DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOPHYSICAL EXPLORATION OF THE ARCKARINGA BASIN - 1970

by

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SEISMIC GEOPHYSICS SECTION

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FIGURES

Rept.Bk.No. 71/69
G.S.No. 4646
D.M.No. 28/70

20th April, 1971

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept. Bk. No. 71/69
G.S. No. 4646
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GEOPHYSICAL EXPLORATION OF THE ARCKARINGA BASIN - 1970

ABSTRACT

During 1970 and early 1971 three stratigraphic wells were drilled by the S.A. Department of Mines and refraction and reflection seismic surveys carried out in the western Arckaringa basin, while in the east (Boorthanna trough) a private company undertook two seismic surveys and the drilling of one oil well. As a result, dolomites were discovered to be the origin of high speed refractors in the southwest and the northwest and the interpretation of gravity and magnetic data in these areas is now more certain.

Mapping of the Phillipson trough by reflection and refraction profiling has enabled a detailed interpretation of this feature to be made and drilling to crystalline basement in the deeper part of the trough has been recommended. Similarly, drilling of the Wintinna gravity high to basement has been recommended to completely intersect the dolomite discovered in Mount Willoughby No. 1. More seismic work in this region will be carried out to assist in choosing a drilling site.

In the Boorthanna trough and the area marginal to this trough and the Wintinna gravity feature, company work has resulted in more detailed mapping of the (?)Devonian dolomite first encountered in Cootanoorina No. 1. Examination of Department of Mines seismic results together with the company data and the log of the company well (Weedina No. 1) has suggested the presence of two dolomites in the Boorthanna trough, distinguishable by the difference in their refraction seismic velocities. Experimental seismic shooting will be undertaken to test this hypothesis and, if successful, to locate the limits of the (?) Devonian dolomite.

INTRODUCTION

This report is a continuation of the 'Report on Seismic Operations - Western and Central Arckaringa Basin - 1969' (Milton, 1970). The object is to describe seismic operations carried out between March and July, 1970, by the S.A. Department of Mines and the interpretation of the results in three regions of the Arckaringa basin. The areas concerned were chosen from the results of aeromagnetic and gravity surveys and previous seismic work and were located over the Wallira West gravity low, the Phillipson gravity low and the Wintinna gravity high (fig.1). The information analysed includes gravity data obtained by the S.A. Department of Mines covering the southeast section of the Phillipson trough and the southwest of the Wallira gravity trend and results of stratigraphic drilling located on seismically defined targets. Gravity surveys by the Bureau of Mineral Resources further west during 1970 have enabled limits to be placed on the western boundary of the Arckaringa basin.

In the eastern region of the basin, some detailed seismic work (United Geophysical Corp., 1970a & b) and an oil exploration well (Weedina No. 1) drilled on the Warrangarrana structure by a private company (Wopfner & Milton, 1969; Papalia, 1970) together with a second well, Boorthanna No. 1 (Holmes, 1970) have increased understanding of the nature of the Boorthanna trough.

PREVIOUS GEOPHYSICAL EXPLORATION

Aeromagnetic:

Unchanged

Gravity:

Gravity values at seismic shot points of the 1970 surveys were integrated with information from helicopter surveys.

Bureau of Mineral Resources helicopter surveys in the western part of the State in 1970 and private company work directed at investigating the Eastern Officer Basin (Murumba, 1970) have resulted in a complete gravity coverage of the Arckaringa basin with an average station interval of about four miles.

Seismic:

In addition to the Departmental surveys in the western and central sectors of the basin, continuous reflection profiling was undertaken by a private company in 1970 in the east to extend investigations of the Boorthanna trough. The northwestern-most limit of these surveys extends on to the eastern extension of the Wintinna gravity high (fig. 6).

GEOLOGY

As a result of the 1969 and 1970 geophysical surveys and stratigraphic drilling, both Departmental and by private companies, knowledge of the geology of the Arckaringa basin has been considerably expanded. A comprehensive interpretation is contained in the "Permian Paleogeography and Depositional Environment of the Arckaringa Basin, South Australia", presented at the I.U.G.S. Gondwana Symposium, South Africa, in July, 1970 by H. Wopfner, Supervising Geologist, Petroleum Exploration Division of the South Australian Geological Survey.

ACCESS

Of the three main regions investigated in 1970, the Wallira West prospect is in an area of deep sand with fairly heavy scrub cover; the Phillipson trough has relatively easy access due

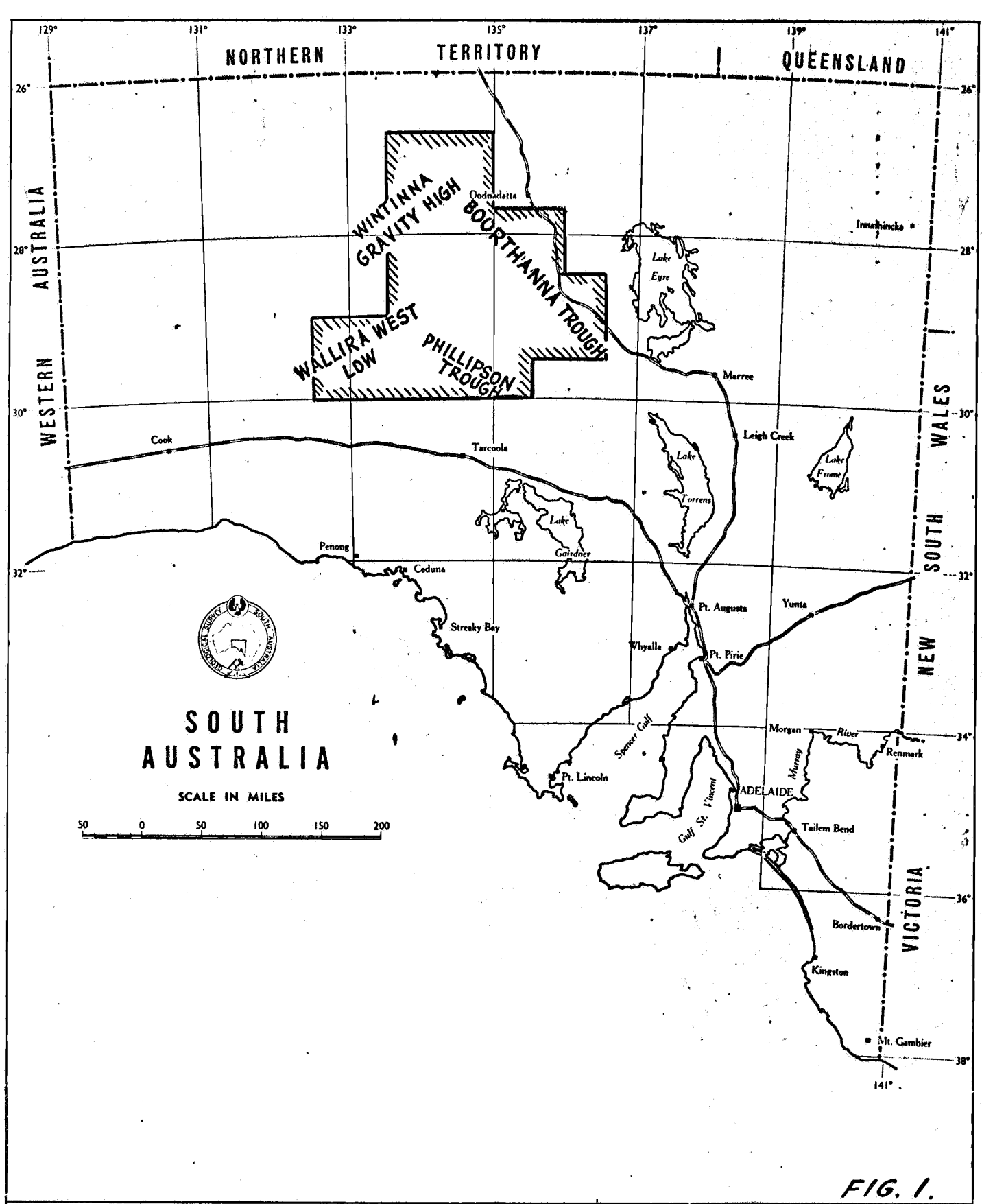

FIG. 1.

	DEPARTMENT OF MINES — SOUTH AUSTRALIA	Scale:
Compiled	ARCKARINGA BASIN LOCALITY PLAN OF SURVEY AREAS	Date: 7th April '71.
Drn: B.S.G Ckd:		Drg. No. S·9247 AB.

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to the number of station tracks in the area; and at the eastern extension of the Wintinna gravity high some areas of outcropping silcrete and others of 'crab hole' country make for difficult travelling.

EXPLORATION METHODS

Seismic methods were similar to those used in the 1969 survey. Continuous refraction profiling was shot in the vicinity of the Wallira West gravity low along the east-west and north-south vermin fences bounding Commonwealth Hill station, and north-south and east-west station tracks, while depth probes were laid down at about 5 mile intervals to the south, west and east of the main concentration of the survey, to obtain spot depths to the high speed refractor.

A combination of continuous reflection and refraction profiling was used to extend the 1969 work over the Phillipson gravity low. Reflection quality was good to fair over the deeper parts of the trough. Where the quality became very poor near the fault zones bounding the trough, refraction profiling was shot and extended where possible to areas of shallow crystalline basement. Several isolated depth probes were shot to the east of the Phillipson trough, but further work will be required in this area to locate the southern and southeastern limits of the Arckaringa basin.

In the northern area, over the eastern extension of the Wintinna gravity high, two weeks were spent in experimental shooting, both reflection and refraction, in an effort to penetrate a refractor of between 20,000 and 21,000 feet per second, described

in the previous report. Surface conditions are extremely bad for energy transmittal and charges of up to 200 lb. of Geophex were required to obtain reasonable first breaks over a spread of 7,200 feet from the high speed refractor at a depth of 2,000 feet below surface. Possible indications of the crystalline basement velocity of 18,500 feet per second were obtained from secondary refraction events, but these were not of sufficient quality to use for quantitative analysis, or indeed to state that they certainly originate from a refractor of this velocity. Attempts to obtain reflections from crystalline basement, including the use of 600% C.D.P. profiling, were unsuccessful, and this is considered to be largely due to surface conditions,

Identification of the high speed refractor has been achieved by drilling and, as suspected, proved to be a dolomite. This has a density of 2.77 gms./c.c. This is contrasted with a density of 2.70 of dolomite core sample from Cootanoorina No. 1 and average densities of 2.64 (from 2054 to 4,000 feet) and 2.85 (from 4,000 to 5,103 feet) from the density log of Weedina No. 1. Complete penetration of the sedimentary sequence to crystalline basement at about 6,000 feet, assuming that this is coincident with magnetic basement, appears to be the next logical step in exploration of the Wintinna feature.

In addition to investigating the three features of Wallira West, Phillipson and Wintinna, a number of isolated refraction 'depth probes' were shot east of the Phillipson trough on BILLAKALINA 1:250,000 sheet, and north and west of Welbourn Hill HS on WINTINNA and ABMINGA. The results were variable in quality, depending largely on surface conditions, e.g. scattered but

sometimes extensive near-surface pods of silcrete west of Welbourn Hill HS have distorted refraction breaks and made timing difficult.

Coverage during the four crew months of operation by the S.A. Department of Mines crew in 1970 consisted of 54 miles of reflection profiling, 90 miles of continuous refraction profiling, and 38 depth probes totalling 50 miles.

INTERPRETATION OF RESULTS

The contour plan of depths to basement presented in the 1970 report has been extended to include the results of the 1970 survey together with results of further stratigraphic drilling (fig. 2). Contours of the high speed refractor originating from thedense dolomite discovered at Mount Willoughby No. 1 and a dense carbonate rock from Wallira West No. 1 are also included. Bouguer gravity contours at 10 milligal intervals are shown on the plan as a background to the seismic basement contours.

The two stratigraphic wells named above were drilled primarily to solve problems arising from the geophysical exploration and these will be briefly described in the appropriate section below.

The results of the 1970 work can be discussed under three major headings, viz. the Wallira West feature, the Phillipson trough and the Wintinna gravity high. These investigations, particularly of the latter feature, have led to a re-assessment of existing data in the Boorthanna trough and this is described in a fourth section.

1. <u>The Wallira West gravity low</u>.

From the gravity pattern, this featureappears to be an extension to the west and southwest of the system of narrow, fault bounded grabens represented by the Wallira and Phillipson gravity lows,

although the interpreted depths to magnetic basement place the magnetic trough to the north of the gravity low. A network of north-south and east-west station tracks and vermin proof fences enabled seismic lines to be surveyed over the gravity anomaly at approximately right angles to the major axis. Extremely difficult drilling conditions were encountered with deep, fine sands and scattered silcrete, ranging from rubble to thick bands, present over much of the area. This resulted in refraction profiling being adopted to investigate the trough, as shallow shot holes could be used to obtain fair to good refraction breaks. Some reflection spreads were shot over the deeper part of the anomaly, but no reflections were recorded.

The Wallira West anomaly differs from the features further east in the following particulars.

(a) The aeromagnetic trough from interpreted depths to magnetic basement, although not well defined, is displaced to the north of the gravity low, whereas the Wallira and Phillipson gravity lows are nearly coincident with the magnetic troughs.

(b) Similarly, the seismic trough is displaced in the same direction. The trough could not be completely defined due to sand ridges covered with thick scrub to the north and west of the vermin fences, and the use of track making equipment could not be organised in the short period available.

(c) The high speed seismic refractor velocity is much more variable than that of the two eastern troughs, where this refraction is known to be associated with crystalline basement and has an average velocity of 18,500 feet per second. On the seismic lines east and south of the Karari fault (fig. 2b), which runs generally through the lowest part of the gravity anomaly in a northeast/southwest direction, shallow

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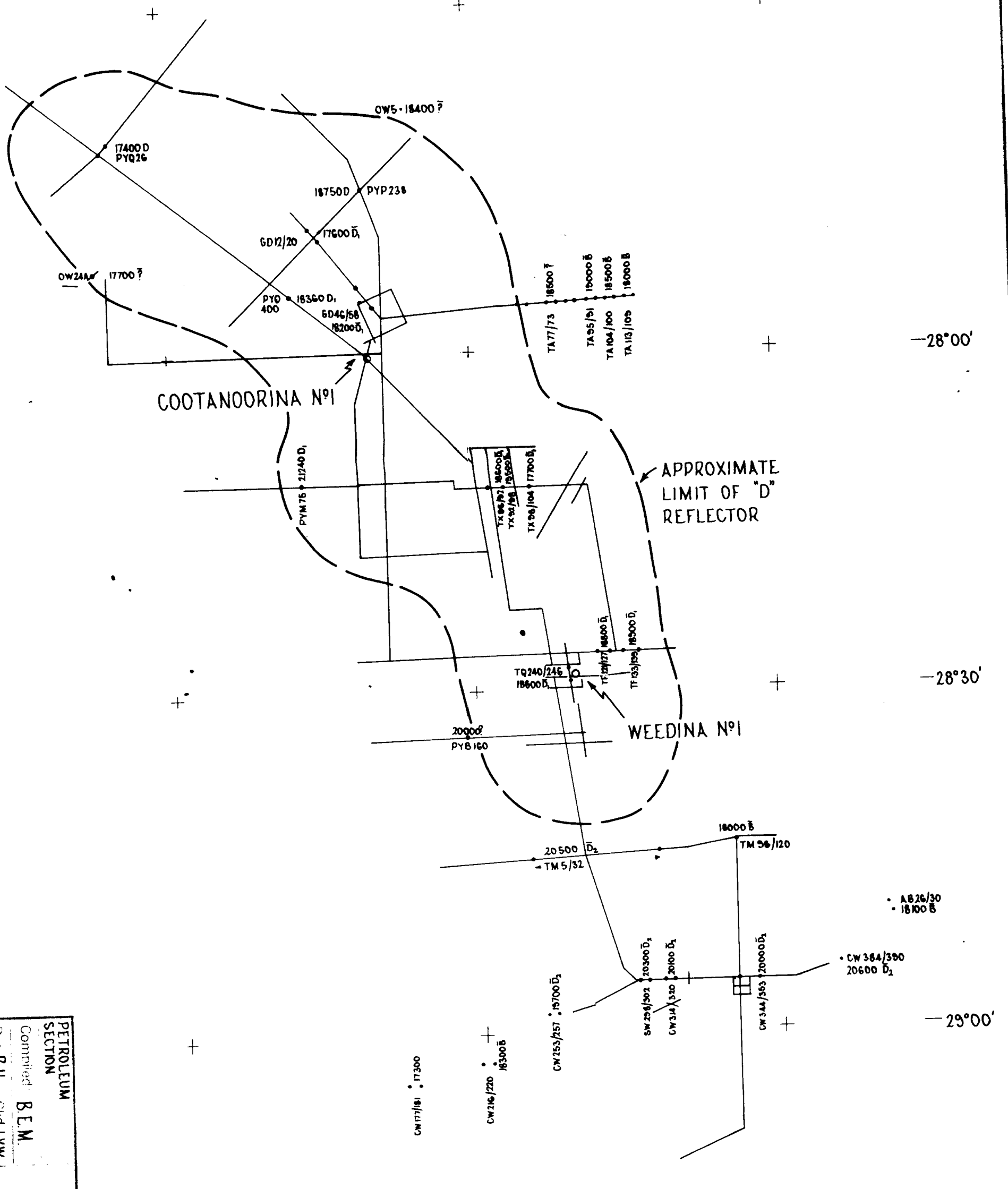


LEGEND

D_1 Lower velocity dolomite

D_2 Higher velocity dolomite

B Refractor outside area of dolomite

Note: D_1, D_2, B indicate reciprocally shot spread
$\bar{D}_1, \bar{D}_2, \bar{B}$ indicate apparent velocity

Interpretation by B.E. Milton

SCALE

MILES 4 0 4 8 12 16 20 24 28 MILES

KILOMETRES 4 0 4 8 12 16 20 24 28 32 36 40 44 KILOMETRES

DEPARTMENT OF MINES – SOUTH AUSTRALIA

PETROLEUM SECTION

Compiled: B.E.M.

Drn. R.H. Ckd. LVW.

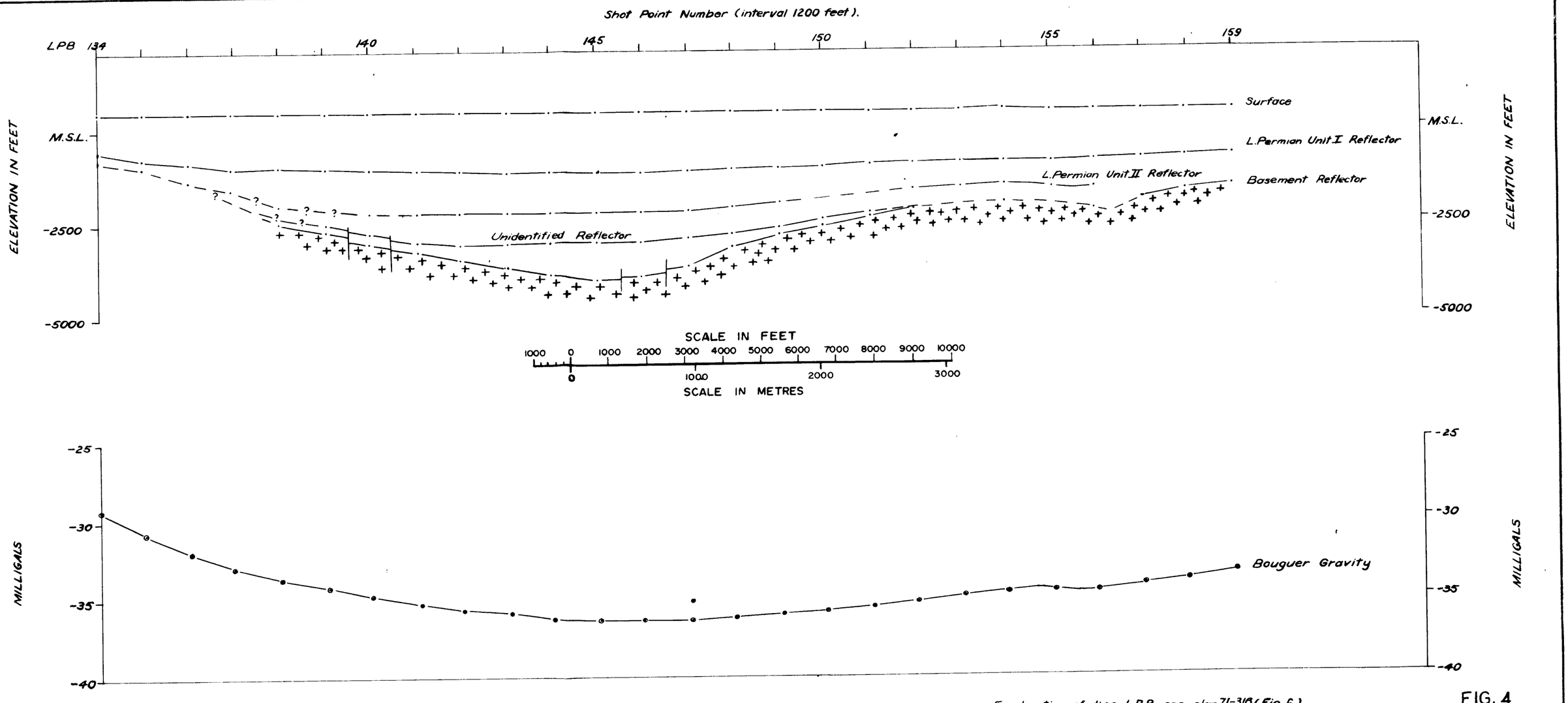
ARCKARINGA BASIN
BOORTHANNA TROUGH
SEISMIC LINES SHOWING DOLOMITE REFRACTION VELOCITIES

Scale: As shown

Date: 23 April 1971

Drg. No. 71-312 Bde

FIG. 6



For location of line LPB see plan 71-316 (Fig. 6).

FIG. 4

PETROLEUM EXPLORATION DIVISION	DEPARTMENT OF MINES – SOUTH AUSTRALIA	Scale: As shown
Compiled: J.McG.H.	WESTERN ARCKARINGA BASIN PHILLIPSON TROUGH SEISMIC REFLECTION CROSS-SECTION AND BOUGUER ANOMALY PROFILE ALONG LINE LPB	Date: 2 April 1971.
Drn. J.M.B. Ckd. L.V.W.		Drg. No. 71-296 Bb.

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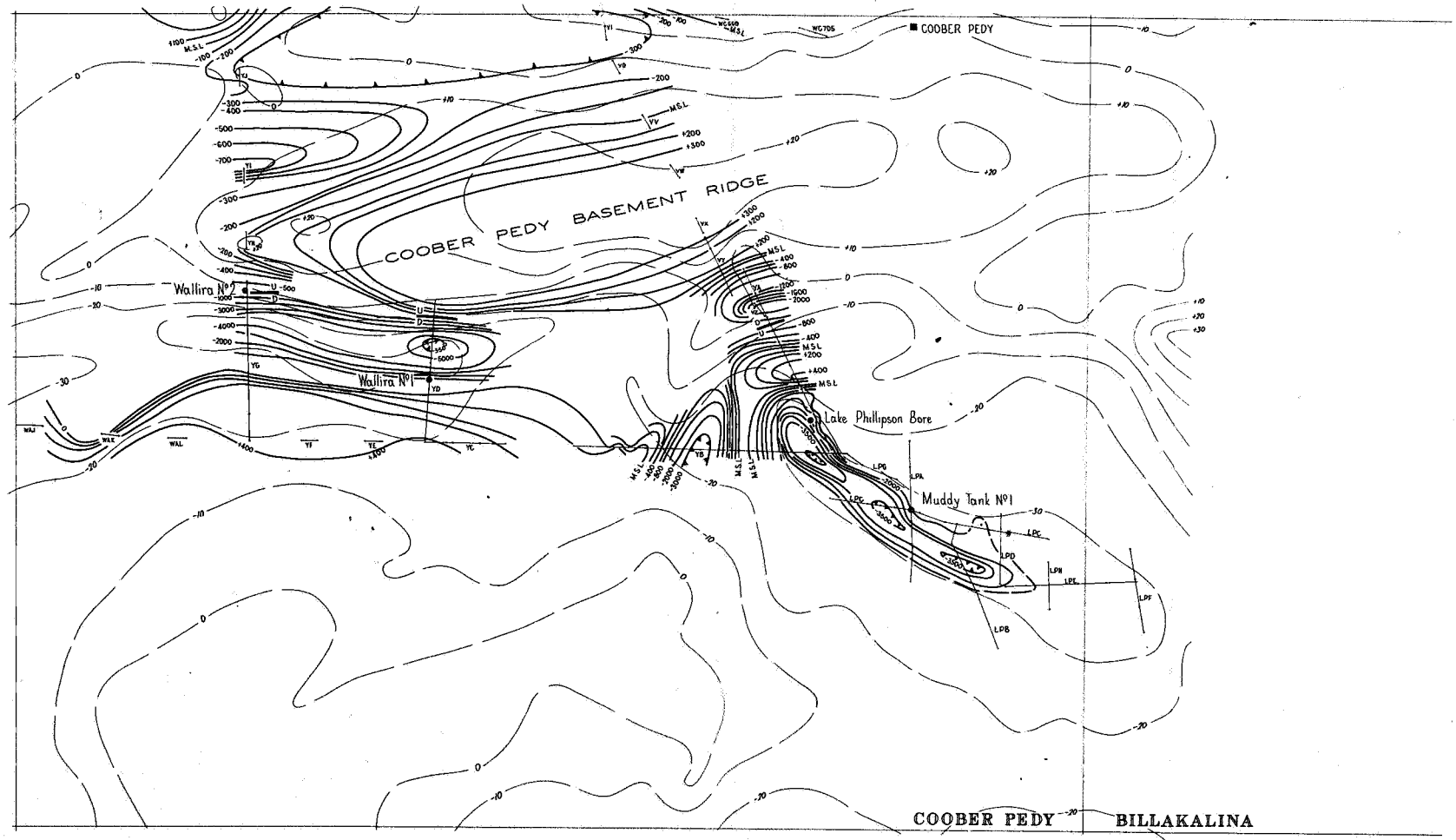


LEGEND

- —10— Gravity Contour (Interval 10 milligals)
- —+1000— Basement Contour (Depth relative to Mean Sea Level)
- —·—·— High Speed refractor contour relative to M.S.L. (not cryst. bas.)
- ● Well location
- YD Seismic Line
- U / D Fault

Interpretation by B.E. Milton

SCALE

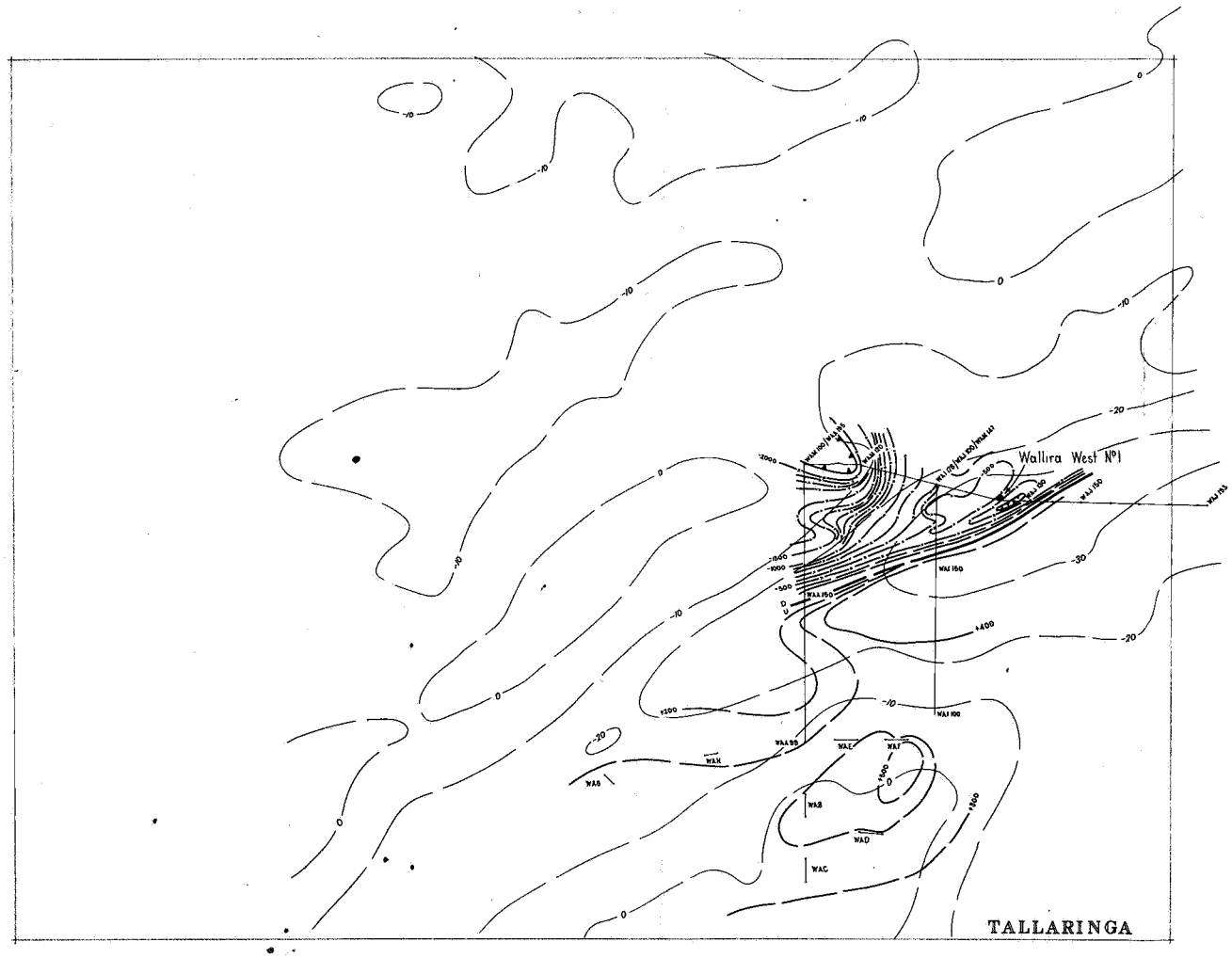
MILES 2 0 2 4 6 8 10 12 14 16 18 20 MILES

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

DEPARTMENT OF MINES — SOUTH AU

WESTERN ARCKARINGA
COOBER PEDY & BILLAKALINA
CONTOURS OF BOUGUER GRAVITY AND
HIGH SPEED REFRACTOR AND REI

PETROLEUM EXPLORATION DIVISION	GEOLOGIST	Compiled B.E. Milton	Scale
		Drn. R.H.	Date
Director of Mines	SUP. GEOLOGIST	Chd. L.Y.W.	Drg.



For legend see plan No 71-308

SCALE

MILES 2 0 2 4 6 8 10 12 14 16 18 20 MILES

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

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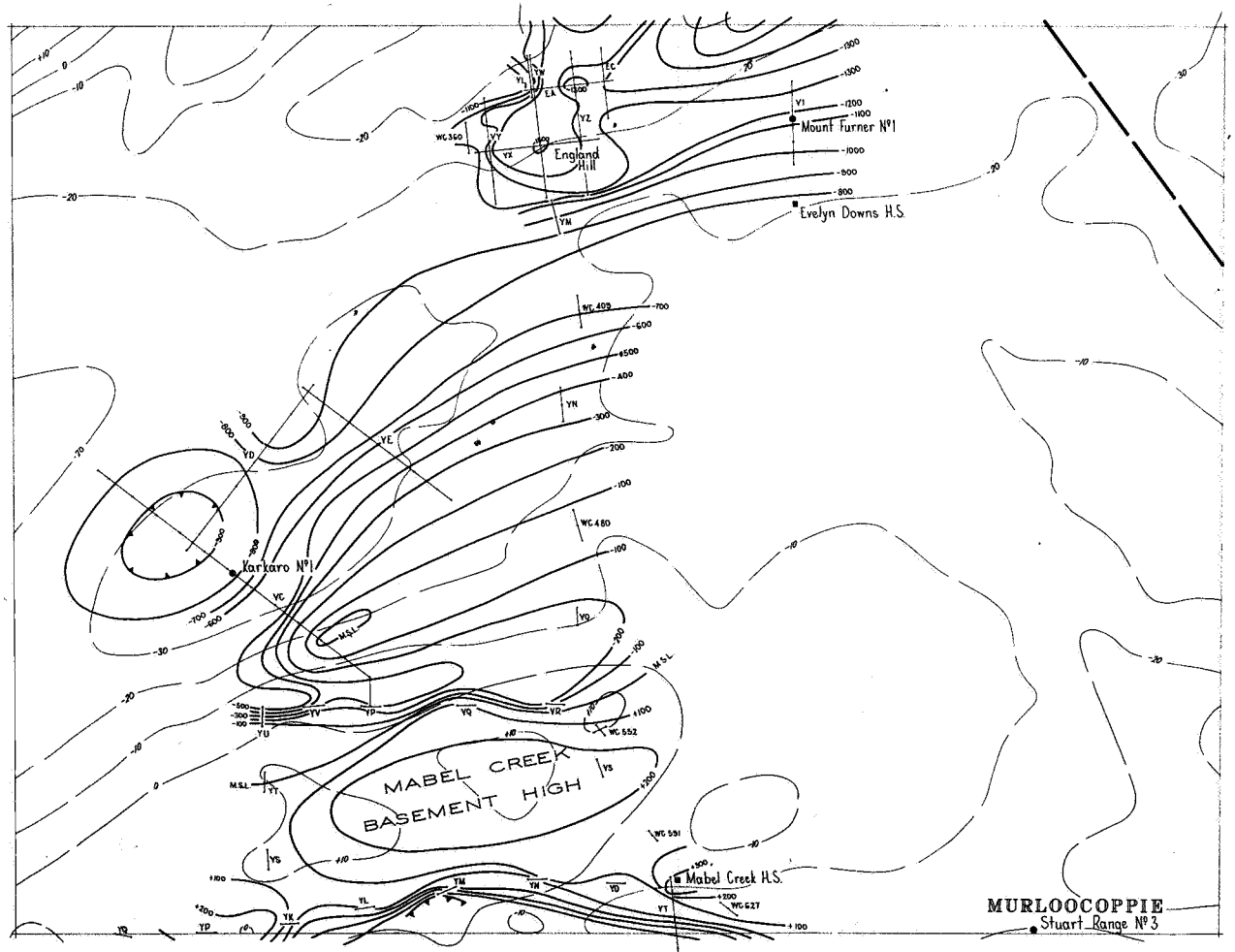

For legend see plan N° 71-308

SCALE

MILES 20 15 10 8 6 4 2 0 2 4 6 8 10 12 14 16 18 20 MILES

KILOMETRES 35 30 25 20 15 10 5 0 5 10 15 20 25 KILOMETRES

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WESTERN ARCKARINGA BA

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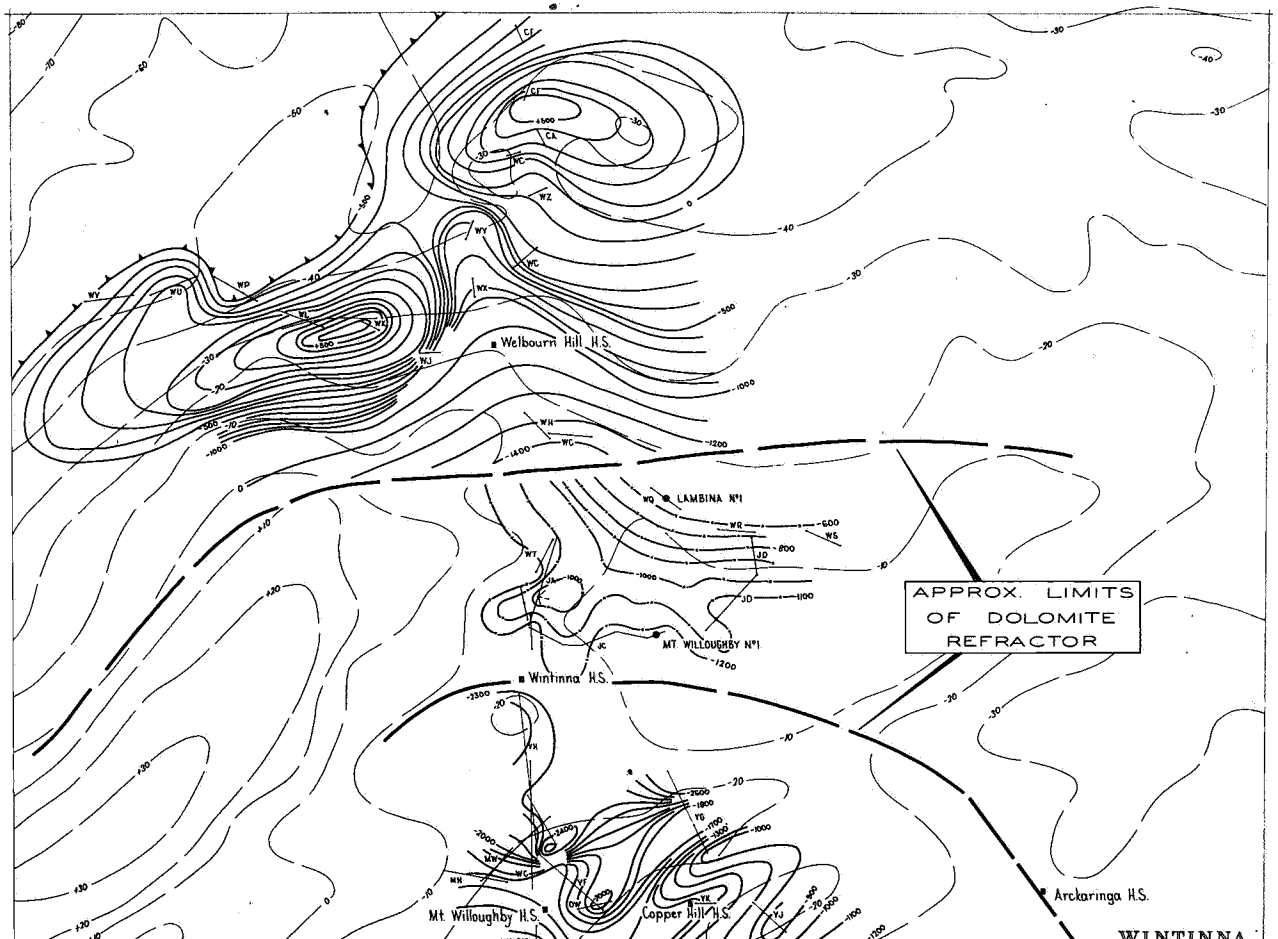
CONTOURS OF BOUGUER GRAVITY AND

HIGH SPEED REFRACTOR AND REFL

PETROLEUM EXPLORATION DIVISION	GEOLOGIST	Compiled B.E. Milton	Scale: A
		Drn. V. H.	Drg. No.
Director of Mines	SUP. GEOLOGIST	Chd. L.V.W.	



For legend see plan N° 71-308

SCALE

MILES 2 0 2 4 6 8 10 12 14 16 18 20 MILES

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

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WESTERN ARCKARINGA BAS

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CONTOURS OF BOUGUER GRAVITY AND DI

HIGH SPEED REFRACTOR AND REFLEC

PETROLEUM EXPLORATION DIVISION	GEOLOGIST	Compiled B.E. Milton	Scale 1 As
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Director of Mines	S.E.N. GEOLOGIST	Chd. L.V.W.	Drg. No. 71

basement is indicated and velocities range from 18,400 to 19,300 feet per second. South of the fault along the Moonbi bore track (line WAI, refer fig. 3), the average velocity is 18,600 feet per second and in this vicinity, which coincides with the lowest gravity values of the feature, granite was intersected in shot holes within a few feet of the surface. On the down thrown side of the fault, the average velocity of 40 refraction spreads is 18,200 feet per second, but true velocities range from about 17,500 to 19,500, which is a much greater range than recorded over crystalline basement.

The displacement of the magnetic and seismic features from the gravity low together with the unusual variation of velocity of the high speed refractor suggests that this does not represent basement on the down-thrown side of the fault but could originate from dense sedimentary rocks. To test this hypothesis, a shallow stratigraphic well, Wallira West No. 1, was drilled early in 1971 at shot point WAJ122. A dense, hard, dolomitic rock was intersected at 1033 feet below surface with a density of 2.65 gms./c.c.

In the light of the information obtained from Wallira West No. 1, a section has been constructed along the north-south seismic line WAI, from shot point 137 to 179 (fig. 3). The northerly shot point, WAI179, lies a few hundred feet north of its intersection with line WAJ and is 5 miles west of the well. The section shows two refractors north of the Karari fault, one of 12,000 feet per second, the origin of which has not yet been correlated with any change of formation in the well, and 18,000 feet per second, which is correlated with the dolomite. Magnetic basement is seen to dip to the north, the increase in depth being 1,600 feet between the fault and the northern end of the line, a distance of 5 miles. The thickening of the dense dolomite section accounts for the increase in the

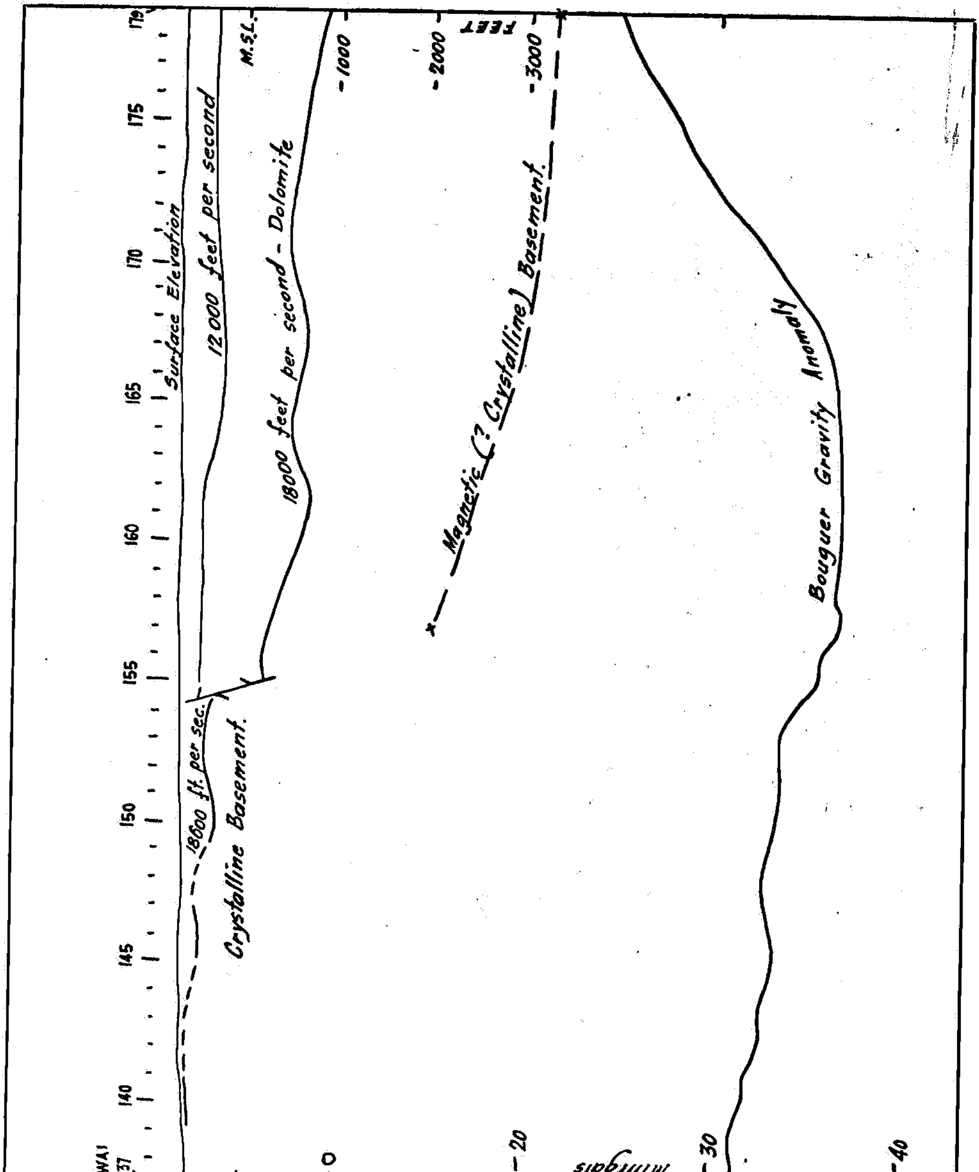
Bouguer gravity values over this part of the anomaly. To the south of the fault, a single refraction velocity has been recorded of 18,600 feet per second, and this is accepted as having its origin from crystalline basement as granite was intersected in shot holes at WAI140 (4 feet below surface) and WAI143 (7 feet) (Williams, 1971).

The change in the appearance of the gravity anomaly to the south of the fault, and the gradual increase in values to the south appears to be the result of a lateral variation in the density of the crystalline basement. Other refraction spreads on this line to the south appears to be the result of a lateral variation in the density of the crystalline basement. Other refraction spreads on this line to the south of WAI137 disclose the same velocity, viz. 18,600 feet per second, with computed depths below surface of less than 150 feet to basement.

2. The Phillipson gravity low

Work on this gravity feature was designed to extend the data obtained on the northern sector in 1969 to the southeast. The location of the seismic profiling was determined by the results of further helicopter gravity surveys.

Good quality reflection records were obtained within the Phillipson trough, the quality declining as the bounding fault zones were approached. Outside the trough, refraction profiling was used to examine the section and results were integrated with the reflection data where possible. In general, the origin of the reflection horizons could be diagnosed by correlation with the refraction horizons whose velocity can be related to geological discontinuities. Formation boundaries at the top of the Permian, the Unit 1 shales (horizon 'B'), the top of Unit 2 and crystalline



DEPARTMENT OF MINES — SOUTH AUSTRALIA

Interpretation by B. E. Milton.

Drn. B.S.G. | Ckd.

FIG. 3. WALLIRA WEST Gravity Low - Profiles of Refracting Horizons, Depth to Magnetic Basement; Surface Elevation and Bouguer Gravity Anomaly.

Scale: -

Date: 7th Apr '71.

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Bob

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basement have been interpreted from these results (fig. 4). A further reflector lying in the deepest part of the trough and generally not less than 3,000 feet below surface, has been correlated and its limits are shown on fig. 5, together with depths to basement. This discontinuity wedges out against the crystalline basement reflector and possibly arises from pre-Permian sediments. As a result of the drilling of Wallira West No. 1, it appears possible that dolomites are present but this can only be determined by drilling (Wopfner & Milton, 1971).

The trough appears at its northern and eastern limits to be rather more structurally complex than the Wallira trough and some further investigations could be warranted at the southeastern part of the anomaly, where refraction velocities differ from those of the main trough and correlation between reflection and refraction results has not yet been achieved.

In general, the section within the Phillipson trough is similar to that of the Wallira trough to the west and the gravity patterns suggest that the two troughs are interconnected (fig. 2a). The main difference in the seismic results lies in the quality of the deeper reflectors, which are of good quality over the Phillipson feature and very poor on the two lines shot at Wallira in 1969.

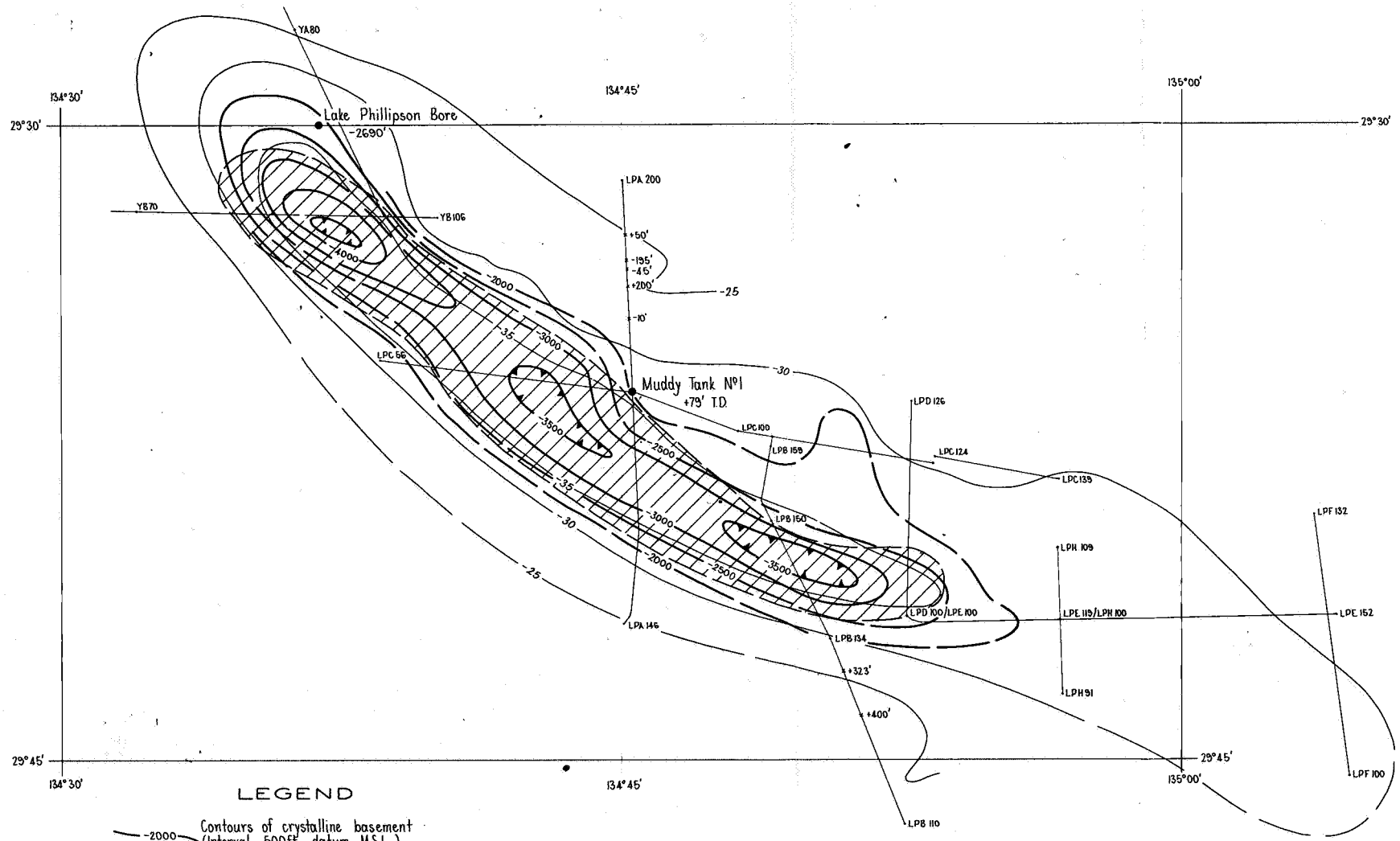
3. The Wintinna gravity high

As a result of geophysical work over a number of years, including aeromagnetic, gravity and seismic surveys, the presence of dense carbonate rocks was suspected in this region. As discussed in the 1970 report, a seismic refraction velocity of greater than 20,000 feet per second had been recorded over an eastern extension of the Wintinna gravity high, which is also coincident with a magnetic trough.

Some weeks were spent in the 1970 survey conducting experiments in an effort to obtain either secondary refractions from below the high speed refractor, or reflection results. Unfortunately, neither method was successful in obtaining interpretable data, but some refraction profiling was carried out to map the surface of the high speed refractor and locate a drilling site. Mount Willoughby No. 1 was drilled at shot point JC44 (Thornton, 1970) and formation tops of the Cadna-owie Formation (refraction velocity 6500/7000 feet per second) and the Mount Toondina beds (8500/9000) were correlated with two refracting horizons. A dense, crystalline dolomite with a density of 2.8 gms/c.c. was intersected at 2054 feet, and the results of a well shoot confirmed that this is the origin of the high speed refractor.

The results of the geophysical exploration and the stratigraphic drilling would seem to indicate that the major gravity feature, the Wintinna gravity high, striking to the southwest, has its origin in the presence of similar, dense dolomite at a shallower depth than in the location of Mount Willoughby No. 1.

Some depth probes were shot to the north and west of Welbourn Hill HS, i.e. to the north and northwest of the eastern extension of the Wintinna gravity high. Shooting conditions were very poor, mainly due to the presence of silcrete rubble,



LEGEND

-2000- Contours of crystalline basement (Interval 500ft., datum M.S.L.)

-30- Contours of Bouguer Gravity (Interval 5 milligals., datum M.S.L.)

× Elevation of Basement Refractor (datum M.S.L.)

LPE 152 Seismic line

● Stratigraphic Well with depth to Basement where reached or Total Depth (rel. to M.S.L.)

Approximate area where penultimate reflector recorded.

SCALE

MILES 2 1 0 2 4 6 MILES

KILOMETRES 4 2 0 2 4 6 8 KILOMETRES

Interpretation J. McG. Hall

DEPARTMENT OF MINES — SOUTH AUSTRALIA

WESTERN ARCKARINGA BASIN
PHILLIPSON TROUGH
DETAILED CONTOURS OF DEPTH TO CRYSTALLINE BASEMENT AND BOUGUER GRAVITY

PETROLEUM EXPLORATION DIVISION		Drn. J.McG.H.	SCALE: As shown
	GEOLOGIST	Tr. R.H.	71-316 Bb
		Chd. L.V.W.	
Director of Mines	SUP. GEOLOGIST	Encl.	DATE: 13 April 1971

and are partly or wholly responsible for the wide scatter of high speed velocities recorded. Theaverage velocity over nine reciprocally shot depth probes is 18200 feet per second, with a velocity range of from 16,800 to 19,600 feet per second. It would appear from the contour plan of high speed refractors (figs. 2d) that the dolomite horizon wedges out on to the northern refractor, which probably originates from crystalline basement. This interpretation is supported by the evidence of the depths to magnetic basement in the region.

4. The Boorthanna trough.

Of the wells drilled in the Arckaringa basin since 1967, four have revealed the presence of a thick section of dolomite. At Cootanoorina No. 1 (Wopfner & Allchurch, 1967), Mount Willoughby No. 1 (Thornton, 1971) and Wallira West No. 1 (Townsend, in process of compilation): identification of a high speed refractor with the top of the dolomite has enabled precise interpretation of much of the geophysical data, although the wells did not penetrate the entire sequence, while at Weedina No. 1 (Papalia, 1970) the complete carbonate sequence was intersected. A seismic reflecting horizon has been correlated with the top of the dolomite intersected at Cootanoorina and Weedina and can be followed over a large part of the Boorthanna trough and to the northwest of the trough, as it is a strong and distinctive event. To the south of the Warrangarrana structure on which Weedina No. 1 was drilled, this 'D' reflector does not persist and it is doubtful if it is present south of the approximate latitude of Box Creek Siding.

Attempts have been made to distinguish the limits of the dolomite by examining refraction velocities in appropriate areas. During this investigation, it was noted that the interval velocities recorded on the sonic log from Weedina No. 1 show a distinct change at 4,000 feet subsurface. The average value for the section from 2054 to 4000 feet is 16,700 feet per second, and for the interval 4,000 to 5,130, 18,600. From the correlation of the dolomite with that from Cootanoorina, the section from 2054 to 5279 feet has been labelled Devonian, but from the sonic and density logs, it appears likely that a distinct change occurs at 4,000 feet. The stratigraphic significance of this change is not yet fully known.

An examination of refraction velocities (fig. 6) reveals that a velocity of around 18,500 feet per second is recorded where the 'D' reflector is present (calculated from 10 reciprocally shot refraction spreads) while to the south of this area the average velocity is 20300 feet per second (from 12 spreads). In the vicinity of Mount Willoughby No. 1, to the northwest of the region of gravity lows outlining the Boorthanna trough, the velocity averages 21,000 feet per second (from 40 spreads). Velocities which do not fit these categories occur on the eastern extremities of the TA, TM and AB lines and the western end of the OW and CW lines, but these are all outside the area of the trough in which the dolomites seem to be present, Velocities recorded on expanding spreads shot for a private company (United Geophysical Corp., 1970a & b) on lines with the prefix PY are apparent values only, as they have not been obtained from reciprocal shots.

Apart from a tentative dating of the Cootanoorina dolomite (of which only 186 feet was penetrated of a possible 4,000) as Devonian on palaeontological evidence (Harris & McGowran. 1968). no

evidence has yet been found on which the deeper dolomite section at Weedina No. 1 or the dolomite at Mount Willoughby No. 1 can be dated. At present the three possible dolomite types discovered in these wells within this part of the Arckaringa basin have only been distinguished by variations in density and seismic velocity. Further work is planned on this material, but in the meantime it seems practicable to use the differences in seismic refraction velocities to establish the limits of the dolomite types within this region.

The dolomite discovered at the Wallira West No. 1 well in March, 1971, appears to be the equivalent of the Observatory Hill Beds (Wopfner, 1969), and from the geophysical evidence is separated from the region described above by large areas in which Permian sediments rest directly on crystalline basement. The problem of distribution of this rock type does not seem to be directly related to that discussed in this section, and will be the subject of a separate investigation.

CONCLUSIONS AND RECOMMENDATIONS

The system of magnetic and gravity features in the vicinity of the Wallira West gravity anomaly and extending to the southwest now appear explicable in terms of density and susceptibility differences between the Permian sediments, the dolomite section, and crystalline basement and further reconnaissance seismic exploration to determine the extent of the dolomite is probably justified. Drilling to basement within the trough at some future date to establish the economic possibilities would seem to be a logical step in further investigation of the region.

In the Phillipson trough, further indirect exploration is not warranted at present, except possibly at the southeast end of the gravity feature to seek solutions to the anomalous refraction velocities. A stratigraphic well to basement with a total depth of about 4,500 feet has been recommended (Wopfner & Milton, 1971), and this is necessary to evaluate the potential of the trough.

Again, drilling to basement has been recommended in the northern area of the Wintinna gravity high, although in this case a limited amount of seismic refraction profiling on the gravity feature will be carried out to determine the depth to the dolomite, which is assumed to be present from the magnetic and gravity data.

In the remainder of the Arckaringa basin, a small scale seismic operation has been planned for mid-1971 to examine refraction velocities as related to the dolomites in the southern Boorthanna trough and the locations where the 'D' reflector fades out both in the south and northwest of the trough. Further work on the western, southwestern and southeastern margins of the basin could also be undertaken at a low cost to obtain more information on the limits of the basin and the inter-relationship between the Eastern Officer and the Arckaringa basins.

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