

000666

BLOCK PROSPECTIVITY
SUMMARY
PEDIRKA BLOCK
FEBRUARY, 1983

ABSTRACT

Recent drilling in the Pedirka Block produced disappointing results, which are best explained in the following ways:

- (a) structural growth on all three structures was late, with little 'C-J_L' thinning being observed.
- (b) the source characteristics of the Poolowanna Beds are different to those assumed by previous workers. The sediments are predominantly gas prone, but are only mature to the level of oil generation. Therefore, only a small amount of oil is likely to have been generated from these sediments, despite their maturity and high TOC.
- (c) the Poolowanna Beds contain a high percentage of sandstone, and show considerable lateral variability. With any structure, there is always the uncertainty that intra-Poolowanna Bed seals are present.

Future exploration should be concentrated on areas where there is evidence of:

- (a) structural thinning in the 'C-J_L' and lower horizons.
- (b) closure independent of faulting at 'J_L'.
- (c) mature Poolowanna Beds which are relatively thick and shaly, but still exhibiting acceptable porosity and permeability.

Recommended areas for exploration are around Macumba-Oolarinna (where underlying Permian sediments provide an early history of structural growth) and east of the N-S Poolowanna Fault.

CONTENTS

1. INTRODUCTION
2. HISTORICAL
3. GEOLOGY
4. EXPLORATION TARGETS
5. PROSPECTS
6. LEADS
7. CONCLUSIONS
8. REFERENCES

APPENDIX 1 - PEDIRKA BLOCK, HYDROCARBON POTENTIAL

ENCLOSURE 1 - LEADS AND PROSPECTS MAP, 1:250,000, PEDIRKA BLOCK

ENCLOSURES 2 to 6 - 'C' HORIZON 1:100,000 TIME MAPS OF AREAS 1, 2, 3,
5 & 6, SHOWING LEADS AND PROSPECTS

1.

INTRODUCTION

The Pedirka Block lies to the west of the Cooper Basin and Birdsville Track Ridge. It has a fairly sparse exploration record, mainly due to its geographic isolation from oil and gas pipelines, combined with the limited success of drilling in the area to date.

The Pedirka Block is located near the centre of a large sedimentary depression known as the Poolowanna Trough (Moore, 1982). This trough accumulated sediments in the Cambro-Ordovician (Warburton Basin), Permian (Pedirka Basin), Triassic (Simpson Desert Basin), Jurassic and Cretaceous (Eromanga Basin).

Exploration is presently concentrated on the Early Jurassic Poolowanna Beds, which are known to contain oil in Poolowanna 1, in the centre of the block. The Permian sequence is mostly thin and confined to the northwestern part of the block, but may also have a modest oil potential.

Seven wells have been drilled in the Pedirka Block to date. A small oil flow to surface was recorded in Poolowanna 1, drilled in 1978. Of the three subsequent wells, Walkandi 1 and Kuncherinna 1 recorded fluorescence in the Poolowanna Beds and underlying Peera Peera Formation.

2.

HISTORICAL

000670

Ownership

Delhi Petroleum Pty. Ltd	13%
AAR Limited	22.14%
Western Mining Corporation	27.86%
Santos Ltd.	21-2/3%
Bridge Oil Ltd	6-2/3%
SAOG Corp.	4-1/3%
Vamgas Ltd.	4-1/3%

Area

Latitudes: 26° 00' to 27° 30' S
 Longitude: 136° to 139° 00' E
 Represents 49,494 sq. km. or 19,149 sq. miles

Wells Drilled

Purni No. 1	Drilled 1963-64	Dry hole
Mokari No. 1	Drilled 1966	Dry hole
Macumba No. 1	Drilled 1977	Dry hole
Poolowanna No. 1	Drilled 1978	Small oil flow to surface
Walkandi No. 1	Drilled 1981	Dry hole - oil shows
Erabena No. 1	Drilled 1981	Dry hole
Kuncherinna No. 1	Drilled 1982	Dry hole

Seismic Coverage

SURVEY NAME	DATE	COVERAGE
Clifton Hills	1962	23 km
Pedirka	1963	181 km
Kallakoopah	1964	178 km
Poolowanna	1964-65	1106 km
Beal Hill	1974	289 km
Lake Thomas	1975	438 km
Pillan Hill	1976	893 km
Peera Peera	1979	1578 km
Koomarinna	1980	1051 km
Christmas Creek - PED	1982	1200 km programmed

DiscoveriesPoolowanna No. 1

Oil was discovered in the Early Jurassic Lower Poolowanna Beds in 1978. DST No. 2 recovered over 2000' of oil in the pipe. A subsequent cased hole test (DST No. 5) flowed 6 barrels of oil to surface followed by a small water recovery. The sandstones are of low permeability. Insufficient is known about the Poolowanna No. 1 discovery to map reserves at this stage, although it is possible that reserves could be in the order of 10 or a few tens of millions of barrels.

3.

GEOLOGY3.1 INTRODUCTION

A summary geological map for the Pedirka area and its surrounds is shown in Figure 1. Mesozoic sediments in the Simpson Desert Region are overlain by up to 200m of fluviatile, playa lake and aeolian sediments of the Lake Eyre Basin (Wopfner & Twidale, 1971). In the northwest of the Pedirka Block and extending northwest from there, the Mesozoic sequence rests unconformably on Early Permian sediments of the Pedirka Basin (Youngs, 1975). Devonian redbeds attributed to the Finke Group commonly underlie the Permian in this northwestern sector. However, for most of the Simpson Desert region, Mesozoic sediments rest unconformably on strongly folded, dark grey shales and siltstones which are traditionally assigned to the Ordovician.

3.2 SURFACE TO 'C' HORIZON (CRETACEOUS)

The Mesozoic and Permian stratigraphy of the area is summarised in Figure 2 and illustrated in cross-section in Figure 3. The uppermost Mesozoic unit is the coal-bearing Winton Formation, of Early to Late Cretaceous age. This rests conformably on a sequence of interbedded calcareous sandstones and siltstones assigned to the Mackunda Formation. The Mackunda Formation in turn rests conformably on a fine-grained marine sequence comprising the Allaru Mudstone, Toolebuc Formation and Wallumbilla Formation (Fig. 2). The Toolebuc Formation, with its characteristic gamma-ray anomaly and dark organic-rich lithology, is well developed in the Simpson Desert region, attaining a maximum thickness of 150' in Walkandi 1.

3.3 CADNA-OWIE FORMATION (EARLY CRETACEOUS)

The major 'C' seismic reflector corresponds to the top of the Cadna-owie Formation in the Simpson Desert region. It represents a marked increase in sonic velocity and coincides with a change in lithology from mudstone to calcareous sandstone. The Cadna-owie Formation is a coarsening-upwards unit, grading from interbedded mudstone and siltstone base, into fine-grained calcareous sandstone in the upper portion. The formation averages 160' in thickness, but thickens from west to east, passing from the margins of the Eromanga Basin towards the more central Cooper region.

According to Wopfner (1969), the various lithologies in the Cadna-owie Formation can be attributed to specific marginal marine environments such as back-water lagoons, sand bars, deltaic conditions and shallow agitated waters. Non-marine environments are represented by the Mount Anna Sandstone Member; a pebbly sandstone which outcrops to the southwest of the study area.

3.4 ALGEBUCKINA SANDSTONE (EARLY JURASSIC-EARLY CRETACEOUS)

The Algebuckina Sandstone is a thick unit of fine to coarse-grained, poorly to moderately sorted sandstone of Early Jurassic to Early Cretaceous age. Shale and siltstone interbeds are uncommon, thin and laterally discontinuous. A braided fluviatile origin is envisaged for the unit, with sediment being supplied from both the Gawler Craton region and the Amadeus Basin.

In the subsurface, the Algebuckina Sandstone is overlain with apparent conformity by the Cadna-owie Formation. In the west of the study area (Witcherrie 1, Purni 1 and Mokari 1) the Algebuckina Sandstone rests unconformably on Early Permian sediments of the Pedirka Basin (Fig. 3). Thin shaly interbeds towards the base of the formation in these wells yield J1 or J2-3 ages, indicating that the formation has an age range of Early Jurassic to Early Cretaceous.

Passing eastwards, the basal Algebuckina Sandstone becomes increasingly shaly and silty, and finally passes laterally into the "Upper" and "Lower" Poolowanna Beds. Thus, in this central area, the Algebuckina Sandstone rests conformably between the Cadna-owie Formation and the "Upper" Poolowanna Beds, having an age range of Early Jurassic to Early Cretaceous.

Further east, near the Birdsville Track Ridge, the Algebuckina Sandstone becomes silty in the upper and middle portions. Eventually, at Pandieburra 1 and east thereof, the sequence is subdivided into three sandy formations (the Mooga Formation, Adori Sandstone and Hutton Sandstone) and two consisting mainly of interbedded sandstone and siltstone (the Westbourne and Birkhead Formations). This entire sequence is a lower energy, relatively distal equivalent of the braided fluvial Algebuckina Sandstone (Fig. 3).

3.5 POOLOWANNA BEDS (EARLY JURASSIC)

The Poolowanna Beds consist of interbedded sandstone, siltstone, shale and coal. Sandstones are predominantly fine-grained and in most cases are easily distinguished from the overlying Algebuckina sandstones. Fining-upward cycles are common in the sequence, which is interpreted as meandering fluvial with associated floodplain sediments.

Price (1978a,b) suggested that a major hiatus may exist within the sequence, with the "Lower" Poolowanna Beds dating as Early Jurassic (J1 and, in some wells J2-3) and the "Upper" Poolowanna Beds being assigned to the Middle Jurassic (Lower J5-6). This is now known to be incorrect, and the Poolowanna Beds are assigned a J2-3 age throughout.

The Poolowanna Beds have been the main target for hydrocarbons in the Simpson Desert region. In Poolowanna 1, drilled in 1978, a mixture of oil and water was recovered during an open-hole drill-stem test of sandstones within the "Lower" Poolowanna Beds. The well was subsequently cased, and DST No. 5 initially flowed oil to surface at the rate of 96 barrels per day. Although subsequent exploration in the Simpson Desert region has been disappointing, there remains an enormous amount of unexplored potential in the region.

Following the recent round of drilling in the Pedirka Block, cross-sections were constructed of the Poolowanna Beds interval, and isopach maps, sandstone percentage maps and shale thickness maps created. These are summarised in Figures 4-6. They illustrate that despite the considerable thickness variations in the interval (Fig. 4), there is little variation in sand/shale ratios (Figs. 5 & 6) through most of the Pedirka Block. The only notable change is the marked increase in sandstone content west of Macumba 1.

3.6 PEERA PEERA FORMATION (MID-LATE TRIASSIC)

The Peera Peera Formation consists of interbedded shale, siltstones and sandstone. It is overlain unconformably by the Poolowanna Beds and rests with apparent conformity on the Walkandi Formation (new name). The thickest section encountered to date is 623' in Walkandi 1. The formation thins rapidly to the west, but is known to extend eastwards at least as far as Pandieburra 1, on the Birdsville Track Ridge.

The internal stratigraphy of the Peera Peera Formation is still very poorly understood. The youngest age so far recorded from the sequence was obtained from a sidewall core at 7520 feet (2292 m) in Macumba 1, four feet (1.2 m) below the top of the formation. According to Price (1978a, p10) the assemblage has basal Bundamba affinities, and indicates that the sampled horizon is "Late Triassic in age no older than the upper part of the Ipswich Coal Measures.... The sampled horizon is probably equivalent to the basal part of the Woogaroo Sub-group.... which de Jersey (1970) regards as being Rhaetian in age".

By comparison, the uppermost part of the Peera Peera Formation in Poolowanna 1 contains an Ipswich microflora, and thus appears to be slightly older.

The oldest definitive date presently recorded from the Peera Peera Formation was obtained from a sidewall core at 7956 feet (2425 m), in the lower portion of Macumba 1. The sample, dated as Middle Triassic by Price (1978b), contained a Moolayember microflora.

In Poolowanna 1 and Walkandi 1 in the central, deepest portion of the Poolowanna Trough, a three-fold division of the Peera-Peera Formation is recognised. The upper unit is characterised by black, silty, extremely carbonaceous shale. The middle unit is sandy, with common fining-upward units which probably represent meandering-stream deposition. The basal unit consists of grey shale and siltstone, with minor thin sandstones and rare coals. Sandstones throughout the formation are typically fine to very fine-grained, with low visual porosity.

The three-fold subdivision which applies to the Peera Peera Formation in the central Poolowanna Trough seems to have limited application elsewhere, assuming that palynological dating is reliable. For example, although a grossly similar subdivision can be recognised in Macumba 1, Price (1978a,b) maintains that the units are not exact chronological equivalents, with the Macumba 1 section being somewhat younger. While major facies changes are known to occur within the Peera Peera Formation, well data are still sparse, and much remains to be learnt about this Middle-Late Triassic unit.

3.7 WALKANDI FORMATION (TRIASSIC)

In the central portion of the Poolowanna Trough, the Peera Peera Formation rests with apparent conformity on a sequence of interbedded shale, siltstone and minor sandstone of Triassic age. The finer-grained lithologies are variable in colour, with pale grey, grey-green, maroon, brown and brick-red varieties recorded. Interbedded sandstones are typically pale grey-green, very fine to fine-grained and well sorted with a silica cement.

The sequence, previously referred to informally as the "unnamed redbeds", was renamed the Walkandi Formation by Moore (1982). A type section, extending from 9083 feet (2768 m) to 9952 feet (2902 m), is defined in Poolowanna 1. This is the thickest section of Walkandi Formation yet encountered, with other occurrences confined to Walkandi 1 and Erabena 1 in South Australia, and Thomas 1 in the Northern Territory. A basal sandy member in Poolowanna 1, extending from 9403 feet (2866 m) to 9522 feet (2902 m), is absent from all other wells.

The only reliable age-dating presently recorded from the Walkandi Formation was obtained from sidewall core samples at 9347 feet (2848 m) and 9353 feet (2851 m) in Poolowanna 1. These yielded poorly preserved, unpoverished microfloras consisting mostly of *Falcisporites* sp., which were assigned a non-specific Triassic age (Price, 1978a). While the sequence is lithologically similar to parts of the Nappamerri Formation in the Cooper Basin (cf. Youngs, 1982), the age relationship between the two units is unclear. In addition, the two formations are separated by a 150-200 km wide zone of non-deposition or erosion along the Birdsville Track Ridge.

3.8 PURNI FORMATION

The Purni Formation consists of interbedded sandstones, siltstones, shales and coal (Figure 7). Its maximum recorded thickness is 1247 feet in Mokari No. 1. Three members are recognised; a middle sandy member, and upper and lower coal-bearing members. The formation was named after the drilling of Purni No. 1 (Magnier, 1964b; Jacques, 1966b) and the name was formalised by Youngs (1975a).

The Purni Formation represents deposition in a non-marine, meandering-fluvial environment. Extensive backswamps associated with the alluvial floodplain developed during the early and later stages of deposition, forming the lower and upper members of the Purni Formation. The stratigraphy of the sequence is shown in Figure 4.

Isopachs of member thickness and sandstone percentages are shown in Figures 8 to 10.

The major source of the sand in the Lower Member of the Purni Formation appears to be the Amadeus region to the northwest of the Pedirka Block. This sand is probably associated with the retreat of intermontane glaciers at the end of the Early Permian glaciation.

The sandstones of the Middle Member of the Purni Formation appear to be derived from the southeast, at least in part (Figure 9). Similarly, for the Upper Member, overbank shales are concentrated in the area around McDills No. 1 and the far northwest of the Block.

3.9 CROWN POINT FORMATION

The Crown Point Formation, in its outcrop sections in the Northern Territory, consists of a series of diamictites, pebbly sandstones and clays which are at least 160 feet thick (Crowell and Frakes, 1971).

Some of the boulders, cobbles and pebbles show evidence of glacial striae, but in general the evidence for glaciation is weak and is restricted to the lower levels of the outcrops (Youngs, 1975b). Generally, the diamictites are overlain by sandstones and siltstones. The sandstones are white, fine to medium-grained, well sorted and kaolinitic. The clays are vari-coloured, micaceous and generally sandy. The sandstones display convolute and contorted bedding slumping, climbing-ripple laminae and many other features resulting from deposition in a fluvial environment (Crowell and Frakes, 1971; Chewings, 1914; David and Howchin, 1924).

In the Pedirka Farmout Area, the Crown Point Formation is present in the western three wells, and absent in Poolowanna 1 (Figure 11). It is conglomeratic, with common quartzite and limestone pebbles, and interbeds of sandstone and grey shale. The matrix of the conglomerate is very fine sandstone. Porosity was described as fair to good in Purni No. 1 but poor in Macumba No. 1. Maximum measured thickness in the farmout area is 332 feet in Mokari No. 1.

The environment of deposition of the Crown Point Formation is envisaged as being shallow marine periglacial, with possibly some non-marine in parts. There is no direct evidence of glaciation, and recently Wopfner (Mines Dept. address, unpubl.) suggested that the main source of the dropstones in the sequence was the Amadeus region, with glaciers descending from the northwest.

4.

EXPLORATION TARGETS

The main hydrocarbon target is the Early Jurassic Poolowanna Beds, with the Triassic Peera Peera Formation and the Early Permian Purni Formation as secondary, or alternative targets.

The main exploration objectives at present are:

- (1) to gain a better insight into the Poolowanna No. 1 oil discovery. A second well on this structure should yield valuable results. Timing of production would depend on the size of mapped reserves and the possible need to discover more fields in the Simpson Desert area to justify such expenditure.
- (2) to evaluate the Permian Pedirka Basin sequence where it is thick and mature, and to test its oil potential. An undisputably valid test of this sequence has yet to be conducted, so the potential of the sequence remains uncertain. Source rock studies suggest that the Permian should have generated some oil.
- (3) to evaluate the Poolowanna Beds in areas where it is less diagenetically altered. One problem recognised with the Poolowanna No. 1 oil discovery was the low permeability of the sands, due to diagenesis and cementation. Better plays may be developed marginal to the main depocentre.
- (4) to trace the fault-anticline trend north from Poolowanna and develop and test additional prospects along the same trend.

5.

PROSPECTS

5.1 OOLARINNA PROSPECT

Introduction

Oolarinna No. 1 is anticipated to be an exploratory well designed to test the crest of the Oolarinna Dome, in the central part of the Pedirka Block. The well is located approximately 385 km northwest of Moomba. The nearest wells are Macumba No. 1 (23 km to the south), Mokari No. 1 (46 km to the WSW) and Poolowanna No. 1 (62 km to the ESE).

Proposed T.D. is approximately 9100 ft. K.B., with the Poolowanna Beds as the primary target and the Peera Peera Formation and Purni Formation as secondary targets. Hydrocarbons may also be trapped in the Cadna-owie Formation and Algebuckina Sandstone, and these represent weak secondary targets.

Structure

The Oolarinna Dome is a relatively flat-topped, steep sided structure in the northwestern part of the Pedirka Block. The eastern and western flanks are faulted at the J₁ horizon, with complex faulting on the nose of the culmination (line 80-WHB). Faulting does not appear to extend to the 'C' horizon and has a maximum throw of 20 msec (100 ft.) at 'J_s'.

Areal closure on the structure is 10,860 acres at 'C' and 14,940 acres at 'J_s'. Vertical closure is approximately 20 msec (105 ft.) at 'C' and 60 msec (350 ft.) at 'J_s'.

The Permian Crown Point and Purni Formations extend from Macumba No. 1 to the base of the Oolarinna Structure, but show evidence of thinning onto the flanks of the dome. A thin Permian sequence (approx. 390 ft.) is prognosed for the crest of Oolarinna.

Thinning of the sequence in the vicinity of Oolarinna is most pronounced in the Permian, with up to 40 msec (300 ft.) of section missing on the top of the structure. Permian thinning occurs on the flanks of the dome, and there is no noticeable thinning of Permian within the area of closure at Oolarinna. Structural growth continued in the Triassic and Early Jurassic, and rough estimates of thinning of the sequences are:

'C' to 'J' = 40 msec (270')

Poolowanna Beds = 35 msec (240')

Peera Peera Beds = 20 msec (150')

No recognisable thinning occurs between the Toolebuc and 'C' horizons, suggesting that the structure has largely stabilized by this time.

Stratigraphy

Stratigraphic control on the Oolarinna structure is provided by Macumba No. 1. The prognosed sequence is:

	<u>Thickness</u>	<u>Depth K.B.</u>
Eyre Formation	624	16
Winton Formation	1750	640
Oodnadatta Formation	1500	2390
Toolebuc Formation	60	3890
Bulldog Shale	760	3950
Cadna-owie Formation	165	4710
Algebuckina Sandstone	2845	4875
Poolowanna Beds	450	7720
Peera Peera Formation	430	8170
Purni Formation	250	8600
Crown Point Formation	140	8850
Pre-Permian	110	8990
T.D.	-	9100

Hydrocarbon Potential

It appears that the Oolarinna Dome was initiated in the Permian, and underwent further growth in the Triassic to basal Jurassic, and again in the Late Cretaceous. Thus the structure probably pre-dates hydrocarbon generation. Vitrinite reflectivity studies from Macumba No. 1 suggest that the primary target in Oolarinna will be marginally mature with respect to oil generation. The Oolarinna Dome is fairly large, and has the potential to trap hydrocarbons migrating from adjacent areas and from the deeper parts of the basin to the south.

5.2 MIANDANA PROSPECT

Introduction

Miandana No. 1 is anticipated to be an exploratory well designed to test the crest of the Miandana dome, in the southern central part of the Pedirka Block. The well is located approximately 70 km SSW of Poolowanna No. 1 and 85 km southeast of Macumba No. 1.

Proposed T.D. is approximately 9450 ft. K.B., with the Poolowanna Beds as the primary target and the Peera Peera Formation as the main secondary target. Hydrocarbons may also be trapped in the Cadna-owie Formation and the Algebuckina Sandstone, and these represent weak secondary targets.

Structure

The Miandana Structure is a NNW-SSE elongate anticlinal dome in the southern portion of the Early Jurassic-Triassic basin. The structure is asymmetrical, with steeper dips and faulting along the western flank. Faults penetrate the 'J' horizon but do not extend to 'C'. Aerial closure is 3,650 acres at 'C' and 2700 acres at 'Tu'. Vertical closure is 20 msec (105 ft.) at 'C' and 20 msec (150 ft.) at 'Tu'.

Rough estimates of thinning onto the crest of Miandana are:

Toolebuc to 'C'	:	40 msecs (180 ft.)
'C' to 'J _L '	:	none
Poolowanna Beds	:	20 msecs (140 ft.)
Peera Peera Fm.	:	20 msecs (150 ft.)

It appears that active growth of the Miandana Structure occurred in the Triassic and earliest Jurassic, with stability through the Middle and Late Jurassic and reactivation in the Cretaceous.

Stratigraphy

Stratigraphic control over the Miandana Structure is provided by Poolowanna 1, Macumba 1 and Walkandi 1. The well is anticipated to encounter a sequence comprising:

	<u>Thickness</u>	<u>Depth K.B.</u>
Eyre Formation	494	16
Winton Formation	1900	510
Oodnadatta Formation	1600	2410
Toolebuc Formation	70	4010
Bulldog Shale	860	4080
Cadna-owie Formation	165	4940
Algebuckina Sandstone	3415	5105
Poolowanna Beds	230	8520
Peera Peera Formation	600	8750
Pre-Permian	100	4350
T.D.	-	9450

No Permian section is prognosed. The Algebuckina Sandstone is a high-energy, braided fluvial sequence, and is likely to be flushed of hydrocarbons. The Poolowanna Beds are meandering-fluvial in origin, consisting of interbedded sandstone, shale and coal. They are a prime target for oil generation and accumulation. The Peera Peera Beds are relatively shaly and due to a low exinite-vitrinite ratio, are likely to be partly gas-bearing, rather than totally oil prone.

Hydrocarbon Potential

It appears that the Miandana Structure was initiated in the Triassic and underwent further growth in the earliest Jurassic. The structure was rejuvenated in the Early Cretaceous, with movements probably associated with faulting on the western flank. It pre-dates in part and may have been partly synchronous with hydrocarbon generation and migration. However, loss of Poolowanna Beds section in this area downgrades the prospect somewhat. Depth of burial and prognosed temperatures appear sufficient for oil generation.

5.3 MIAMIANA PROSPECT

Introduction

Miamiana No. 1 is anticipated to be an exploratory well designed to test the crest of the Miamiana Structure, in the southern central part of the Pedirka Block. The well is located approximately 265 km northwest of Moomba. The nearest wells are Poolowanna No. 1 (80 km to the NNE) and Macumba No. 1 (95 km to the northwest).

Proposed T.D. is approximately 9100 ft. K.B., with the Poolowanna Beds as the primary target and the Peera Peera Formation as the main secondary target. Hydrocarbons may also be trapped in the Cadna-owie Formation and the Algebuckina Sandstone, and these represent weak secondary targets.

Structure

The Miamiana Structure is a slightly elongate anticlinal dome in the southern portion of the Early Jurassic-Triassic basin. The structure is relatively uncomplicated by faulting, with minor faults cutting the 'Z' seismic reflector, but not extending to 'Tu' or higher horizons. Aerial closure is 9,650 acres at 'C' and 7,280 acres at 'Tu'.

Vertical closure is 35 msec (190 ft.) at 'C' and 40 msec (280 ft.) at 'Tu'. Rough estimates of thinning onto the crest of Miamiana are:

Toolebuc to 'C'	:	none (possible minor thickening)
'C' to 'J'	:	? 50 msec (300 ft.)
Poolowanna Beds	:	none
Peera Peera Fm.	:	30 msec (220 ft.)

It appears that active growth of the Miamiana Structure occurred primarily in Triassic time, with some rejuvenation in the Middle to Late Jurassic.

Stratigraphy

Stratigraphic control over the Miamiana Structure is provided by Poolowanna 1, Macumba 1 and Walkandi 1. The well is anticipated to encounter a sequence comprising:

	<u>Thickness</u>	<u>Depth K.B.</u>
Eyre Formation	619	16
Winton Formation	1800	635
Oodnadatta Formation	1500	2435
Toolebuc Formation	65	3935
Bulldog Shale	850	4000
Cadna-owie Formation	160	4850
Algebuckina Sandstone	3090	5010
Poolowanna Beds	240	8100
Peera Peera Formation	660	8340
Pre-Permian	100	9000
T.D.	-	9100

No Permian section is prognosed. The Algebuckina Sandstone is a high-energy, braided fluvial sequence, and is likely to be flushed of hydrocarbons. The Poolowanna Beds are meandering-fluvial in origin, consisting of interbedded sandstone, shale and coal. They are a prime target for oil generation and accumulation. The Peera Peera Beds are relatively shaly and due to a low exinite/vitrinite ratio, are likely to be gas-bearing in part rather than totally oil prone.

Hydrocarbon Potential

It appears that the Miamiana Structure was initiated in the Triassic and underwent further growth in the Middle-Late Jurassic. Thus, the structure certainly pre-dates hydrocarbon generation and migration. However, the loss of Poolowanna Beds section in this area downgrades the prospect somewhat. Depth of burial and prognosed temperatures appear sufficient for oil generation.

5.4 KOONAKOO STRUCTURE

Introduction

Koonakoo No. 1 is anticipated to be an exploratory well designed to test the crest of the Koonakoo Structure, in the eastern part of the Pedirka Block. The well is located approximately 75 km east of Poolowanna No. 1, and 245 km northwest of Moomba.

Proposed T.D. is approximately 8550 ft. K.B., with the Poolowanna Beds as the primary target and the Peera Peera Formation as the main secondary target. Hydrocarbons may also be trapped in the Cadna-owie Formation and Algebuckina Sandstone, and these represent weak secondary targets.

Structure

The Koonakoo Structure is an anticlinal dome with significant faulting along the western flank and minor faulting along the eastern edge. There appears to be negligible closure independent of faulting, suggesting that the upper Poolowanna Beds are probably flushed. Aerial closure is 10,290 acres at 'C' and 6,640 acres at 'Tu'. Vertical closure is 30 msec (155 ft.) at 'C' and 25 msec (185 ft.) at 'Tu'. Faulting at 'J' and 'Z' does not extend to the 'C' horizon. Thinning of the sequence onto Koonakoo is minor, and rough estimates of the amount of thinning are:

Toolebuc to 'C'	:	none (possibly thicker)
'C' to 'J _L '	:	none
Poolowanna Beds	:	20 msec (140 ft.)
Peera Peera Fm.	:	60 msec (440 ft.)

Thus, it appears that the structure was active in the Triassic and earliest Jurassic, but was then stable until the Late Cretaceous or Tertiary when faulting probably occurred.

Stratigraphy

Stratigraphic control on the Koonakoo Structure is provided by Kuncherinna 1. The prognosed sequence is:

	<u>Thickness</u>	<u>Depth K.B.</u>
Eyre Formation	534	16
Winton Formation	1950	550
Oodnadatta Formation	1530	2500
Toolebuc Formation	65	4030
Bulldog Shale	720	4095
Cadna-owie Formation	160	4815
Algebuckina Sandstone	2360	4975
Poolowanna Beds	650	7335
Peera Peera Formation	480	7985
Pre-Permian	85	8465
T.D.	-	8550

No Permian section is prognosed. The Algebuckina Sandstone is a high-energy, braided-fluvial sequence and is likely to be flushed of hydrocarbons. The Poolowanna Beds are meandering-fluvial in origin, consisting of interbedded sandstone, shale and coal. The unit is a prime target for oil generation and accumulation. The Peera Peera Formation is predicted to be rather shaly, with fine-grained, low porosity sandstone interbeds.

Hydrocarbon Potential

It appears that the Koonakoo Structure was initiated in the Triassic and underwent further growth in the earliest Jurassic. Late Cretaceous or Tertiary movements were probably responsible for some of the relief on the structure. Thus, the structure may in part pre-date generation and migration of hydrocarbons. Vitrinite reflectivity studies from Poolowanna No. 1 suggest that the primary target in Koonakoo will be marginally mature with respect to oil generation. However, the structure is considerably downgraded by the presence of normal faults on the western flank which expose the upper half of the Poolowanna Beds to artesian water flushing.

6.

LEADS

There are over 100 weak and strong leads mapped at the 'C' horizon in the Pedirka Block (Enclosure 1). Leads which are considered to have the most potential are those which:

- (a) show structural thinning over the crest of structures in the 'C-J_L' interval.
- (b) have closures which are independent of faulting at the 'J_L' horizon.
- (c) are sufficiently deep so that the Poolowanna Beds are mature, but not so deep that the section is impermeable.
- (d) are located in areas where the Poolowanna Beds are both thick and shaly.

On present knowledge, there are no known areas which combine all of the above factors. As for the Cooper Basin area, Jurassic structural growth is best developed on structures which are associated with Permian sedimentation. Unfortunately however, Permian and Early Jurassic depocentres only partly overlap in the Pedirka Block, so where the Permian is thick (e.g. around Mokari 1), the Poolowanna Beds are absent or poorly developed. Areas of compromise are around Macumba (Leads L83-10, L83-1P, L83-1Q, L83-1R and L83-1S) and at Oolarinna. Structures developed in this area could be of considerable interest.

Permian and Early Jurassic sequences are predicted to be mature through most of the Pedirka Block, from immediately east of Mokari 1 right across to the Birdsville Track Ridge. A more serious problem is associated with finding acceptable permeability in the Poolowanna Beds, and for this reason the central deep around Walkandi is now downgraded. More acceptable leads may occur to the south, towards Miandana and Miamiana, although the Poolowanna Beds appear to be discouragingly thin and lacking seismic character in this area.

In terms of shale content and source potential, the Poolowanna Beds show little variation between Erabena 1, Poolowanna 1, Walkandi 1 and Kuncherinna 1. In all cases the Poolowanna Beds and underlying Peera Peera Formation are oil mature, but are predominantly gas-prone source rocks. This may largely account for the lack of success in the basin to date, and the small oil recovery obtained from Poolowanna 1. A slight variation in source rock potential between wells is suggested by recent kerogen studies on Walkandi 1, Erabena 1 and Kuncherinna 1, which suggest that the Poolowanna Beds are a slightly better oil source in Kuncherinna. However, the variation noted was not very large.

7.

CONCLUSIONS

Recent drilling in the Pedirka Block produced disappointing results, which are best explained in the following ways:

- (a) structural growth on all three structures was late, with little 'C-J_L' thinning being observed.
- (b) the source characteristics of the Poolowanna Beds are different to those assumed by previous workers. The sediments are predominantly gas prone, but are only mature to the level of oil generation. Therefore, only a small amount of oil is likely to have been generated from these sediments, despite their maturity and high TOC.
- (c) the Poolowanna Beds contain a high percentage of sandstone, and show considerable lateral variability. With any structure, there is always the uncertainty that intra-Poolowanna Bed seals are present.

Future exploration should be concentrated on areas where there is evidence of:

- (a) structural thinning in the 'C-J_L' and lower horizons.
- (b) closure independent of faulting at 'J_L'.
- (c) mature Poolowanna Beds which are relatively thick and shaly, but still exhibiting acceptable porosity and permeability.

Recommended areas for exploration are around Macumba-Oolarinna (where underlying Permian sediments provide an early history of structural growth) and east of the N-S Poolowanna Fault.

8.

REFERENCES

- Chewings, C., 1914. Notes on the stratigraphy of Central Australia. Trans. R. Soc. S. Aust., 38, 41-52
- Crowell, J.C. and Frakes, L.A., 1971. Late Paleozoic glaciation of Australia. J. geol. Soc. Aust., 17, 115-155
- David, T.W.E. and Howchin, W., 1924. Glacial research on deposits at Yellow Cliff, Central Australia, and in the vicinity. Rept. Australas. Ass. Advance. Sci., 16, 74-94
- Jacque, M., 1966. Mokari No. 1 well completion report. By French Petroleum Co. (Aust.) Ltd. S. Aust. Dept. Mines open file Env., 640 (unpubl.)
- McKirdy, D.M., 1981. Petroleum geochemistry and source-rock potential of the Arrowie, Pedirka, Cooper and Eromanga Basins, Central Australia. Part 2 : Pedirka Basin and superadjacent Eromanga Basin. Delhi Petroleum Pty. Ltd. (unpubl.)
- Metter, R.E., 1978a. Geochemical analyses of rock and oil samples from Poolowanna 1, Pedirka Basin, South Australia. Exon Production Research Company, EPR. 19ES. 78 (unpubl.)
- Metter, R.E., 1978b. Geochemical "fingerprint" analyses of cuttings from Poolowanna 1, South Australia. Exon Production Research Company, EPR. 139ES. 78 (unpubl.)
- Moore, P.S., 1980. Block Prospectivity report, Pedirka Block. Delhi Petroleum Pty. Ltd. (unpubl.)
- Moore, P.S., 1982a. Mesozoic geology of the Simpson Desert region, northern South Australia; in Moore, P.S. and Mount, T.J. (compilers) Eromanga Basin Symposium summary papers. Geol. Soc. Aust. and Petrol. Explor. Soc. Aust., Adelaide.
- Moore, P.S., 1982b. Source rock analysis of samples from Walkandi No. 1, Simpson Desert region, S.A. Delhi Petroleum Pty. Ltd. (unpubl.)
- Moore, P.S., 1982c. Source rock analysis of samples from Erabena No. 1, Simpson Desert region, S.A. Delhi Petroleum Pty. Ltd. (unpubl.)
- Moore, P.S., 1983. Source rock analysis of samples from Kuncherinna No. 2, Simpson Desert region, S.A. Delhi Petroleum Pty. Ltd. (unpubl.)
- Moore, P.S., in prep. Kerogen analyses of the Poolowanna Beds and Peera Peera Formation in Walkandi 1, Erabena 1 and Kuncherinna 1. Delhi Petroleum Pty. Ltd. (unpubl.)
- Price, P.L., 1978a. Palynological laboratory report no. 13/103; in Wiltshire, M.J. Well completion report, Poolowanna No. 1. Delhi Petroleum Pty. Ltd. (unpubl.)

- Price, P.L., 1978b. Palynological laboratory report no. 13/104; in Wiltshire, M.J. Well completion report, Macumba No. 1. Delhi Petroleum Pty. Ltd. (unpubl.)
- Saxby, J.D., Russell, N.J., Bruen, L. and Friedrich, J., 1978. Source rock and oil analyses on samples from Poolowanna No. 1 and Macumba No. 1. CSIRO Minerals Research Lab. Rest. Invest. Rept. 927R.
- Smyth, M. and Cameron, M., 1982. Organic petrology and source rock potential of sediments in the Eromanga Basin, South Australia. Int. J. Coal Geol.
- Smyth, M. and Saxby, J.D., 1981. Organic petrology and geochemistry of source rocks in the Pedirka-Simpson Desert Basins, Central Australia. APEA J., 21(1), 187-199
- TLR Consultants, 1977. Evaluation of Poolowanna No. 1, Pedirka Basin, Australia. Delhi Petroleum Pty. Ltd. (unpubl.)
- Wopfner, H. and Twidale, C.R., 1967. Geomorphological history of the Lake Eyre Basin; in Jennings, J.N. and Harbutt, J.A. (eds) Landform Studies from Australia and New Guinea. Aust. Nat. Univ. Press, Canberra, 118-143.
- Youngs, B.C., 1975. The geology and hydrocarbon potential of the Pedirka Basin. S. Aust. Geol. Surv. Rept. Invest., 44.

APPENDIX 1 : PEDIRKA BLOCK - HYDROCARBON POTENTIAL OF
MAPPED LEADS AND PROSPECTS

Prospect/Lead No.	Area (acres)	Estimated N.E.P.	Bbl/acre ft recoverable	Est. oil potential (MMSTB)
<u>Area 1, Prospects</u>				
x Oolarinna	See prospect data sheet			101
x Updip Macumba	3,100	30 (AL)	400	37
		30 (PB)	150	14
		20 (PM)	200	12
<u>Area 1, Strong Leads</u>				
L83-1I	5,000*	30 (AL)	400	60
		20 (PM)	200	20
L83-1J	1,800	30 (AL)	400	22
		30 (PB)	150	8
		20 (PM)	200	7
L83-1L	1,200	25 (AL)	400	12
		25 (PB)	150	5
		20 (PM)	200	5
L83-1M	200	10 (AL)	400	0.8
		10 (PB)	150	0.3
		20 (PM)	200	0.8
L83-1O	4,600	30 (AL)	400	55
		30 (PB)	150	28
		20 (PM)	200	18
L83-1Q	1,300	20 (AL)	400	10
		20 (PB)	150	4
		20 (PM)	200	5
L83-1R	800	10 (AL)	400	3
		10 (PB)	150	1
		10 (PM)	200	2
L83-1S	800	10 (AL)	400	3
		10 (PB)	150	1
		10 (PM)	200	2
L83-1V	1,200	10 (AL)	400	5
		10 (PB)	150	2
<u>Area 1, Weak Leads</u>				
L83-1A	700	30 (AL)	400	8
L83-1B	3,100	30 (AL)	400	37
L83-1C	3,300	10 (AL)	400	13
L83-1D	5,000*	30 (AL)	400	60
L83-1E	5,000*	20 (AL)	400	40
L83-1F	5,000*	20 (AL)	400	40
L83-1G	5,000*	30 (AL)	400	60
L83-1H	3,200	30 (AL)	400	38
		20 (PM)	200	13
L83-1K	250	10 (AL)	400	1
		10 (PM)	200	0.5
L83-1N	800	10 (AL)	400	7
		10 (PM)	200	4

Prospect/Lead No.	Area (acres)	Estimated N.E.P.	Bbl/acre ft recoverable	Est. oil potential(MMSTB)
L83-1P	500	10 (AL)	400	2
		10 (PM)	200	1
L83-1T	3,000	10 (AL)	400	12
		10 (PB)	150	5
L83-1U	1,400	10 (AL)	400	6
		10 (PB)	150	2
<u>Area 2, Prospects</u>				
P83-2A	1,200	10 (AL)	400	5
		10 (PB)	100	1
P83-2B	4,200	20 (AL)	400	34
		20 (PB)	100	8
P83-2C	2,000	20 (AL)	400	16
		20 (PB)	100	4
P83-2D	1,400	20 (AL)	400	11
		20 (PB)	100	3
P83-2E	4,300	30 (AL)	400	52
		30 (PB)	100	13
XUpdip Poolowanna	See prospect data sheet			55
<u>Area 2, Strong Leads</u>				
L83-2E	2,000	20 (AL)	400	8
		20 (PB)	150	3
XTupanna	3,200	30 (AL)	400	38
		30 (PB)	150	14
XPadmuri	5,600	20 (AL)	400	45
		20 (PB)	100	11
L83-2H	1,200	10 (AL)	400	5
		10 (PB)	100	1
L83-2I	250	10 (AL)	400	1
		10 (PB)	100	0.3
L83-2K	600	10 (AL)	400	2
		10 (PB)	100	0.6
L83-2L	200	10 (AL)	400	0.8
		10 (PB)	100	0.2
L83-2M	350	10 (AL)	400	1
		10 (PB)	100	0.4
L83-2N	600	10 (AL)	400	2
		10 (PB)	100	0.6
L83-2O	370	10 (AL)	400	1
		10 (PB)	100	0.4
L83-2P	5,000*	20 (AL)	400	40
		20 (PB)	100	10
L83-2Q	5,000*	20 (AL)	400	40
		20 (PB)	100	10
L83-2X	1,300	20 (AL)	400	10
		20 (PB)	100	3
L83-2AA	2,200	10 (AL)	400	9
		10 (PB)	100	2

Prospect/Lead No.	Area (acres)	Estimated N.E.P.	Bbl/acre ft recoverable	Est. oil potential(MMSTB)
<u>Area 2, Weak Leads</u>				
L83-2A	4,200	20 (AL)	400	34
		20 (PB)	150	13
L83-2B	2,100	30 (AL)	400	25
		30 (PB)	150	9
L83-2C	850	10 (AL)	400	3
		10 (PB)	150	1
L83-2D	3,300	10 (AL)	400	13
		10 (PB)	150	5
L83-2J	200	10 (AL)	400	0.8
		10 (PB)	100	0.2
L83-2R	2,700	20 (AL)	400	22
		20 (PB)	100	5
L83-2S	1,400	30 (AL)	400	17
		30 (PB)	100	4
L83-2T	1,600	10 (AL)	400	6
		10 (PB)	100	2
L83-2U	200	10 (AL)	400	0.8
		10 (PB)	100	0.2
L83-2V	700	10 (AL)	400	3
		10 (PB)	100	0.7
L83-2W	2,500*	30 (AL)	400	30
		30 (PB)	100	8
L83-2Y	4,500	20 (AL)	400	36
		20 (PB)	100	9
L83-2Z	300	10 (AL)	400	1
		10 (PB)	100	0.3
L83-2BB	500	10 (AL)	400	2
		10 (PB)	150	0.8
L83-2CC	3,700	15 (AL)	400	22
		15 (PB)	150	8
L83-2DD	3,800	15 (AL)	400	23
		15 (PB)	100	6
L83-2EE	200	10 (AL)	400	0.8
		10 (PB)	100	0.2
<u>Area 3, Prospects</u>				
Koonakoo	See prospect data sheet			25
<u>Area 3, Strong Leads</u>				
L83-3A	4,300	25 (AL)	400	43
		25 (PB)	150	16
L83-3B	2,700	10 (AL)	400	11
		10 (PB)	150	4
L83-3F	3,900	20 (AL)	400	31
		20 (PB)	150	12
L83-3J	5,000*	25 (AL)	400	50
		25 (PB)	150	19
L83-3K	3,300	15 (AL)	400	20
		15 (PB)	150	7
L83-3L	600	10 (AL)	400	2
		10 (PB)	150	0.9

Prospect/Lead No.	Area (acres)	Estimated N.E.P.	Bbl/acre ft recoverable	Est. oil potential(MMSTB)
L83-3N	700	10 (AL)	400	3
		10 (PB)	150	1
L83-30	400	10 (AL)	400	2
		10 (PB)	150	0.6
L83-3R	500	10 (AL)	400	2
		10 (PB)	150	0.8
<u>Area 3, Weak Leads</u>				
L83-3C	1,000	20 (AL)	400	8
		20 (PB)	150	3
L83-3D	4,900	10 (AL)	400	20
		10 (PB)	150	8
L83-3E	2,900	10 (AL)	400	12
		10 (PB)	150	4
L83-3G	800	10 (AL)	400	3
		10 (PB)	150	1
L83-3H	500	10 (AL)	400	2
		10 (PB)	150	0.8
L83-3I	5,400*	30 (AL)	400	65
		30 (PB)	150	24
L83-3M	500	10 (AL)	400	2
		10 (PB)	150	0.8
L83-3P	600	10 (AL)	400	2
		10 (PB)	150	0.9
L83-3Q	800	20 (AL)	400	6
		20 (PB)	150	2
L83-3S	1,600	20 (AL)	400	13
		20 (PB)	150	5
L83-3T	2,100	10 (AL)	400	8
		10 (PB)	150	3
L83-3U	700	10 (AL)	400	3
		10 (PB)	150	11
L83-3V	2,200	20 (AL)	400	18
		20 (PB)	150	7
<u>Area 4, Weak Leads</u> (no prospects or strong leads in Area 4)				
L83-4A	5,000*	15 (AL)	400	30
		15 (PB)	150	11
L83-4B	5,000*	15 (AL)	400	30
		15 (PB)	150	11
<u>Area 5, Prospects</u>				
* Miamiana	See prospect data sheet			22
* Miandana	See prospect data sheet			10
<u>Area 5, Strong Leads</u>				
L83-5D	2,300	10 (AL)	400	9
		10 (PB)	150	3
L83-5G	3,600	15 (AL)	400	22
		15 (PB)	150	8
L83-5H	1,000	20 (AL)	400	8
		20 (PB)	150	3
L83-5L	2,800	25 (AL)	400	28
		25 (PB)	150	11

Prospect/Lead No.	Area (acres)	Estimated N.E.P.	Bbl/acre ft recoverable	Est. oil potential(MMSTB)
<u>Area 5, Weak Leads</u>				
L83-5A	2,500	15 (AL)	400	15
		15 (PB)	150	6
L83-5B	400	10 (AL)	400	2
		10 (PB)	150	0.6
L83-5C	5,000*	20 (AL)	400	40
		20 (PB)	150	15
L83-5E	5,000*	15 (AL)	400	30
		15 (PB)	150	11
L83-5F	900	10 (AL)	400	4
		10 (PB)	150	1
L83-5I	3,500	10 (AL)	400	14
		10 (PB)	150	5
L83-5J	700	10 (AL)	400	3
		10 (PB)	150	1
L83-5K	600	10 (AL)	400	2
		10 (PB)	150	0.9
L83-5M	500	10 (AL)	400	2
		10 (PB)	150	0.8
L83-5N	4,700	15 (AL)	400	28
		15 (PB)	150	11
L83-5O	2,800	15 (AL)	400	17
		15 (PB)	150	6
L83-5P	1,600	10 (AL)	400	6
		10 (PB)	150	2
L83-5Q	2,000	10 (AL)	400	8
		10 (PB)	150	3
L83-5R	1,400	10 (AL)	400	6
		10 (PB)	150	2
L83-5T	4,300	15 (AL)	400	26
		15 (PB)	150	10
L83-5U	1,400	10 (AL)	400	6
		10 (PB)	150	2
L83-5V	600	10 (AL)	400	2
		10 (PB)	150	0.9
L83-5W	1,400	10 (AL)	400	6
		10 (PB)	150	2

Area 6, Weak Leads (no prospects or strong leads in Area 6)

L83-6A	5,000*	15 (AL)	400	30
		15 (PB)	150	11
L83-6B	2,000	15 (AL)	400	12
		15 (PB)	150	5
L83-6C	350	10 (AL)	400	1
		10 (PB)	150	0.5
L83-6D	2,300	10 (AL)	400	9
		10 (PB)	150	3
L83-6E	5,000*	15 (AL)	400	30
		15 (PB)	150	11

Prospect/Lead No.	Area (acres)	Estimated N.E.P.	Bbl/acre ft recoverable	Est. oil potential(MMSTB)
L83-6F	4,600	15 (AL)	400	28
		15 (PB)	150	10
L83-6G	1,100	15 (AL)	400	7
		15 (PB)	150	2
L83-6H	5,000*	20 (AL)	400	40
		20 (PB)	150	15
L83-6I	3,000	10 (AL)	400	12
		10 (PB)	150	5
L83-6J	900	10 (AL)	400	4
		10 (PB)	150	1
L83-6K	1,200	10 (AL)	400	5
		10 (PB)	150	2
L83-6L	500	10 (AL)	400	2
		10 (PB)	150	0.8
L83-6M	400	10 (AL)	400	2
		10 (PB)	150	0.6
L83-6N	1,500	10 (AL)	400	6
		10 (PB)	150	2
L83-6O	350	10 (AL)	400	1
		10 (PB)	150	0.5
L83-6P	900	10 (AL)	400	4
		10 (PB)	150	1
L83-6Q	400	10 (AL)	400	2
		10 (PB)	150	0.6

NOTES:

* indicates that the area used in this calculation has been reduced to take into account the likely size of the hydrocarbon accumulation. All other areas quoted are areas of closure.

- (a) 'PM' indicates Permian potential
'PB' indicates Poolowanna Beds potential
'AL' indicates Algebuckina Sandstone potential
- (b) All leads and prospects are considered to contain marginally mature or mature source rocks with respect to the oil window, and are therefore assigned oil potential only. In the case of the Permian Purni Formation, and the Jurassic Poolowanna Beds, source rocks data suggest that the rocks have a tendency to be gas prone with a small oil potential. Given the maturation of the sequence and the results obtained from Poolowanna 1, the most likely hydrocarbons likely to be found in the basin are waxy, high pour-point oils.
- (c) Leads and prospects which lie within the limits of Permian sedimentation (see Enclosure 1) are generally considered to have Permian potential in the Purni Formation. Estimates of oil potential are based on the following assumptions:
 - (i) west of Mokari 1, the sequence is immature
 - (ii) prospects close to the limits of Permian sedimentation contain only Crown Point Formation, and are not assigned a Permian potential.
 - (iii) the remaining prospects and leads are assigned an arbitrary 20' N.E.P. in the Purni Formation, capable of yielding 200 bbl/acre ft. recoverable oil.
- (d) The Peera Peera Formation is not assigned any hydrocarbon potential because:
 - (i) it is gas prone, but rather immature for gas generation
 - (ii) it is typically too fine-grained with too low a porosity to be productive.
- (e) The Poolowanna Beds are arbitrarily assigned a maximum of 30' N.E.P. through most of the licence area, except for west of Mokari 1, where the sequence is considered to be too sandy to have any potential (see Enclosure 1), and in the southern area where a maximum of 15' N.E.P. is assigned due to the thin nature of the sequence. Recovery factors vary from 100 bbl/acre ft. to 150 bbl/acre ft depending upon the depth of burial and anticipated porosity of the sequence. No structure is considered to be more than 50% filled, so the pay column for low-relief structures is reduced accordingly.

(f)

The Algebuckina Sandstone is arbitrarily assigned a maximum of 30' N.E.P. through most of the licence area. In the southern area however, a maximum of 15' N.E.P. is assigned due to the thin nature of the underlying Poolowanna Beds (predicted to be the source of any hydrocarbons reservoir in the top Algebuckina Sandstone). Recovery factor used for the Algebuckina Sandstone is 400 bbl/acre ft. Once again, no structure is considered to be more than 50% filled, so the pay-column for low-relief structures is reduced accordingly.

HYDROCARBON POTENTIAL OF MAPPED LEADS AND PROSPECTS

The hydrocarbon potential of the mapped leads and prospects in the Pedirka Block is calculated on the basis of the following equation:

$$\text{Hydrocarbon Potential} = \text{SF} \times (\text{P} + 0.6\text{SL} + 0.2\text{WL})$$

where SF = Success Factor = 0.05

P = estimated potential of prospects

SL = estimated potential of strong leads

WL = estimated potential of weak leads

Since the Pedirka Block is so large and so diverse, each of the six areas shown in Enclosure 1 is assessed separately:

$$\begin{aligned} \text{Hydrocarbon Potential (Area 1)} &= 0.05(164 + 0.6 \times 280 + 0.2 \times 350) \\ &= 20.1 \text{ MMSTB OIL} \end{aligned}$$

$$\begin{aligned} \text{Hydrocarbon Potential (Area 2)} &= 0.05(202 + 0.6 \times 259 + 0.2 \times 312) \\ &= 21.0 \text{ MMSTB OIL} \end{aligned}$$

$$\begin{aligned} \text{Hydrocarbon Potential (Area 3)} &= 0.05(25 + 0.6 \times 225 + 0.2 \times 235) \\ &= 10.4 \text{ MMSTB OIL} \end{aligned}$$

$$\begin{aligned} \text{Hydrocarbon Potential (Area 4)} &= 0.05(0 + 0 + 0.2 \times 82) \\ &= 0.8 \text{ MMSTB OIL} \end{aligned}$$

$$\begin{aligned} \text{Hydrocarbon Potential (Area 5)} &= 0.05(32 + 0.6 \times 92 + 0.2 \times 389) \\ &= 13.3 \text{ MMSTB OIL} \end{aligned}$$

$$\begin{aligned} \text{Hydrocarbon Potential (Area 6)} &= 0.05(0 + 0.6 \times 0 + 0.2 \times 266) \\ &= 2.7 \text{ MMSTB OIL} \end{aligned}$$

$$\text{HYDROCARBON POTENTIAL} = 63 \text{ MMSTB OIL}$$

Name: OOLARINNA No. 1.

Location: Lat. 26° 13' 36" S
Long. 136° 51' 43" E

Block/Basin: Pedirka Block

Most Recent Seismic Coverage: Koomarinna
Seismic Survey, 1980

Distance ex Moomba (km): 385 km

Relevant Maps: 'C' and 'Js' horizon maps, 1:50,000 scale
Enclosures 1-4, Pedirka Block Prospectivity Report
Figures 1-16, Pedirka Block Prospectivity Report

Objectives/Depths/Temps.: Primary objective is the Poolowanna Beds, with prognosed top at approx. 7720 ft., thickness of 450 ft., and temperature of 240°F. Main secondary objectives are (a) the Peera Peera Fm., with prognosed top at approx. 8170 ft., thickness of 430 ft., and temperature of 280°F. and (b) Permian Purni Formation with prognosed top at 8600 ft., thickness of 250 ft.

Proposed T.D.: 9100 ft.

Prospect Summary: (Nature of traps, vertical closure, reservoir quality, proximity to migration paths, etc.).

The Oolarinna Structure is a large, relatively flat-topped dome, with minor faulting along the margins at 'Js' and lower horizons. Maximum vertical closure is approximately 60 msec (350 ft) at Js. The Poolowanna Beds, which are the primary target, are anticipated to be 50 ft thick, and should be mature with respect to oil generation. The Permian Purni Formation should be a major secondary target, and has a prognosed thickness of 250 ft.

Comments: The structure is highly rated, being large, relatively uncomplicated by faulting, and presenting a dual Permian-Jurassic target. Total area of closure at the 'C' horizon is 30 msec and 16,600 acres.

Estimate of Hydrocarbon Potential:

Formation	Av. NEP	Area of Closure	Sales Gas BCF (max. processing)	Gas Liquids bbl x 10 ⁶	Oil bbl x
Algebuckina Sst	20 ft	5,000 acres*			40 (a)
Poolowanna Beds	30 ft	7,600 acres*			46 (b)
Purni Fm.	20 ft	7,600 acres*			15 (c)
(*Area of hydrocarbon accumulation based on prognosed oil column)					

- (a) Using 400 bbl/acre ft. recoverable
 (b) Using 200 bbl/acre ft. recoverable
 (c) Using 100 bbl/acre ft. recoverable

PROSPECT DATA SHEET

000697

Name: MIAMIANA No. 1

Location: Lat. 27°12' 40" S
Long. 137°29' 06" E

Block/Basin: Pedirka Block

Most Recent Seismic Coverage: Koomarinna
Seismic Survey, 1980

Distance ex Moomba (km): 265 km

Relevant Maps: 'C' and 'Tu' horizon maps, 1:50,000 scale
Enclosures 1-4, Pedirka Block Prospectivity Report
Figures 1-16, Pedirka Block Prospectivity Report

Objectives/Depths/Temp's.: Primary objective is the Poolowanna Beds, with prognosed top at approx. 8100 ft., thickness of 240 ft. and temperature of 240°F.

Main secondary objectives are (a) the Peera Peera Formation, with prognosed top at approx. 8340 ft., thickness of 660 ft. and temperature of 250°F; and (b) the uppermost Algebuckina Sandstone, with top at 5010 ft., and temperature of 200°F.

Proposed T.D.: 9100 ft.

Prospect Summary: (Nature of traps, vertical closure, reservoir quality, proximity to migration paths, etc.).

The Miamiana Structure is moderately-sized, NNW-SSE, elongate anticlinal dome in the southern central portion of the Pedirka Block. It has a steep margin on the western side, with faulting extending from basement through to the 'J' horizon. The Poolowanna Beds, which are thinned considerably from the sections to the north, are the main target. Hydrocarbons may also be trapped in the Peera Peera Formation and top of Algebuckina Sandstone in particular.

Comments: The structure has moderate potential; however the thinned Poolowanna Beds sequence combined with the presence of minor faulting at this level downgrades the structure.

Estimate of Hydrocarbon Potential:

Formation	Av. NEP	Area of Closure	Sales Gas BCF (max. processing)	Gas Liquids bbl x 10 ⁶	Oil bbl x 10 ⁶
Poolowanna Beds	20 ft.	4,460 acres			18(a)
Peera Peera Beds	10 ft.	4,300 acres			4(b)

Drilling Cost: Dry hole \$1,400,000 (a) Using 200 bbl/acre ft. recoverable
Cased \$1,600,000 (b) Using 100 bbl/acre ft. recoverable
Completed \$

P.S. Moore
February, 1983.

Name: KOONAKOO No. 1

Location: Lat. 26° 30' 36" S
Long. 138° 24' 15" E

Block/Basin: PEDIRKA BLOCK

Most Recent Seismic Coverage: Koomarinna
Seismic Survey, 1980.

Distance ex Moonba (km): 245 km W

Relevant Maps: 'C' and 'Tu' horizon maps, 1:50,000 scale
Enclosures 1-4, Pedirka Block Prospectivity Report
Figures 1-16, Pedirka Block Prospectivity Report.

Objectives/Depths/Temp's.: Primary objective is the Poolowanna Beds, with prognosed top at 7335', thickness of 650 ft., and temperature of 230°F.

Main secondary objective is the Peera Peera Formation, with prognosed top at 7985', thickness of 480; and temperature of 250°F.

Proposed T.D.: 8550 ft. K.B.

Prospect Summary: (Nature of traps, vertical closure, reservoir quality, proximity to migration paths, etc.).

The Koonakoo Structure is an anticlinal dome with significant faulting along the western margin and minor faulting along the eastern edge. There may be very little closure independent of faulting. The structure is located in the eastern portion of the Early Jurassic-Triassic Basin. Vertical closure at 'C' is 8,900 acres. The Poolowanna Beds are likely to be mature with respect to oil generation, however, the upper part is faulted against the Algebuckina sandstone, and thus likely to be flushed. The Peera Peera Formation is prognosed at 480 ft. thick, and may yield wet gas.

Comments: The Koonakoo Structure is at present poorly rated.

Estimate of Hydrocarbon Potential:

Formation	Av. NEP	Area of Closure	Sales Gas BCF (max. processing)	Gas Liquids bbl x 10 ⁶	Oil bbl x
Poolowanna Beds	30 ft	5,000 acres*			23(a)
Peera Peera Fm.	10 ft	2,000 acres*			2(b)
(*Area of hydrocarbon accumulation based on prognosed oil column)					

- (a) Using 150 bbl/acre ft. recoverable
(b) Using 100 bbl/acre ft. recoverable

P.S. Moore,
February, 1983.

Name: MIANDANA No. 1.

Location: Lat. 27° 04' 13" S
Long. 137° 24' 00" E

Block/Basin:

Most Recent Seismic Coverage: Koomarinna
Seismic Survey, 1980.

Distance ex Moonba (km): 270 km

Relevant Maps: 'C' and 'Tu' horizon maps, 1:50,000 scale
Enclosures 1-4, Pedirka Block Prospectivity Report.
Figures 1-16, Pedirka Block Prospectivity Report.

Objectives/Depths/Temps.: Primary objective is the Poolowanna Beds, with prognosed top at approx. 8520 ft. thickness of 230' and temperature of 260°F.

Main secondary objective is the Peera Peera Formation with prognosed top at 8750 ft., thickness of 60 ft. and temperature of 270°F.
Proposed T.D.: 9450 ft.

Prospect Summary: (Nature of traps, vertical closure, reservoir quality, proximity to migration paths, etc.).

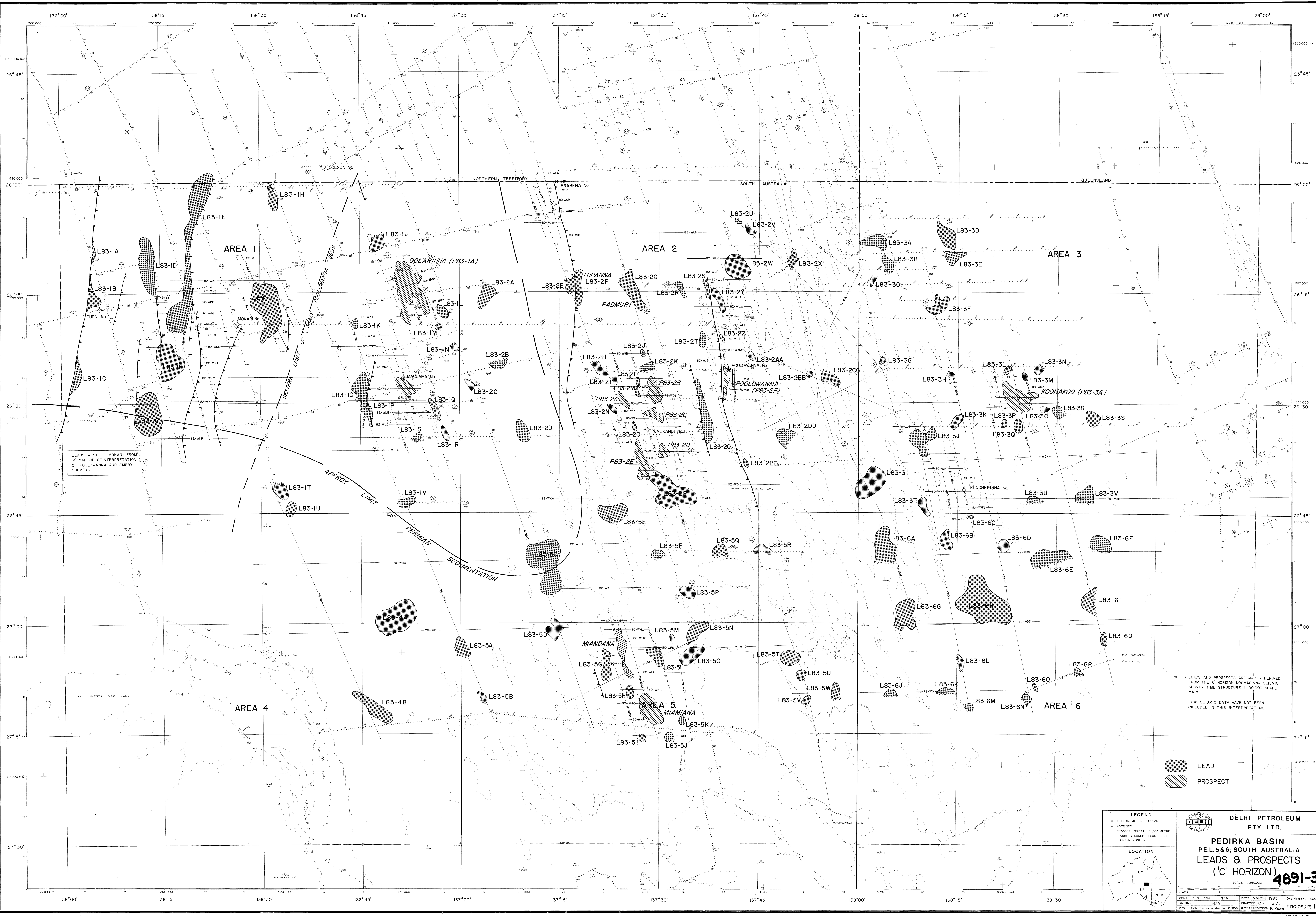
The Miandana Structure is a NNW-SSE elongate anticlinal dome in the southern portion of the Early Jurassic-Triassic basin. The structure is asymmetrical, with steeper dips and faulting along the western flank. Faults penetrate the 'J₁' horizon but do not extend 'C'. The Miandana Structure is favourably located to trap hydrocarbons migrating from deeper parts of the basin to the north. The Poolowanna Beds should contain approx. 60-70% sandstone, mainly in the lower portion.

Comments: The Miandana Structure is moderately rated. Problems which downgrade the structure are the lack of thick Poolowanna Beds section, and the very sandy nature of the unit.

Estimate of Hydrocarbon Potential:

Formation	Av. NEP	Area of Closure	Sales Gas BCF (max. processing)	Gas Liquids bbl x 10 ⁶	
Poolowanna Beds	30 ft	1,400 acres			
Peera Peera Fm	10 ft.	1,300 acres			

Drilling Cost: Dry hole \$1,400,000 (a) Using 200 bbl/acre ft. recoverable
(b) Using 100 bbl/acre ft. recoverable
Cased \$1,600,000P.S. Moore,
February, 1983.



NOTE: LEADS AND PROSPECTS ARE MAINLY DERIVED FROM THE 'C' HORIZON KOONAKOO SEISMIC SURVEY TIME STRUCTURE 1:100,000 SCALE MAPS.
1982 SEISMIC DATA HAVE NOT BEEN INCLUDED IN THIS INTERPRETATION.

LEAD
PROSPECT

LEGEND

▲ TELLUROMETER STATION
+ ASTROFIX
+ CROSSES INDICATE 30000 METRE GRID INTERCEPT FROM FALSE ORIGIN ZONE 5.

LOCATION

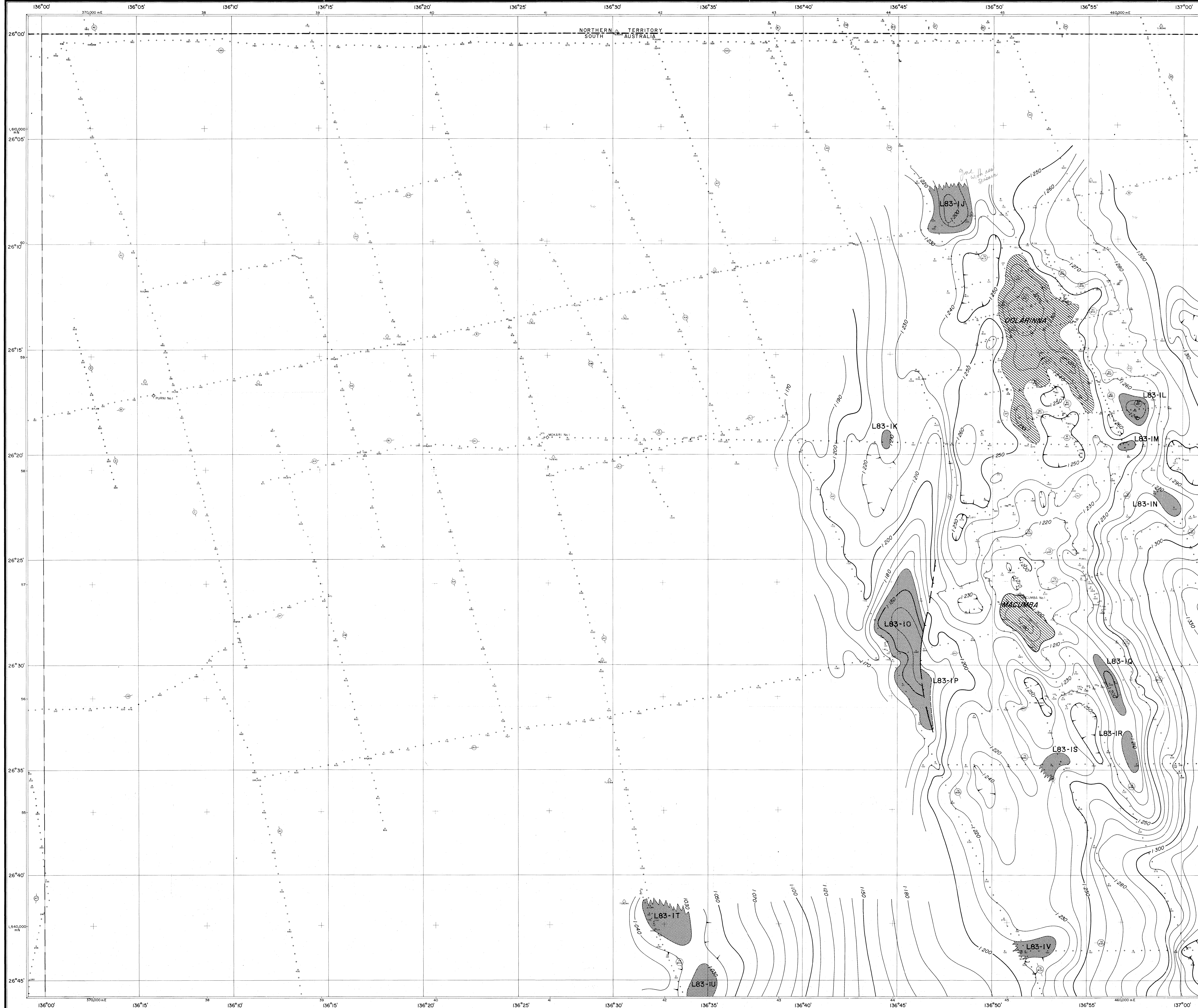
W.A. N.T. Q.L.D.
S.A. N.S.W.

DELHI PETROLEUM PTY. LTD.

PEDIRKA BASIN
P.E.L. 5&6; SOUTH AUSTRALIA
LEADS & PROSPECTS
('C' HORIZON)

4891-3

SCALE 1:250,000
WILES 0 10 20 30 40 50 60 70 80 90 100
DATE: MARCH 1983
DRAFTED: A.G. W.A.
PROJECTION: Transverse Mercator C.1858 INTERPRETATION: P. Moore
ENCLOSURE I



4891-4

DELHI PETROLEUM PTY. LTD.

KOOMARINNA SEISMIC SURVEY

P.E.L. 5 & 6; SOUTH AUSTRALIA

PEDIRKA BASIN FARMOUT AREA

'C' HORIZON TIME STRUCTURE

(LEADS & PROSPECTS)

CONTOUR INTERVAL: 0.010 SECONDS DATUM: AUSTRALIAN MAP SERIES

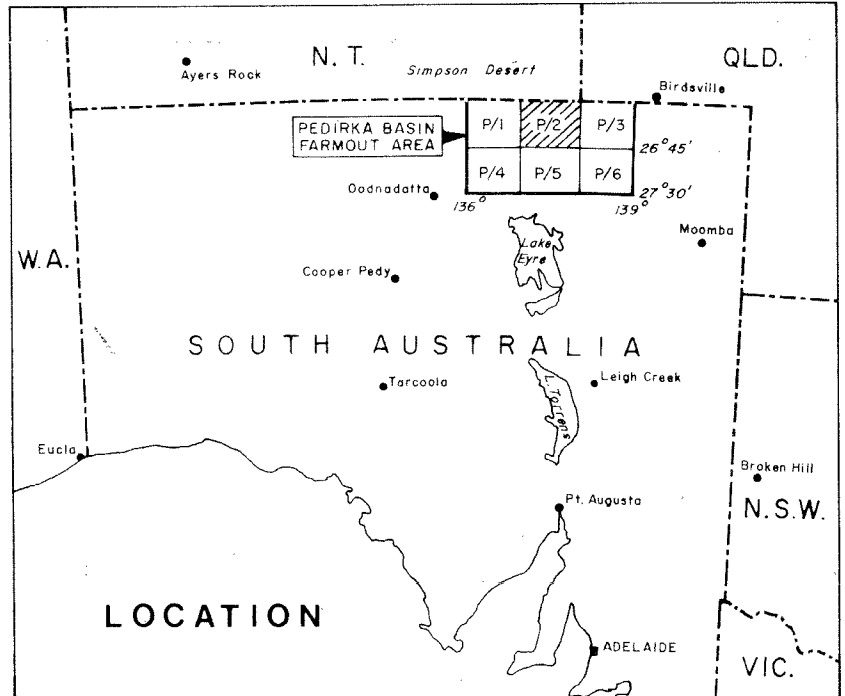
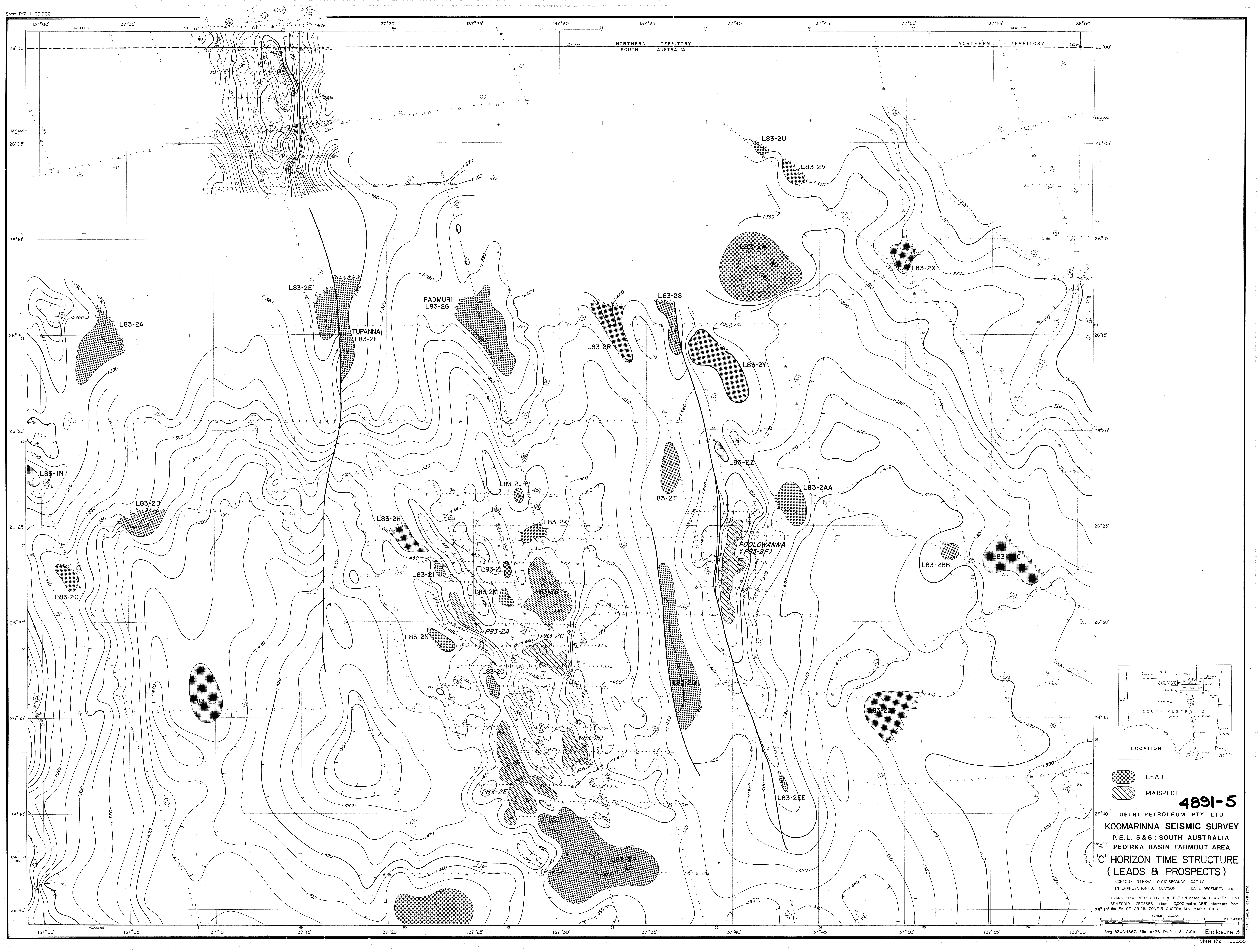
INTERPRETATION: B. FINLAYSON DATE: DECEMBER, 1982

TRANSVERSE MERCATOR PROJECTION based on CLARK'S 1858 SPHEROID. CROSSES indicate 10,000 metre GRID intercepts from 26°45' 17" S FALSE ORIGIN, ZONE 5, AUSTRALIAN MAP SERIES.

SCALE 1:100,000

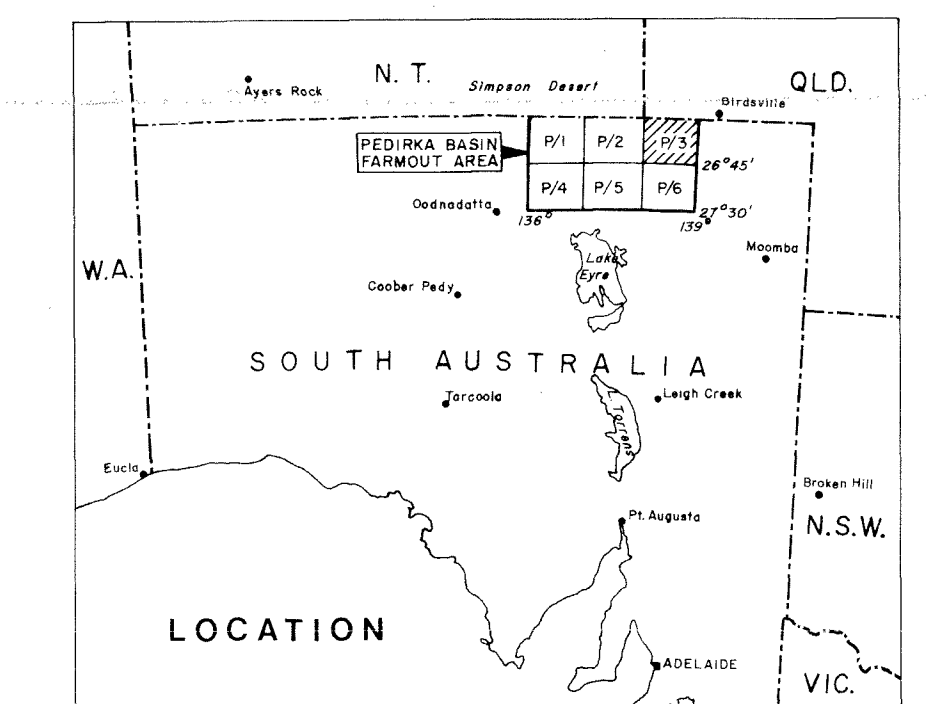
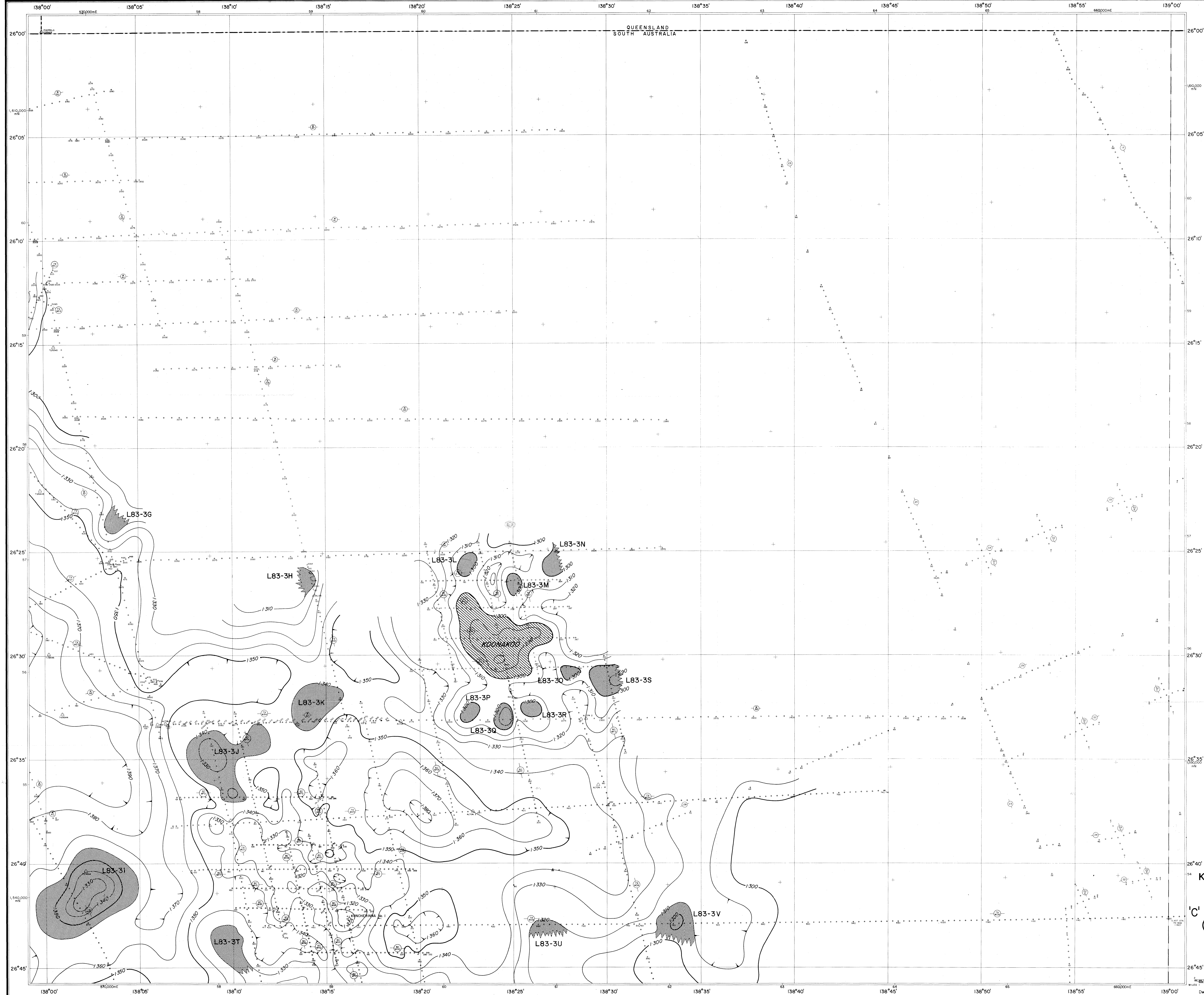
Dwg. 83XG-1866, File: A-26, Drafted: S.J./W.A. Enclosure 2

Sheet P/1 1:100,000



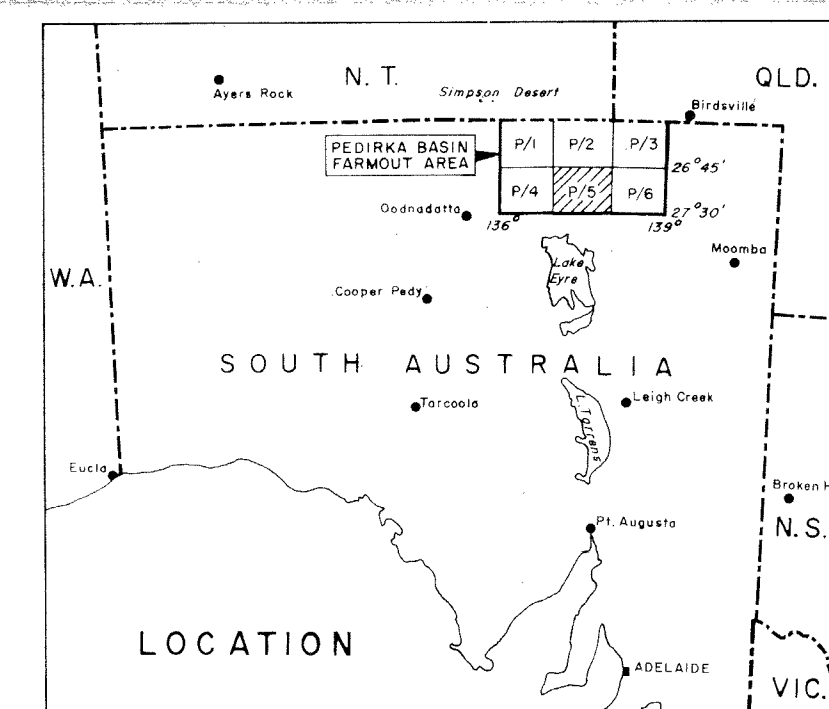
4891-5
DELHI PETROLEUM PTY. LTD.
KOOMARINNA SEISMIC SURVEY
P.E.L. 5 & 6; SOUTH AUSTRALIA
PEDIRKA BASIN FARMOUT AREA
**'C' HORIZON TIME STRUCTURE
(LEADS & PROSPECTS)**

CONTOUR INTERVAL: 0.010 SECONDS DATUM:
INTERPRETATION: B. FINLAYSON DATE: DECEMBER, 1982
TRANSVERSE MERCATOR PROJECTION based on CLARKE'S 1858
SPHEROID. CROSSES indicate 10000 metre GRID intercepts from
26°45' the FALSE ORIGIN, ZONE 5, AUSTRALIAN MAP SERIES.
SCALE 1:100,000
Dwg 83X8-1867, File: A-26, Drafted S.J./W.A. Enclosure 3
Sheet P/2 1:100,000



LEAD
PROSPECT

4891-6
DELHI PETROLEUM PTY. LTD.
KOOMARINNA SEISMIC SURVEY
P.E.L. 5 & 6; SOUTH AUSTRALIA
PEDIRKA BASIN FARMOUT AREA
'C' HORIZON TIME STRUCTURE
(LEADS & PROSPECTS)
CONTOUR INTERVAL 0.010 SECONDS DATUM:
INTERPRETATION: B FINLAYSON DATE: DECEMBER, 1982
TRANSVERSE MERCATOR PROJECTION based on CLARKE'S 1858
SPHEROID. CROSSES indicate 10,000 metre GRID intercepts from
26°45' the FALSE ORIGIN, ZONE 5, AUSTRALIAN MAP SERIES.
SCALE 1:100,000
Dwg. 83XG-1868, File A-26, Drafted S.J./W.A. Enclosure 4
Sheet P/3, 1:100,000



 LEAD

 PROSPECT

CT 4891-7

DELHI PETROLEUM PTY. LTD.
KOOMARINNA SEISMIC SURVEY
 P.E.L. 5 & 6; SOUTH AUSTRALIA
 PEDIRKA BASIN FARMOUT AREA
¹C' HORIZON TIME STRUCTURE
(LEADS & PROSPECTS)

CONTOUR INTERVAL: 0.010 SECONDS DATUM:
INTERPRETATION: B. FINLAYSON DATE: DECEMBER, 1982

TRANSVERSE-MEDIATED PROJECTION FROM A CHAIRMAN'S OFFICE

SPHEROID. CROSSES indicate 10,000 metre GRID intercepts from 30° the FALSE ORIGIN. ZONE 5. AUSTRALIAN MAP SERIES.

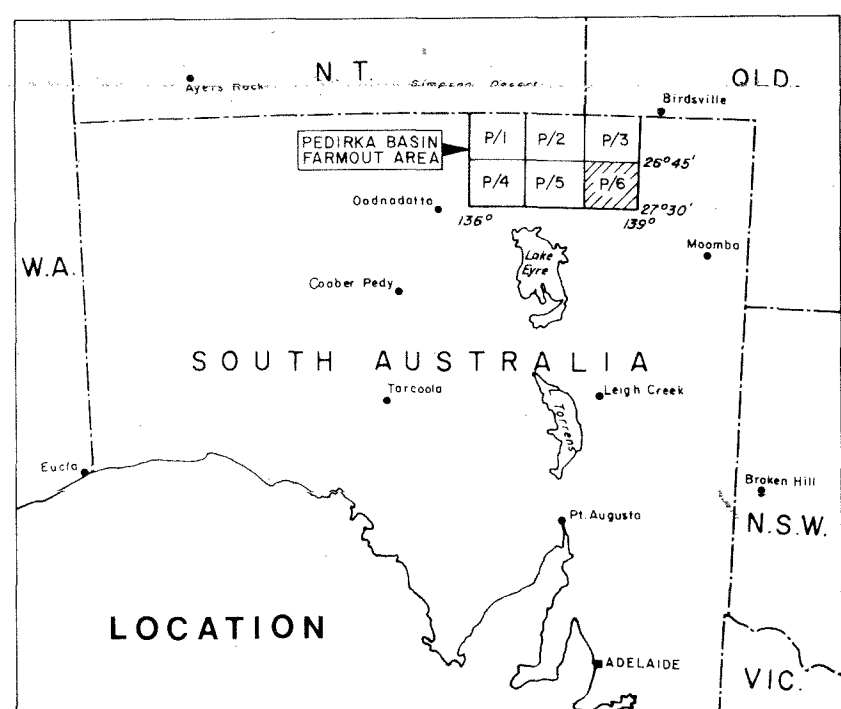
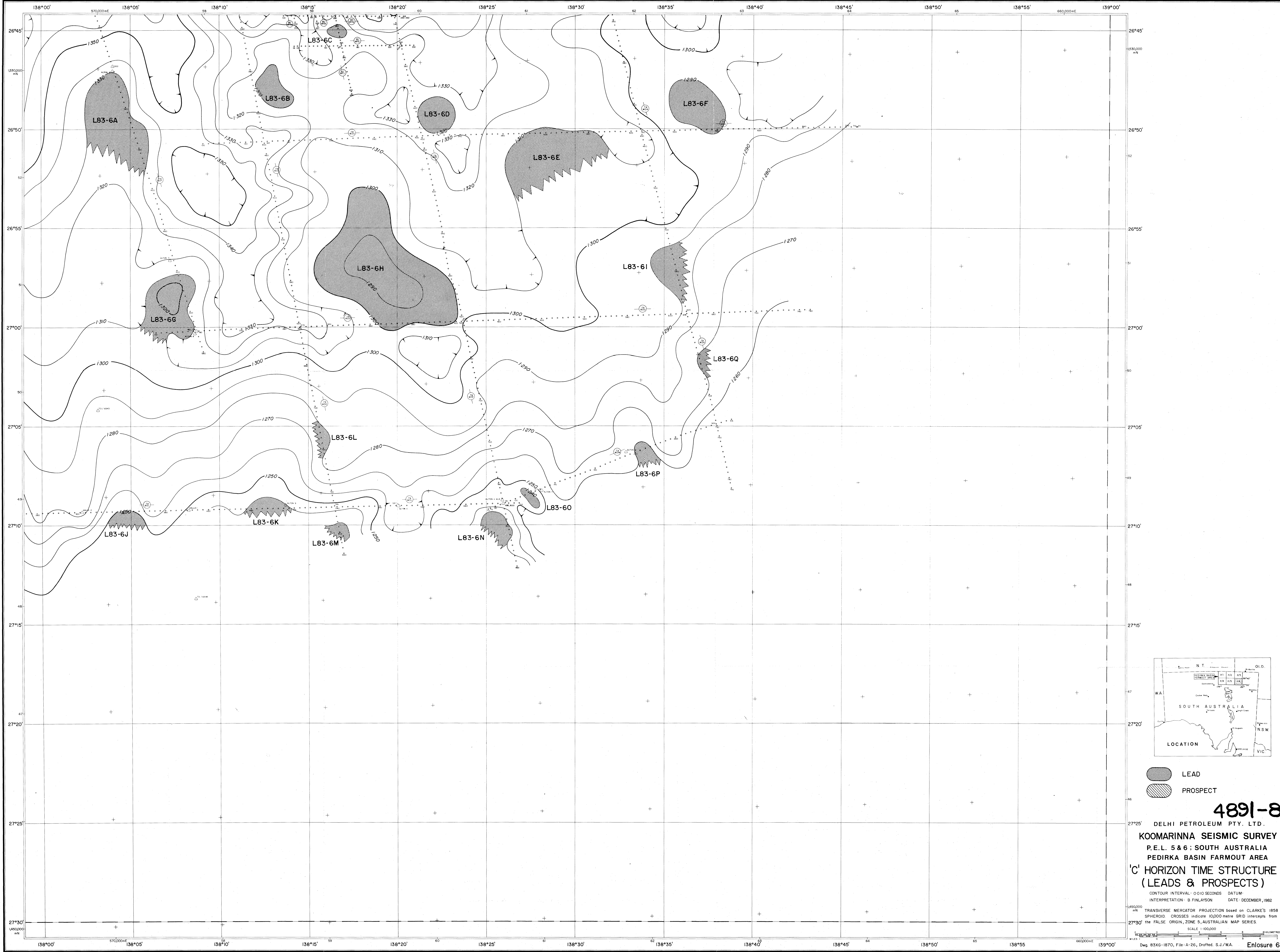
SCALE 1:100,000

Dwg. 83YG-1869 File: A-26 Drafted: S.J./W.A. Enclosure 1

0.07 mg. 55X5 1985, 10-12-85, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 8

Sheet P/5 1:100,

Sheet P/5 1:100,0



LEAD
PROSPECT

4891-8

DELHI PETROLEUM PTY. LTD.
KOOMARINNA SEISMIC SURVEY
P.E.L. 5 & 6; SOUTH AUSTRALIA
PEDIRKA BASIN FARMOUT AREA
'C' HORIZON TIME STRUCTURE
(LEADS & PROSPECTS)

CONTOUR INTERVAL: 0.010 SECONDS
INTERPRETATION: B. FINLAYSON
DATE: DECEMBER, 1982
TRANSVERSE MERCATOR PROJECTION based on CLARKE'S 1858
SPHEROID. CROSSES indicate 10,000 metre GRID intercepts from
27°30' the FALSE ORIGIN, ZONE 5, AUSTRALIAN MAP SERIES.
SCALE 1:100,000
Dwg. 85XG-1870, File: A-26, Drafted. S.J./W.A.
Enlosure 6