .93814 | - 16.43 |
| 230 | 26° 00.0 | 193 | 979.01518 | - 10.73 |
| 231 | 00.0 | 143 | .02918 | - 0.23 |
| 232 | 00.0 | 110 | .03456 | 2.85 |
| 233 | 00.0 | 127 | .03461 | 4.09 |
| 234 | 00.0 | 120 | .03139 | 0.38 |
| 235 | 25° 54.2 | 148 | .00300 | - 19.21 |
| 236 | 01.05 | 281 | 978.93453 | - 16.49 |
| 237 | 01.65 | 326 | .93733 | - 11.24 |
| 238 | 01.5 | 308 | .94437 | - 5.29 |

APPENDIX "A" (Contd.)

DESCRIPTION OF PERMANENTLY MARKED STATIONS.

| STATION | DESCRIPTION |
|---|---|
| 1 | Poeppels Corner - survey peg - 40 yards east of salt lake. |
| 5 | North end of large salt lake, beer bottle. |
| 12 | North end of claypan. |
| 18 | North end of large salt lake, beer bottle. |
| 34 | North end of small salt lake. |
| 43 | North end of claypan. |
| 54 | Small claypan. |
| 69 | Centre of large claypan - beer bottle. |
| 72 | North-east corner of claypan. |
| 85 | East side of small claypan. |
| 94 | North-east corner of small claypan. |
| 102 | North-east corner of small claypan. |
| 120 | North-east corner of small claypan. |
| 129 | Centre of small claypan. |
| 139 | North-east corner of small claypan. |
| 153 | North end of claypan. |
| 157 | North-east corner of claypan. |
| 162 | South end of small claypan. |
| 174 | 182 MP of Queensland/South Australia border survey. |
| 177 | 164 MP of Queensland/South Australia border survey. |
| 178 | 157 MP of Queensland/South Australia border survey. |
| 180 | Fence corner on Queensland/South Australia border survey. |
| 184 | South end of small claypan. |
| 198 | North end of small claypan. |
| 214 | 6 MP of Queensland/Northern Territory border survey. |
| 221 | East side of claypan. |
| 223 | Base of two small gidyea trees - beer bottle. |
| 230 | 106 MP of Queensland/South Australia border survey. |
| 231 | 116 MP of Queensland/South Australia border survey. |
| 232 | 122 MP of Queensland/South Australia border survey. |
| 233 | 129 MP of Queensland/South Australia border survey. |
| 234 | 137 MP of Queensland/South Australia border survey. |