SOUTH AUSTRALIA

OT93-A - OTWAY BASIN
INVITATION FOR APPLICATIONS

THE DEPARTMENT OF
MINES AND ENERGY

F04793.JGM

SUMMARY

OT93-A located in the South Australian sector of the onshore Otway Basin, is available for application as Petroleum Exploration Licence (PEL). OT93-A covers an area of 1 069 km^2 (264 000 acres), and within which 638 km (396 miles) has been recorded and three modern petroleum wells drilled.

The Otway Basin is one of a series of basins which originated with the rifting and final pull-apart of the Australia-Antarctica landmass, initiated during the Early Cretaceous. The oil and gas productive Gippsland Basin is the best known of these basins as it contains several giant oil and gas fields.

Commercial gas was discovered in the onshore Otway Basin in South Australia at Katnook in 1987. Sufficient reserves were proved by follow-up drilling to enable the signing of contracts and construction of a pipeline to supply local markets in 1991. Oil has been recovered from two wells in Victoria (Lindon 1 and Windermere 1) and two in SA - Caroline 1 and Sawpit 1 (the latter drilled in 1992). Hydrocarbons have recently been discovered from the offshore Otway Basin, adjacent to OT93-A, where gas was recovered on RFT in Troas 1, although the accumulation is considered uneconomic. In the eastern Otway Basin in Victoria two large discoveries were made in the offshore in 1993, estimated to contain at least 1 000 BCF of gas.

OT93-A has in excess of 2 400 m (8 000 feet) of Early Cretaceous and 500 m (1 600 feet) of Late Cretaceous and Tertiary clastic sediments, containing a number of potential source rock and reservoir objectives. Early Cretaceous and older sediments have not been fully penetrated in the central part of the area. There are a number of undrilled prospects and leads within the area.

Enquiries and applications for a Petroleum Exploration Licence over OT93-A may be addressed to:

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Applications should be accompanied by a proposed 5 year work program, a map of the area applied for, a $2000 application fee, and details of the technical and financial resources of the applicant (there is no set form for the making of an application).

The closing date for applications is **11 March 1994**.

OT93 SUMMARY SHEET

OT93-A AREA	-	1 069 km^2 (264,000 acres)
AGE OF SEDIMENTS	-	Early to Late Cretaceous
THICKNESS OF SEDIMENTS	-	Up to 3 km (10 000 ft)
DEPTH TO TARGET ZONES	-	760-2 700 m, (2 500-8 900 ft)
BASIN TYPE	-	Rift
DEPOSITIONAL SETTING	-	Fluvial-lacustrine-deltaic
REGIONAL STRUCTURE	-	Early half grabens, late growth faulting
RESERVOIRS	-	Fluvial and deltaic sandstones
SOURCE ROCKS	-	Casterton Formation, Laira Formation and Eumeralla Formation Shales (lacustrine)
DEPTH TO OIL/GAS WINDOW	-	1 800 - 2 600 + m (5 900 - 8 500 + ft)
EXPECTED HYDROCARBONS	-	Gas with some liquids potential. Unconfirmed oil seep.
NUMBER OF WELLS	-	Five (plugged and abandoned, some with gas/oil shows)
WELL DENSITY	-	1 well per 213 km^2 (82 square miles)
SEISMIC COVERAGE	-	638 line km (396 miles)
PREVIOUS TENEMENT HOLDERS	-	Ansbachall Pty Ltd, Mosaic Oil, Beach Petroleum
TRAPS	-	Largely fault independent 4 way dip closure

SETTING

The Otway Basin is one of a series of Mesozoic to Tertiary sedimentary basins formed along Australia's southern margin during a period of rifting and continental breakup which separated Australia and Antarctica. The northern margin of the basin extends up to 50 miles (80 kilometres) inland while the southern margin is poorly defined and lies in the region of the continental slope some 160 kilometres offshore. Approximately 70 percent of the basin is offshore. The basin straddles the South Australian/Victorian State border.

OT93-A comprises approximately 1 069 square kilometres (413 square miles) and comprises most of the Robe Trough and a residual basement horst which separates the Robe and St Clair Troughs (Figure 1). The known sedimentary sequence within these 'troughs' is dominated by up to 2 400 metres (8000 feet) of Early Cretaceous Otway Group sediments, with a cover of Late Cretaceous and Tertiary sediments which range in thickness from about 250 metres (800 feet) in the north to an interpreted 500 metres (1600 feet) in the south (Figure 3). The Early Cretaceous Otway Group has not been fully penetrated within deeper parts of the OT93-A area, but should offer considerable prospectivity.

Seismic studies have shown that the structural evolution of the Otway Basin is analogous to basins such as the Tucano-Reconcauo Basin of Brazil and the Gabon and Cabinda Basins of the west coast of Africa. Each of these basins have been found to contain at least one giant oil field.

EXPLORATION HISTORY

The first oil well drilled in the Otway Basin was in 1866 at Alfred Flat. The drilling venture was convinced of the presence of oil in the subsurface on the basis of bitumen strandings frequently found on the coastline and oily algal scums floating on nearby lagoons. Robe 1 was drilled in OT 93-A in 1915, but it is believed the well did not penetrate the most prospective reservoir Section (Crayfish Subgroup) although gas shows were encountered in the Eumeralla formation. Lake Eliza 1, drilled in 1969, also encountered gas shows in the Otway group. The first offshore well was drilled in 1967 and over the period 1967 to 1975 Esso and Shell drilled six wells offshore, in the South Australian sector of the basin. Although hydrocarbon shows were encountered, no discoveries were made. Failure is attributed to the then poor quality of seismic data and to a poor understanding of the stratigraphic relationships which together led to all of these wells being invalid tests (either drilled off structure or the main objective not penetrated).

The first commercial production of hydrocarbons was established with the drilling of North Paaratte No. 1, an onshore well located near Port Campbell in Victoria, in 1979. Gas is currently being produced from the Late Cretaceous Waarre Sandstone through this well. Lindon No. 1, drilled in 1983, recovered a heavily biodegraded oil within the Tertiary Pebble Point Formation but commercial production could not be achieved. In 1987, Windermere No. 1 recovered oil from sands within the Early Cretaceous Eumeralla Formation.

There has been a historical report of an oil seep in the vicinity of Mt Benson, in the OT93-A area, but this has not been able to be confirmed.

In 1987, Katnook 1, an onshore well in the South Australian portion of the basin, flowed gas at rates up to 9 MMCFD during production testing of a sand at the base of the Eumeralla Formation. A follow-up well, Katnook 2, drilled in 1989, flowed gas at rates of over 16 MMCFD during production testing of the Pretty Hill Sandstone. The field is now on commercial production. Another field (Ladbroke Grove) was discovered near to the Katnook field in 1989. In August 1992 a small but significant volume of oil was recovered from Sawpit and in early 1993 gas was recovered on RFT in Troas 1, an offshore well in South Australia, although the well proved uneconomic.

Since 1961, approximately 638 kilometres (396 miles) of seismic data has been acquired within OT93-A (Figure 3), most of which is post 1985 vintage.

BASIN EVOLUTION AND DEFORMATION

The Otway Basin is one of a series of basins which lie along the southern continental margin of Australia, stretching from the Bremer Basin in Western Australia to Australia's most productive oil and gas basin, the Gippsland Basin, in the east. All of these basins share a common origin linked with the rifting and final pull apart of the Australia-Antarctic land mass during the Cretaceous.

The central doming which preceded rifting is believed to be Late Jurassic (based on volcanic material found in the basin and nearby) and may have reached an elevation of 1 000 metres (3 300 feet). The rifting appears to have commenced around 125 Ma, resulting in a system of narrow, east-west trending grabens developed through extensive down to the basin faulting. Actual breakup of the two continents occurred about 95±5 Ma.

A regime of northwesterly orientated compressional stress, as evidenced by the set up of the Tasmanian subplate and most likely resulting from the opening of the Tasman sea, is understood to have generated a conjugate fault set, leading to the development of the break in structural trend from east-west to northwest-southeast of the major structural elements in the basin.

Stabilisation of the basin in the Tertiary led to carbonate sedimentation across the area in a seaward thickening wedge.

STRATIGRAPHY

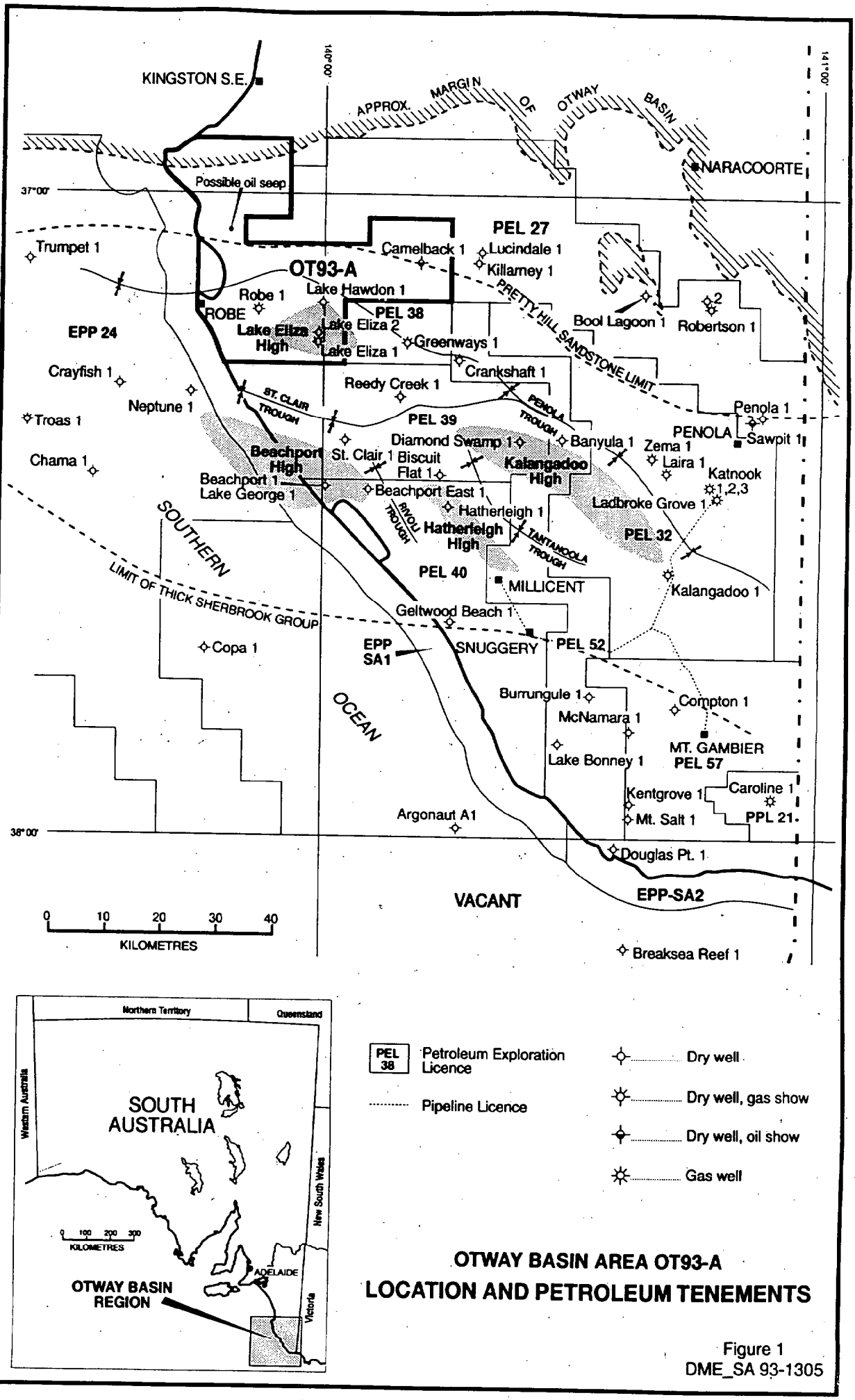
The stratigraphy of the Otway Basin is summarised on Figure 2.

During the Late Jurassic or earliest Cretaceous time, the initial period of rifting which formed the Otway Basin led to the deposition of the Early Cretaceous Otway Group. Although ancient Palaeozoic highlands to the north may have contributed sediments, volcanic material suggests at least a partial provenance to the south and west where volcanic activity accompanied pre-breakup thermal uplift and doming. Sediments, which are dominated by volcanogenic fluvial and lacustrine clastics and coals, were deposited in an intracratonic setting in a series of northward dipping half grabens during the initial rifting stage (Berriasian to Barremian Pretty Hill Sandstone, Laira Formation and Katnook Sandstone) and as a relatively conformable sequence across the rotated fault blocks of the grabens during a period of post rift thermal subsidence (Aptian to Albian Windermere Sandstone and Eumeralla Formation).

Breakup in Cenomanian time generated further down to the south fault block rotation (Waarre Sandstone/Flaxman Formation) followed in turn by thermal subsidence associated with the initiation of sea-floor spreading and the separation of Antarctica from Australia (Cenomanian to Maastrictian Flaxman Formation, Belfast Mudstone, Paaratte Formation and Timboon Sandstone). These five units which collectively reach thicknesses up to 5 000 metres (16 000 feet) comprise the Sherbrook Group. A regional unconformity separates the Sherbrook Group from the underlying Otway Group.

A final phase of basin movement which was accompanied by a period of extensive erosion occurred towards the end of Maastrichtian time. Up to 2500 metres (8000 feet) of Tertiary marine sediments were deposited in a passive margin setting. The Tertiary thins to about 300 metres (1000 feet) towards the northwest. Palaeocene and Eocene clastics of the Pebble Point Formation, Pember Mudstone and Dilwyn Formation which form the Wangerrip Group, and Oligocene to Recent shelf marls, limestones and clastics of the Gambier Limestone Formation unconformably overlie the Sherbrook Group.

The Mesozoic/Cainozoic sequence overlies a pre-rift, metamorphic basement composed of Palaeozoic and older rocks. The pre-rift succession has not been penetrated within OT93 and therefore remains unknown with respect to hydrocarbon potential.



OTWAY BASIN AREA OT93-A
LOCATION AND PETROLEUM TENEMENTS

Figure 1
DME_SA 93-1305

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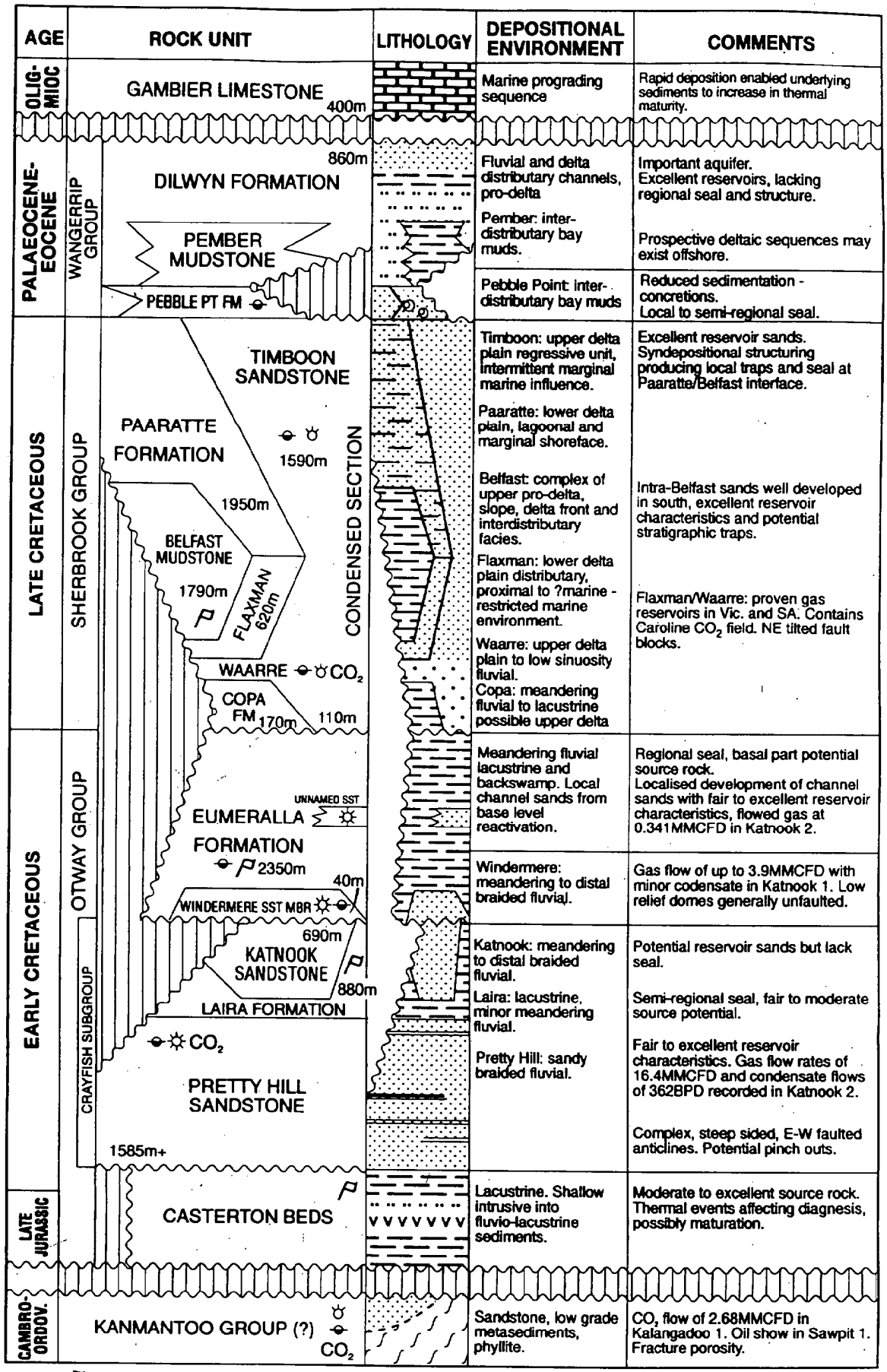

OTWAY BASIN GEOLOGICAL SUMMARY

Figure 2
DME_SA 93-1306

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GEOLOGY OF THE APPLICATION AREA OT93-A

The OT93-A tenement tract covers about 1 069 sq km of the western onshore Otway Basin (Fig. 1). The extensional tectonic origins of the Otway Basin are typically preserved as an east-west trending complex of grabens and residual horsts, created by rifting and transfer faulting prior to crustal break-up. Tertiary fault reactivations and probable transpressional movements have added a characteristic overprint, including mild flower-styled structuring.

The region, of which OT93-A forms part, represents a terraced flank province of the fundamental Otway Basin rift, now largely offshore. OT93-A covers most of the Robe Trough and a residual basement horst, (the Lake Eliza High) which separates the Robe and St Clair troughs (Fig 1).

The results of rifting tectonics across the 'Lake Eliza High' are characterised by "thin skinned" listric extensional structuring on relatively shallow (acoustic) basement, so that intra-rift sediment packages are separated by low angle soling faults and detachments.

Repeated syndepositional fault slices dip off the Lake Eliza High into the Robe and Penola Troughs on the north and the St Clair Trough to the south. The seismic sections reveal a complex of extensional fault arrays in detail, with marked changes in the profiles of fault geometry along strike, attesting the influence of transfer faulting and accommodation zones.

The sedimentary fill in the Robe Trough comprises Early Cretaceous (mainly Neocomian) mixed clastic "paralic" sediments of the Crayfish Subgroup. The current threefold subdivision (comprising the Pretty Hill, Laira, and Katnook Formations typical of the Penola Trough, does not appear to be applicable to the Robe Trough. The Crayfish Subgroup sequence thickens considerably into the main part of the Robe Trough. Existing wells in OT93-A have only penetrated the margins of this trough, and are not representative of the sequence in the deeper parts. A seismic line (Figure 4), from Lake Hawdon 1 to the west, illustrates the significant thickening of the Crayfish Subgroup into the Robe Trough. Figures 5 & 6 are regional time structure maps of the Crayfish unconformity and Basement.

The Crayfish Subgroup sequence is unconformably overlain by the shaly Eumeralla Formation, a regional blanket of non marine claystone with minor calcareous and coaly beds. A basal sandy unit, the Windermere Sandstone Member is represented by eight metres of excellent quartzose sand at Greenways-1 (Fig. 1), which produced a minor gas flow on DST accompanied by water. Its pattern of distribution in the region is unpredictable.

PETROLEUM POTENTIAL

The Robe Trough is a conceptually favourable petroleum play, with potential structural and stratigraphic targets. Because of the gas shows in the Windermere Sandstone Member at Greenways-1 and Crankshaft-1 (1991, to the east in PEL 52) the unconformity play is considered to be the priority target in OT93-A. At least four prospects/leads have been identified.

RESERVOIRS

The Windermere Sandstone Member, and sands of the Crayfish subgroup are the major exploration targets over the application area. The main proven gas reservoir is the Pretty Hill Sandstone, which in the Katnook Field has porosities in excess of 25%, permeabilities in excess of 1000 md and has flowed over 451 000 m^3/day (16 MMCFD) gas on test. Reservoir quality in the Windermere Sandstone Member is also excellent.

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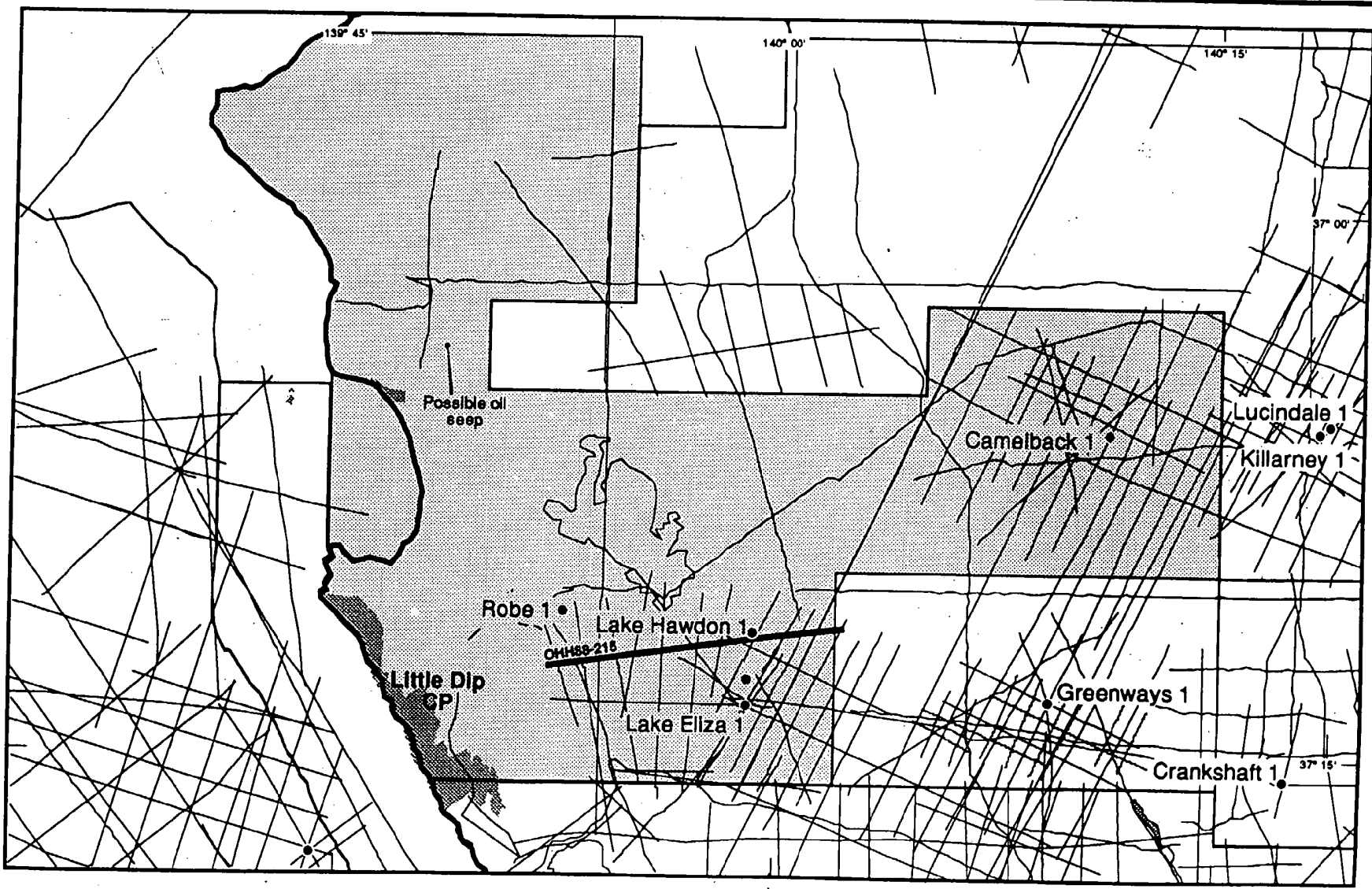

OT93-A SEISMIC LINE COVERAGE
(1961 - 1992)

Figure 3
DME_SA 93-93-1307

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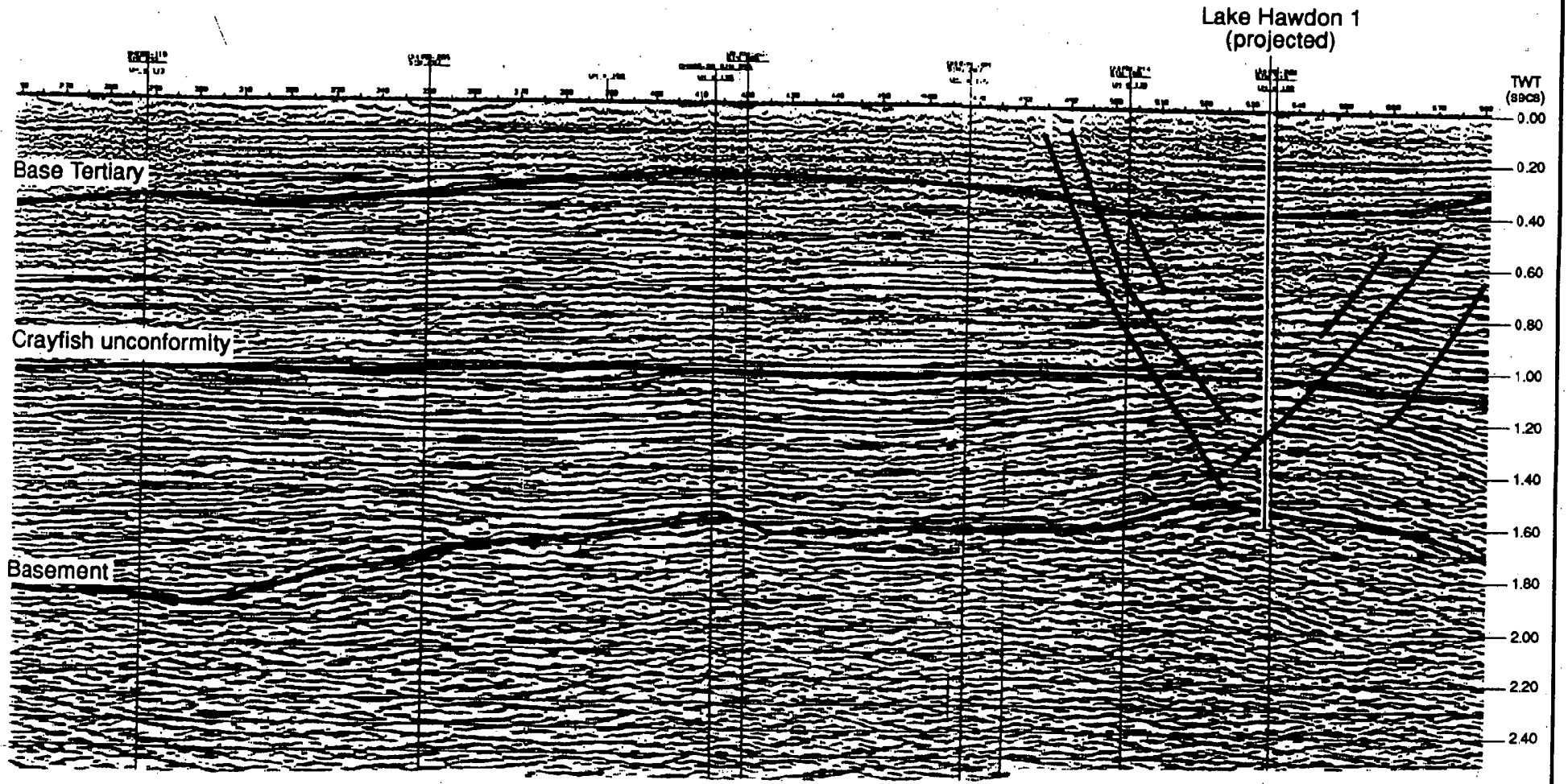

SEISMIC LINE OHH88-215

0 1 2 3
KILOMETRES

Figure 4
DME_SA 93-1308

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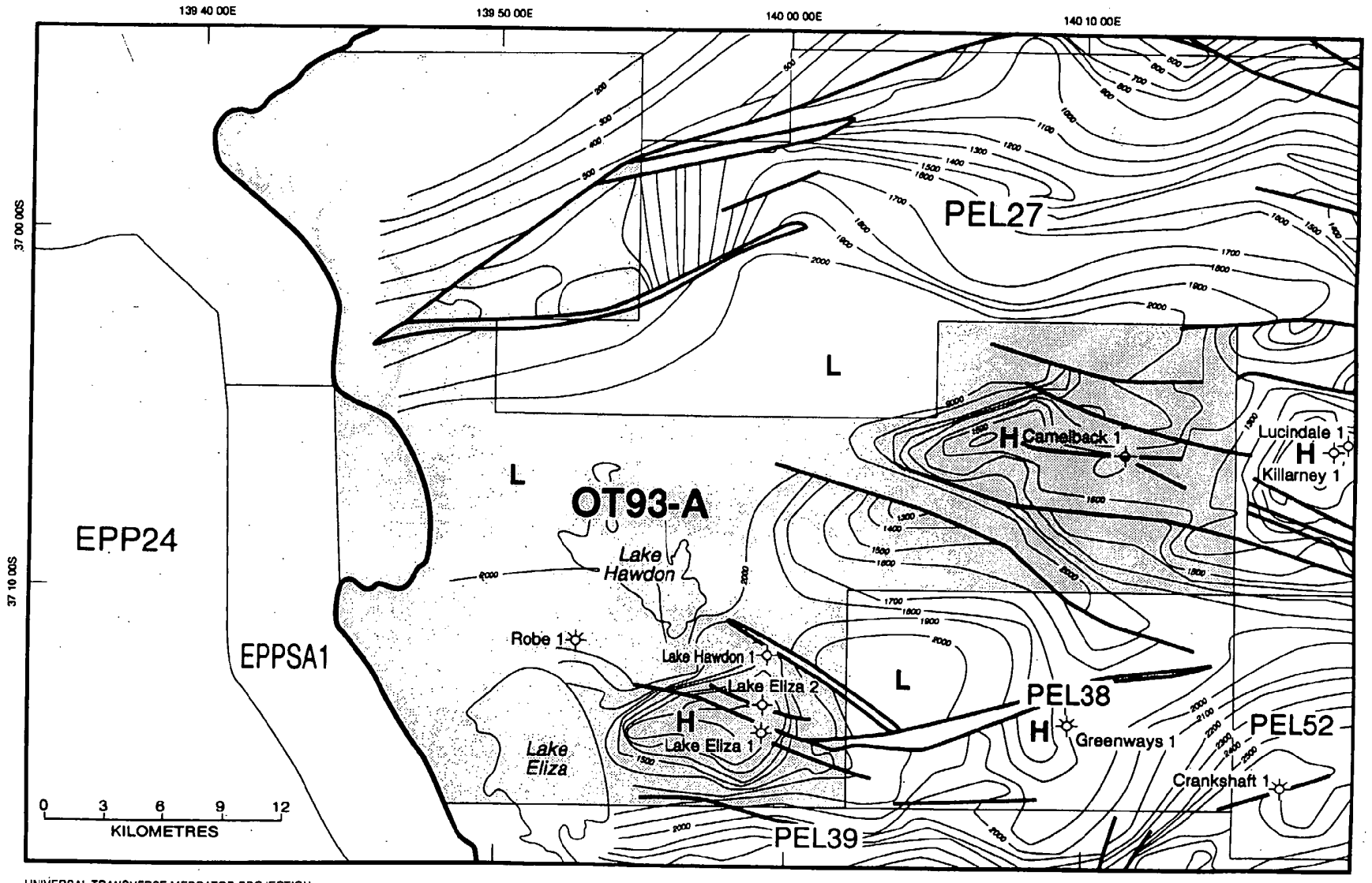

UNIVERSAL TRANSVERSE MERCATOR PROJECTION
AUSTRALIAN NATIONAL SPHEROID
CENTRAL MERIDIAN 141 00 00E

TIME STRUCTURE (millisecs): BASEMENT

Figure 5
DME_SA 93-1309

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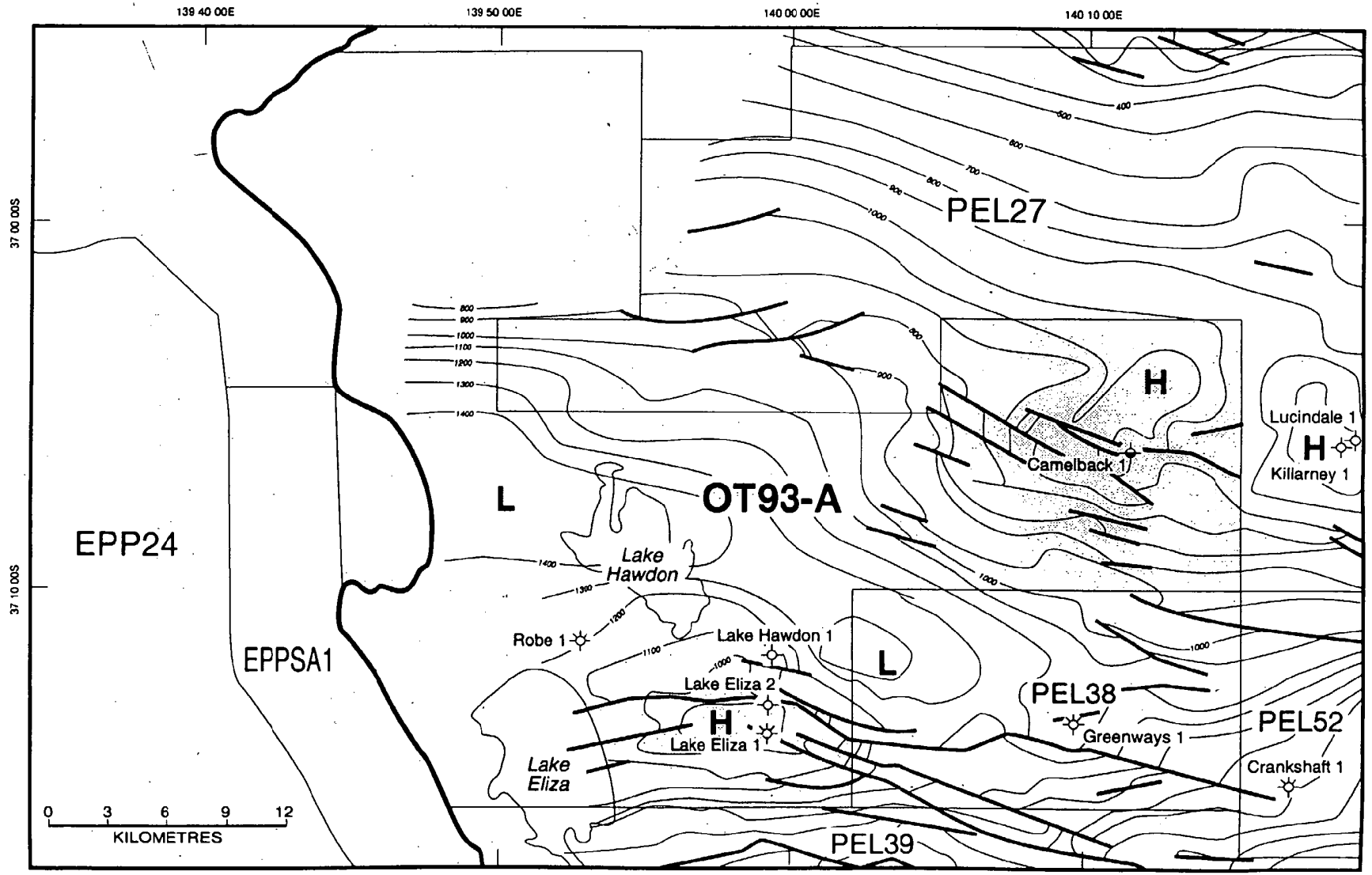


UNIVERSAL TRANSVERSE MERCATOR PROJECTION
AUSTRALIAN NATIONAL SPHEROID
CENTRAL MERIDIAN 141 00 00E

TIME STRUCTURE (millisecs): CRAYFISH UNCONFORMITY

Figure 6
DME_SA 93-1310

SOURCE ROCK POTENTIAL

Although the presence of free hydrocarbons in the area surrounding OT93-A is established, the degree of hydrocarbon generation within OT93-A has yet to be confirmed, although gas shows have been recored from Robe 1 and Lake Eliza 1 within the area. In addition Camelback 1 recorded oil shows in the Crayfish Subgroup. To the west the offshore well Crayfish 1A recorded gas shows and reservoir bitumen was recoverd from sands of the Crayfish Subgroup.

Rock-Eval data for the Otway Group shales from Camelback-1 and Lake Hawdon-1 (Figure 7) indicate a gas prone province although there may be some liquids potential away from these structural highs in the deeper parts of the Robe Trough.

Maturity

Gas and oil window thresholds for Camelback-1 and Lake Hawdon-1 are summarised below:

Camelback-1

Threshold	VR %	Depth (m)	Formation
Top gas window	0.55	1410	Pretty Hill

Basal shales of the Otway Group which rest on basement in Camelback-1 have sufficient maturity to generate gas (VR = 0.66) but are still above the threshold for oil generation (VR = 0.70) which would have occurred at approximately 1800 metres. Peak oil generation would have occurred at approximately 2200 metres.

Lake Hawdon-1

Threshold	VR %	Depth (m)	Formation
Top gas window	0.55	1900	Pretty Hill

The maturity profile for Lake Hawdon-1 indicates that the sedimentary section above 1720 m depth is immature (VR <0.5) with significant gas generation occurring at 1900 m. Basal shales of the Otway Group are still immature for oil generation which would have occurred at 2260 metres although source quality and kerogen type suggest that the sediments are more likely to be gas prone (ie terrestrial (woody herbaceous) organic matter.

Significant erosion has occurred over the Camelback and Lake Hawdon 'highs' where up to 1400 metres of sediment has been stripped at the Crayfish unconformity. Deeper regions away from these highs appear to have an almost complete Early Cretaceous succession with little or no erosion at the Crayfish unconformity and therefore can be expected to generate some liquid hydrocarbons.

Source Richness

With the exception of coals of the Eumeralla Formation, which constitute excellent source rocks (S1 + S2 = 5-26 kg hc/tonne; TOC = 3.2-12.7), the remainder of the shales from the Pretty Hill Sandstone and basal Otway Group in Camelback-1 and Lake Hawdon-1 are poor to moderate (0.9-1.80 kg hc/tonne). TOC values are moderate to very good with basal Otway Group shales consistently greater than 1.5% (TOC range = 1.53-1.83%).

Source Quality and Kerogen Type

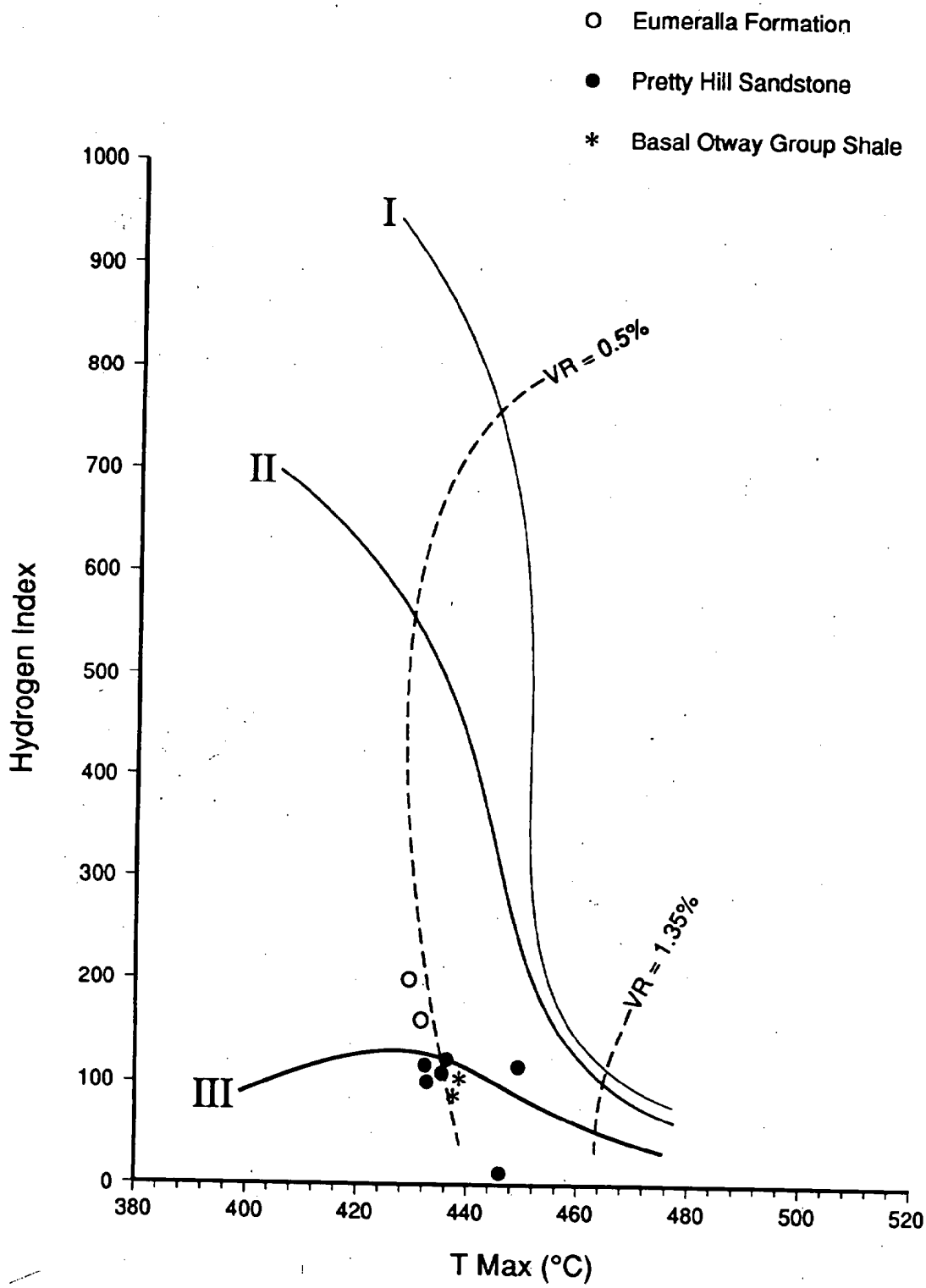
Hydrogen Index values for sediments of the Crayfish Subgroup are less than 150 indicating that sediments are predominantly dry gas prone. Coals of the lower Eumeralla Formation have locally moderate to excellent source quality but lack sufficient maturity in wells drilled to date within the OT93-A area.

THE WINDERMERE PLAY

The essence of the Windermere sand equivalent play lies in establishing closure at the base of the Eumeralla Formation mudstone, considered to represent an effective regional top seal. Thus any Windermere Sandstone Member and subcropping Crayfish sands will form a common reservoir system within any closures at the base of the unit. The main problem in defining prospects related to this play is the variability in the seismic response of the mid-Cretaceous "break-up" unconformity across the area. The difficulty in identifying the unconformity surface is due in part to variations in lithological interfacing across the unconformity surface. Mapping of the unconformity is further hindered by structuring related to reactivation and transpressional movements which have created flower-style structures tending to verge to the unconformity surface. Nevertheless the sealing properties of the Eumeralla suggest these structures have efficient hydrocarbon trapping impedance.

In the context of the Windermere Sandstone Member play it should be noted that the seismic data reveal features which are suggestive of low relief eroded fault scarps at the top Crayfish Subgroup unconformity surface on the Lake Eliza high. These features could be associated with Windermere sand build-ups and strandings, providing significant potential reservoir packages which are not evident in structure map contouring. These features may account for the variations noted in seismic response at the unconformity level across the area and are the subject of further study.

Numerous reservoir/seal couples are present within the Otway subgroup succession. They provide multiple potential hydrocarbon traps where they occur in association with the numerous syndepositional listric faults and stratigraphic wedge-outs which characterise the sequence.



ROCK - EVAL DATA
LAKE HAWDON 1 AND CAMELBACK 1

Figure 7
DME_SA 93-1311

PROSPECTS AND LEADS

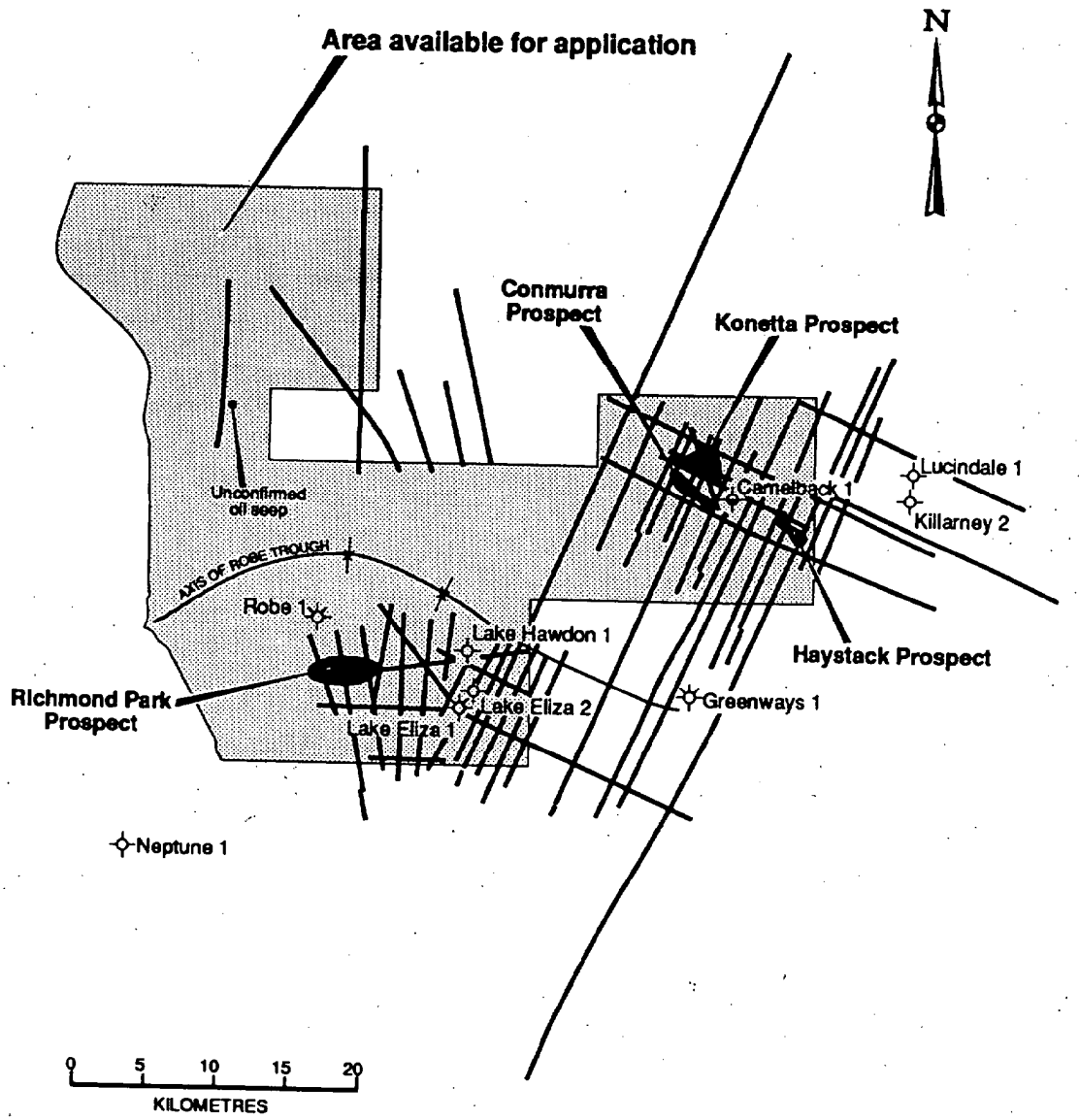
A number of Prospects and leads are known (Fig. 8).

These are:

	Potential hydrocarbon in place.	
	GAS (BCF)	Oil (MMSTB).
Haystack Prospect	9	9
Konetta Prospect	36	37
Conmurra Prospect	13	13
Richmond Park Prospect	10	10

There are likely to be many more prospects in the area that have not been identified due to an almost total lack of seismic over the deeper parts of the Robe Trough. Prospects in these areas may be even more favourably placed in relation to mature source rock.

Undiscovered resources of the onshore Otway Basin have been estimated by DME-SA at 930 PJ (881 BCF) of sales gas or 30 million kL (190 MMstB) of recoverable oil. These estimates have been derived using Monte Carlo simulation techniques, taking into account such factors as source, reservoir, seal and structure distribution, and success rates.



OTWAY BASIN - AREA AVAILABLE FOR APPLICATION

POST 1985 SEISMIC COVERAGE AND PROSPECTS

Figure 8

DME_SA 93-1312

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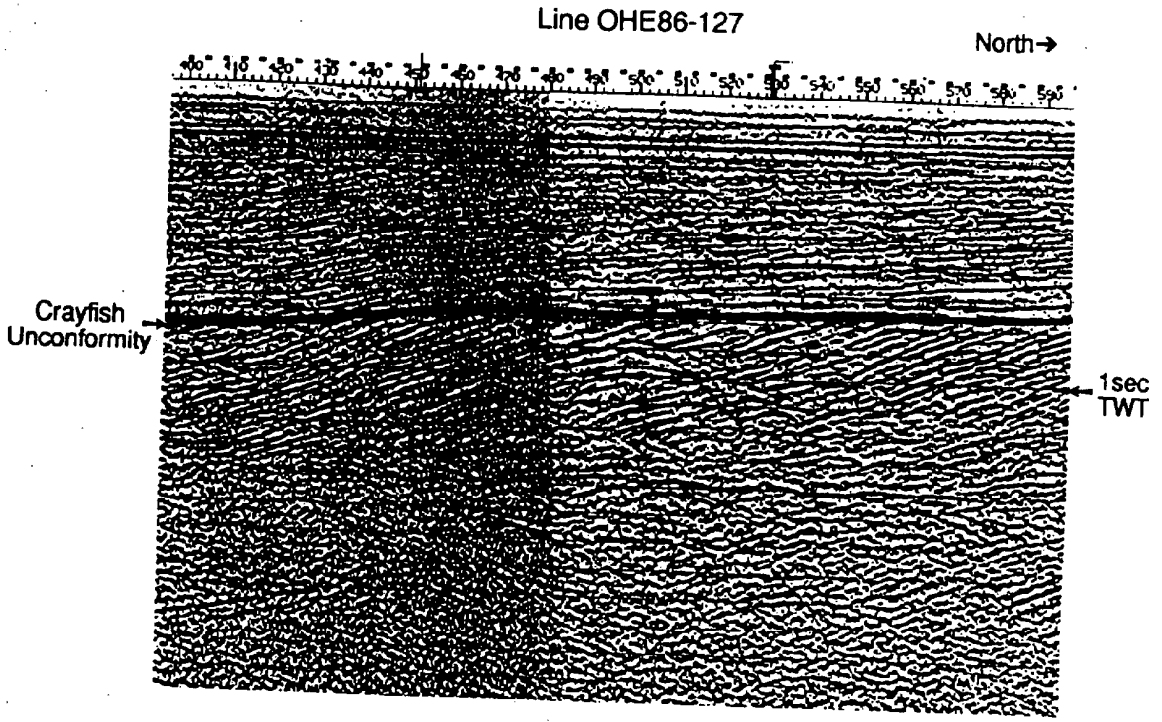
HAYSTACK PROSPECT

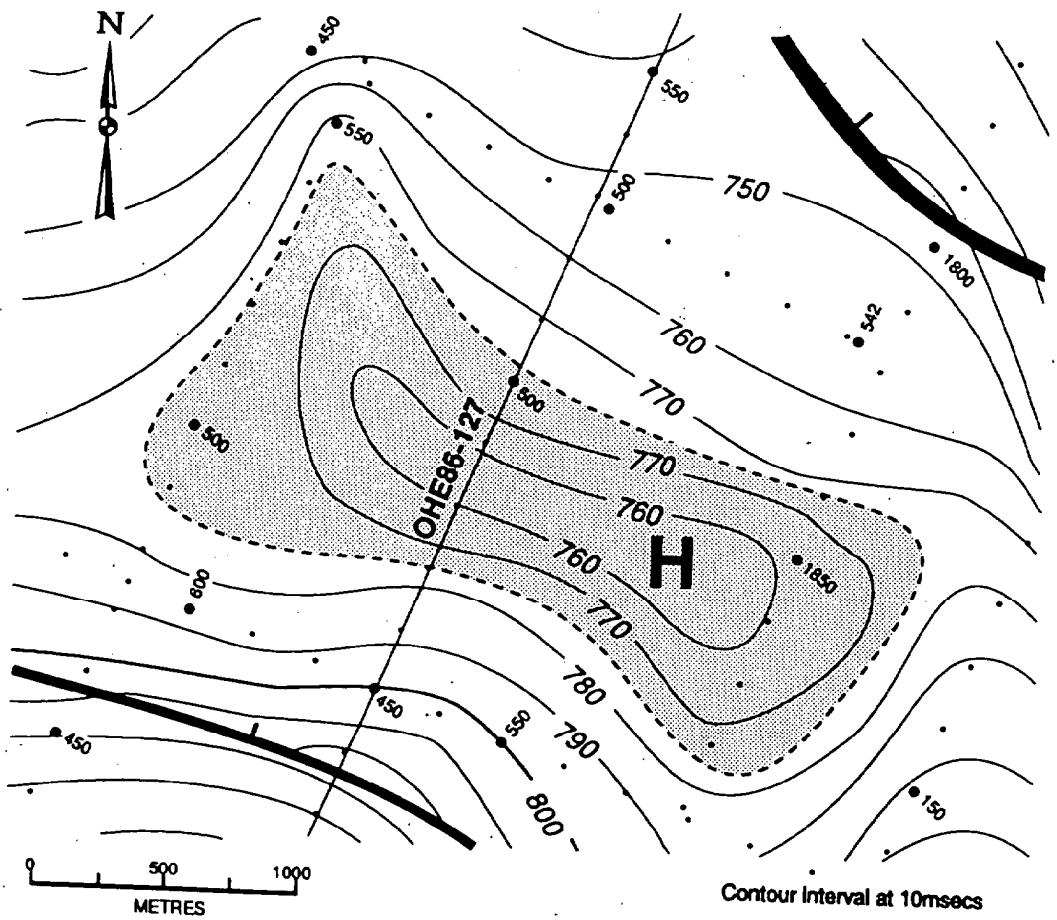
POTENTIAL RESERVES
Oil: 9 MMSTB oil in place
Gas: 9 BCF gas in place.

STRUCTURE: Fault independent 4 way clip closure.	RISK: Medium. Requires more seismic to prove closure.
SEAL: Eumeralla Formation.	RISK: Low.
RESERVOIR: Windermere Sandstone /Katnook Sandstone.	RISK: Medium
SOURCE: Shales of basal Crayfish Subgroup or lateral migration from Robe Trough.	RISK: High. Source poor in Camelback area. Faults may impede lateral migration. Gas prone.
MAXIMUM AREA OF CLOSURE:	272 hectares (673 acres)
VERTICAL CLOSURE:	18 metres (60 feet)
DEPTH TO TARGET:	900 metres (2940 feet)
DEPTH TO BASEMENT:	1850 metres (6080 feet)
POROSITY: 15%	H.C. SATURATION: 75%

NET TO GROSS RATIO: 0.83

$^1/Bg = 165$ $^1/Bo = 0.90$.





CRAYFISH UNCONFORMITY TIME STRUCTURE

HAYSTACK PROSPECT

DME_SA 93-1315

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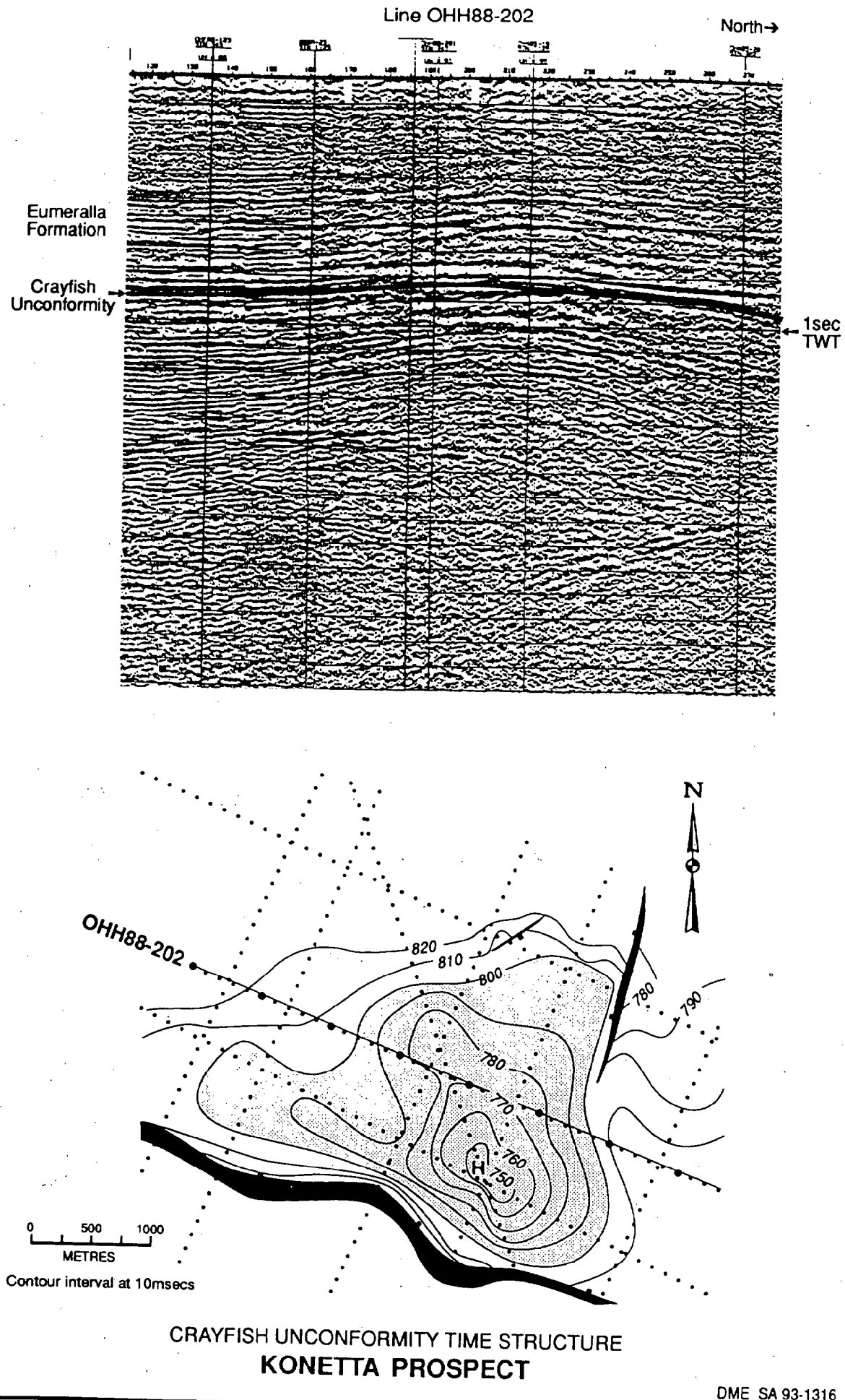
KONETTA PROSPECT

POTENTIAL RESERVES
Oil: 36 MMSTB oil in place
Gas: 37 BCF gas in place.

STRUCTURE: Fault independent 4 way clip closure.	RISK: Low - no further seismic required.
SEAL: Eumeralla Formation.	RISK: Low.
RESERVOIR: Windermere Sandstone/Katnook Sandstone.	RISK: Medium.
SOURCE: Shales of basal Crayfish Subgroup or lateral migration from Robe Trough.	RISK: High. Source poor in Camelback area. Faults may impede lateral migration. Gas prone source.
MAXIMUM AREA OF CLOSURE:	509 hectares (1 258 acres)
VERTICAL CLOSURE:	67 metres (220 feet)
DEPTH TO TARGET:	884 metres (2 900 feet)
DEPTH TO BASEMENT:	1 840 metres (6 040 feet)
POROSITY: 15%	H.C. SATURATION: 75%
NET TO GROSS RATIO: 0.50	

$^1/Bg = 165$ $^1/Bo = 0.90$.



CRAYFISH UNCONFORMITY TIME STRUCTURE

KONETTA PROSPECT

DME_SA 93-1316

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CONMURRA PROSPECT

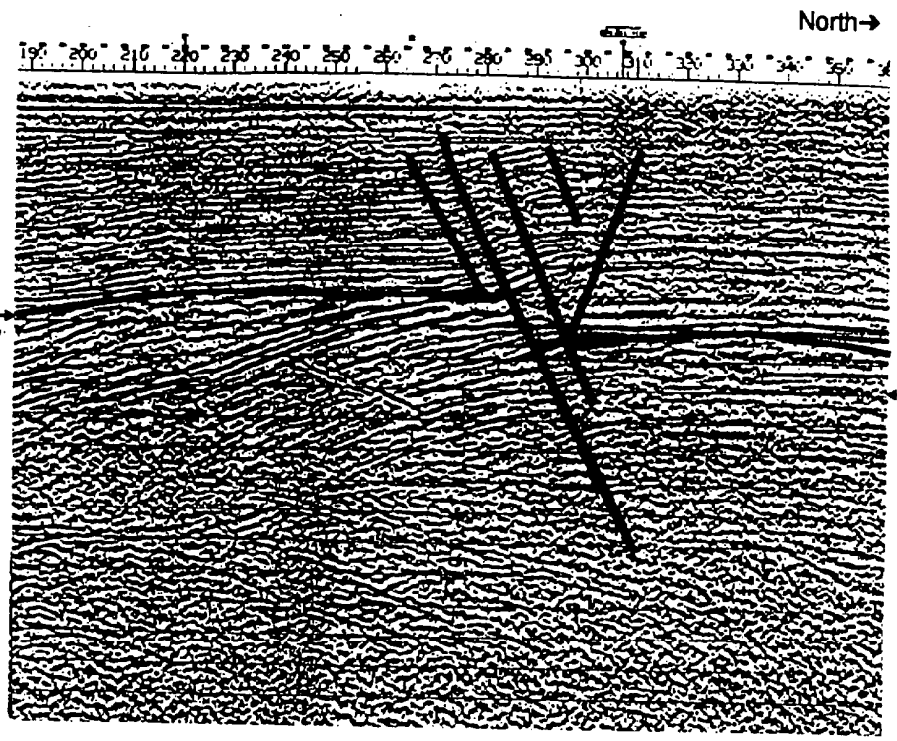
POTENTIAL RESERVES
Oil: 13 MMSTB oil in place
Gas: 13 BCF gas in place.

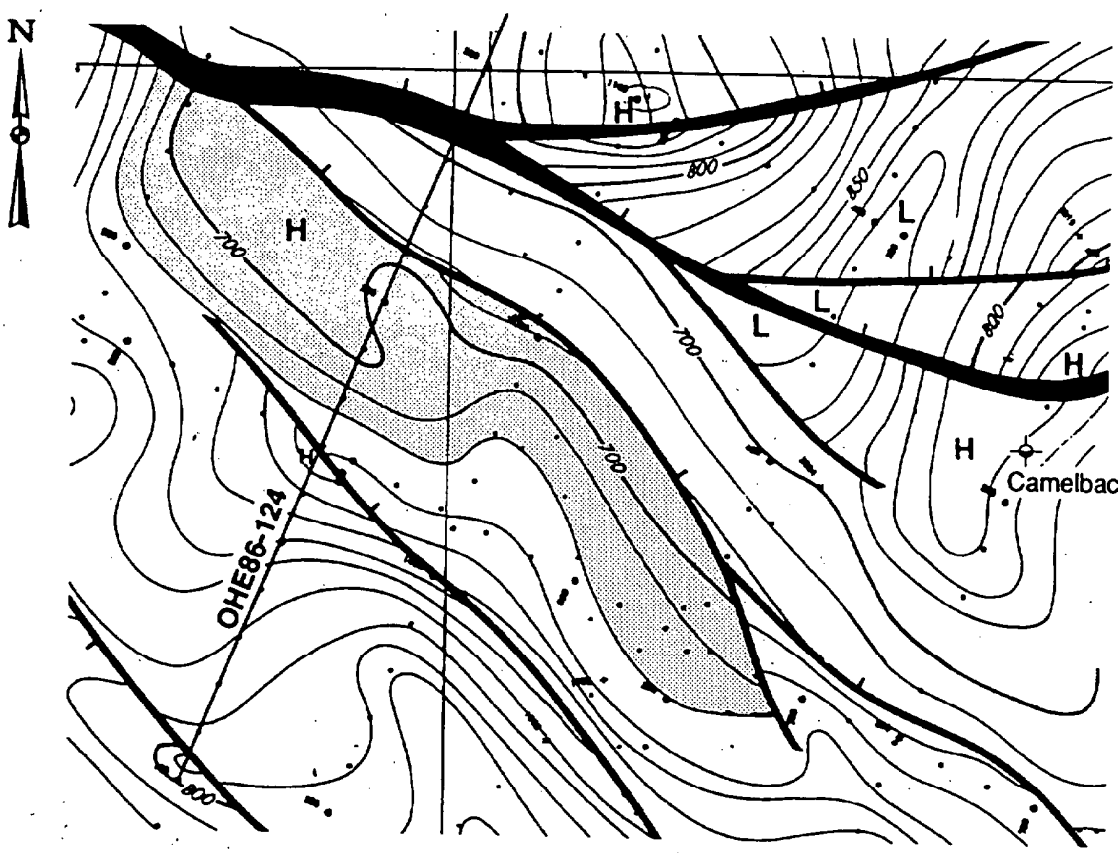
STRUCTURE: Fault bounded anticline.	RISK: Medium. Requires fault to seal. Requires more seismic.
SEAL: Eumeralla Formation.	RISK: Medium - bounding fault extends through seal. May have breached structure.
RESERVOIR: Windermere Sandstone/Katnook Sandstone.	RISK: Medium.
SOURCE: Shales of basal Crayfish Subgroup or lateral migration from Robe Trough.	RISK: High. Source poor in Camelback area, Faults may impede lateral migration. Gas prone.
MAXIMUM AREA OF CLOSURE:	304 hectares (752 acres)
VERTICAL CLOSURE:	30 metres (100 feet)
DEPTH TO TARGET:	813 metres (670 feet)
DEPTH TO BASEMENT:	1 770 metres (5 807 feet)
POROSITY: 15%	H.C. SATURATION: 75%

NET TO GROSS RATIO: 0.64

$^1/Bg = 165$ $^1/Bo = 0.90$.

Line OHE86-124





0 500 1000
METRES

Contour interval at 10msecs

CRAYFISH UNCONFORMITY TIME STRUCTURE

CONMURRA PROSPECT

DME_SA 93-1313

5875/m.ea

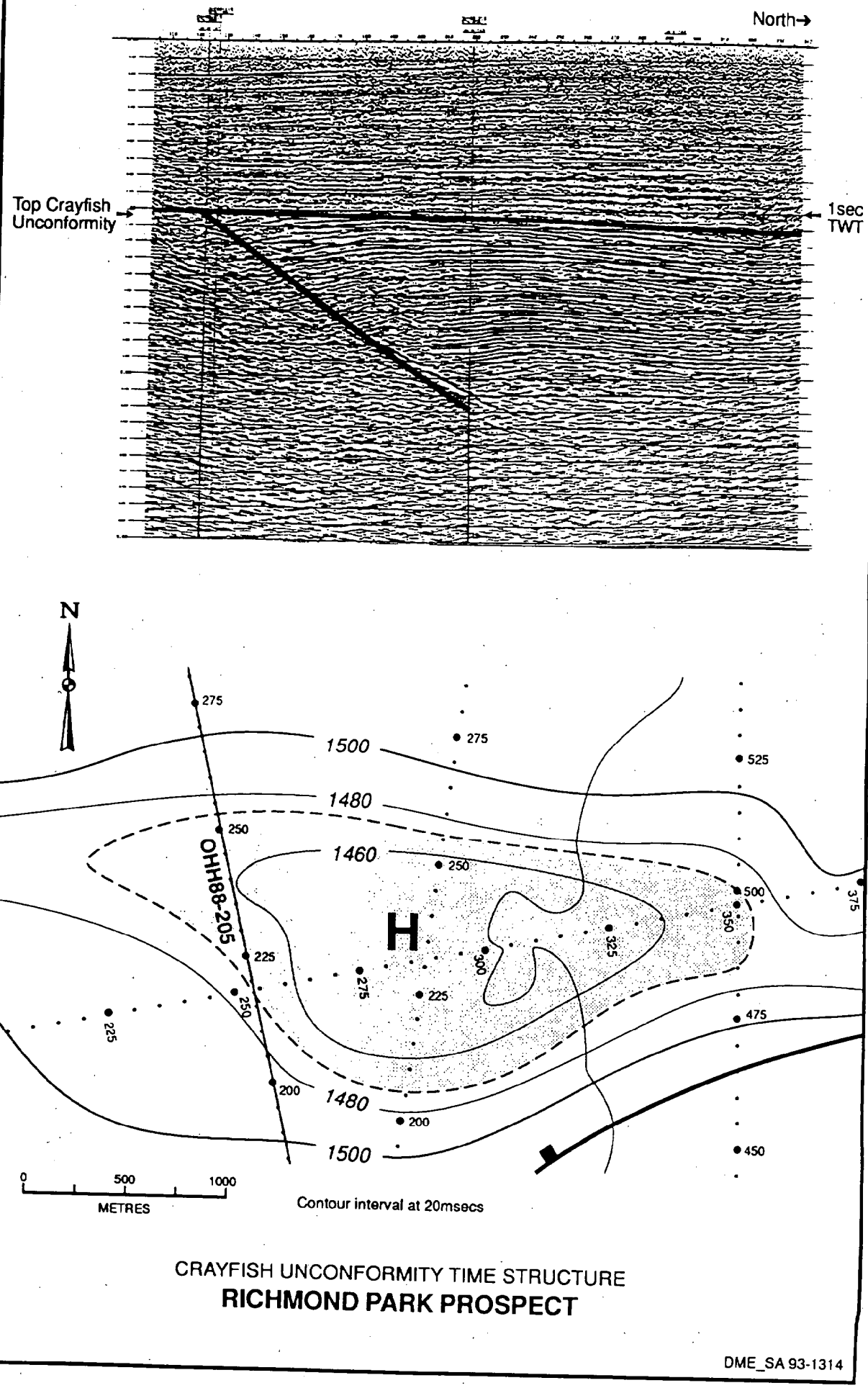
RICHMOND PARK PROSPECT

POTENTIAL RESERVES
Oil: 10 MMSTB oil in place
Gas: 10 BCF gas in place.

STRUCTURE: Fault independent 4 way disclosure.	RISK: Medium - requires more seismic to prove closure.
SEAL: Eumeralla Formation.	RISK: Low.
RESERVOIR: Windermere Sandstone/Katnook sandstone.	RISK: Medium.
SOURCE: Shales of basal Crayfish Subgroup or lateral migration from Robe Trough.	RISK: High. Source poor in Lake Hawdon. Faults may impede lateral migration from Robe Trough. Gas prone.
MAXIMUM AREA OF CLOSURE:	270 hectares (667 acres)
VERTICAL CLOSURE:	34 metres (110 feet)
DEPTH TO TARGET:	1 884 metres (6 180 feet)
DEPTH TO BASEMENT:	2 728 metres (8 950 feet)
POROSITY: 15%	H.C. SATURATION: 75%

NET TO GROSS RATIO: 0.53

$^1/Bg = 165$ $^1/Bo = 0.90$.



CRAYFISH UNCONFORMITY TIME STRUCTURE

RICHMOND PARK PROSPECT

DME_SA 93-1314

3873/m.ea

PRODUCTION FACILITIES AND GAS MARKET

Following the discovery of gas at Katnook in 1987, negotiations between the partners of PEL 32 and PASA led to the signing of a contract in 1990 for the supply of 22.5 PJ of sales gas from the Katnook and Ladbroke Grove fields over 15 years. Gas production commenced in February 1991. The main pipeline supplies natural gas to Mount Gambier and the Apcel paper mill at Snuggery. The natural gas replaced the use of LPG at Apcel and tempered LPG at Mount Gambier. If demand warrants, the pipeline may be extended to Millicent. A smaller pipeline supplies gas to the SAFRIES Pty Ltd potato chip factory south of Penola. Condensate recovered from Katnook is stored at the plant and transported (by truck) to the Adelaide refinery at Port Stanvac.

Further discoveries of gas (even if small) would find a market within the South-East. Discovery of 200 - 250 BCF of gas would justify construction of a pipeline to Adelaide.

SELECTED REFERENCES

Hibburt, J E 1993. Petroleum exploration and development in South Australia. *South Australia. Department of Mines and energy. Report Book,* 92/48.

Morton, J G G, 1990. Revisions to stratigraphic nomenclature of the Otway Basin, South Australia. *South Australia. Geological Survey. Quarterly Geological Notes,* 116.

Morton, J G G, 1991. Undiscovered petroleum: Assessment of the potential of the Officer and Otway Basins in South Australia. *South Australia. Department of Mines and Energy. Report Book,* 91/104.

DATA AVAILABLE FOR PURCHASE

OT93-A

To place orders for data please complete the Document Storage Centre Request form at the rear of this brochure, and Fax to (IAC)* 618 3798133 or (08) 379 8133 within Australia.

For further information about data availability, please contact John Morton, Principal Petroleum Geologist, phone (08) 274 7565 or fax (08) 373 3269.

(* Dial the appropriate International Access Code).

Costs listed are approximate and exclude Sales Tax, postage, packaging and handling. Costs will be confirmed on ordering.

1. Well Completion Reports.

	Year	TD(m)	DME Envelope	Cost Micro	Cost Paper
Robe 1	1915	1373	102	$2.50	$6.00
Lake Eliza 1	1969	1473	1202	10.00	115.00
Lake Eliza 2	1973	1158	2275	7.50	107.90
Camelback 1	1987	1783	7053/6	20.00	307.50
Lake Hawdon 1	1988	2083	7191/6	17.50	308.40
			TOTAL	$57.50	$845.60

Alternatively the digital database PEPS-SA may be purchased for $2,000 (for Otway Basin data only, $4000 for the whole state); this includes all 57 wells in the South Australian portion of the Otway Basin and includes more recent data not included in well completion reports. For further information or ordering please fill out the form given at the rear of this brochure and return to the Department.

2. Paper Prints of Logs. (Sepia and 1:600 scale copies also available for extra cost).

Lake Eliza 1

	From (m)	To (m)	Scale (1 to)	Cost
Dipmeter (Tadpole Plots)	632	1473	20	86.00
Sonic-Gamma Ray	17	1472	240	16.00
Density	17	1472	240	17.00
Induction	17	1472	240	18.50
			TOTAL	$137.80

Lake Eliza 2

Sonic Gamma Ray	0	1154	240	12.00
Induction	317	1156	240	9.40
			TOTAL	$21.40

Camelback 1

	From (m)	To (m)	Scale (1 to)	Cost
Sonic-Gamma Ray	9	1778	240	22.00
Dual Laterolog - resistivity	290	1778	240	22.00
Density - neutron	716	1781	240	17.60
			TOTAL	$61.00

Lake Hawdon 1

Sonic - Gamma Ray	393	2981	240	17.20
Dual Laterolog - resistivity	393	2078	240	15.00
Density - neutron	10.97	1992	240	11.20
Gamma Ray Spectrometry	392	2078	240	10.20
			TOTAL	$53.60

Other wells outside the OT93-A area are also available upon request.

3. Digital log data

Available in either CWLS-LAS or LIS format, 9 track tape or floppy disk.
An order form is included at the rear of this brochure.

Lake Eliza 1 - $240.00

Log Type	Units	From	to (feet)
*AKHC	MD	3488.5	4832.0
*APHC	FRAC	3488.5	4832.0
DT	U/FT	0.0	4832.0
GR	GAPI	0.0	4832.0
ILD	OHMM	0.0	4832.0
RHOB	G/CC	1738.5	4832.0
SN	OHMM	0.0	4832.0
SP	MV	0.0	4832.0

Lake Eliza 2 - $129.00

DT	U/FT	714.5	3800.0
GR	GAPI	0.0	3800.0
ILD	OHMM	714.5	3800.0
SN	OHMM	714.5	3800.0
SP	MV	714.5	3800.0

* Core porosity and permeability.

Camelback 1 - $406.00

Log Type	Units	From	to (feet)
CALI	INCH	867.5	5859.0
DRHO	G/CC	2339.5	5859.0
DTL	U/FT	0.0	5859.0
GR	GAMPI	0.0	5859.0
LLD	OHMM	867.5	5859.0
LLS	0HMM	867.5	5859.0
MSFL	OHMM	867.5	5859.0
NPHI	PU	2339.5	5859.0
PEF		2339.5	5859.0
RHOB	G/CC	2339.5	5859.0
SP	MV	867.5	5859.0

Lake Hawdon - $583.00

LLS	OHMM	1204.0	6835.5
MSFL	OHMM	1204.0	6835.5
NPHI		3252.0	6835.5
PEF		3252.0	6835.5
POTA		3252.0	6835.5
RHOB	G/CC	3252.0	6835.5
SGR	GAPI	3252.0	6835.5
SP	MV	1204.0	6835.5
THOR	PPM	3252.0	6835.5
URAN	PPM	3252.0	6835.5
CALI	IN	1204.0	6835.5
CGR	CAPI	3252.0	6835.5
DRHO	G/CC	3252.0	6835.5
DT	US/F	1204.0	6835.5
GR	GAPI	0.0	6835.5
LLD	OHMM	1204.0	6835.5

Total cost of digital data - $1358.00
Other wells outside the OT93-A area are available upon request.

4. <u>Paper prints of Seismic lines</u> (Post 1980)

Line Name	Line length (km)	Estimated Cost for Paper Copy
OHA88-301	7.00	$13.60
OHA88-302	6.00	12.70
OHB88-219	11.00	17.30
OHB88-220	12.00	18.20
OHE86-119	7.70	14.30
OHE86-123	7.70	14.30
OHE86-124	7.80	14.30
OHE86-125	10.00	16.40
OHE86-126	25.00	30.10
OHE86-127	14.00	20.00

OHE86-133	11.00	17.30
OHE86-136	5.00	11.80
OHE86-139	5.20	12.00
OHE86-140	1.70	8.80
OHH88-201	6.10	12.80
OHH88-202	4.90	11.70
OHH88-203	6.60	13.30
OHH88-204	13.20	19.30
OHH88-205	6.00	12.70
OHH88-206	11.30	17.60
OHH88-206	11.30	17.60
OHH88-207	10.50	16.80
OHH88-208	6.00	12.70
OHH88-209	8.20	14.70
OHH88-210	3.90	10.80
OHH88-211	4.80	11.60
OHH88-212	10.00	16.40
OHH88-213	10.10	16.50
OHH88-214	10.30	16.60
OHH88-215	11.30	17.60
OHK85-01	21.70	27.10
OHK85-03	25.00	30.10
OHK85-04	10.50	16.80
OHK85-05	11.20	17.50
OHK85-13	16.90	22.70
OHK85-14	18.80	24.40
OHK85-15	9.10	15.50
OHK85-15	9.10	15.50
OHK85-16	16.50	15.10
OHK85-17	11.00	17.30
OHK85-18N	10.50	16.80
OHK85-19	27.80	32.70
OHK85-20	14.50	20.50
OHK85-21	31.90	29.20
OHK85-22	20.40	25.90
OHK85-23	7.90	7.20
OHK85-24	10.40	16.70
OHK85-27	18.50	24.20
OHK85-28	9.80	16.20
OHL86-104	15.60	14.30
OHL86-117	10.00	16.40
OTSA82-2	15.20	21.10
RM80-16	43.40	47.00
SCD91-118	4.98	11.80
SCD91-125	13.62	19.70
SCD91-127	8.01	14.50
TOTAL:	682.00 km	$ 999.60

Note:
1. Some lines listed only partially occur in OT93-A area.
2. Copying costs will be confirmed at time of order.
3. Other seismic lines for adjoining areas also available on request.

5. DIGITAL SEISMIC DATA

Shotpoint Database

A digital shotpoint database is available. This includes location and attribute data for all seismic lines in the on and offshore Otway Basin in S A. Only open file data (greater than two years old) is available. The cost of all on and offshore Otway Basin data is $2 000. Alternatively hardcopy maps of selected areas can be ordered. If you are interested in ordering the shotpoint database, please fill out the form at the rear of this brochure.

Digital Data Sets of Regional Interpretations

Major seismic horizon interpretations of the Otway Basin will shortly be available as digital datasets or hardcopy maps. These will be similar to Figures 5 & 6 (which are preliminary) and will be available as either time or depth maps. If you are interested in purchasing these datasets please contact Mr D Cockshell ph: (08) 274 7671 or FAX: (08) 373 3269.

Gravity and aeromagnetic data are also available from the Department.

SA DEPARTMENT OF MINES AND ENERGY

PEPS-SA ORDER FORM

For further information or a **free demonstration disk**, please contact:

Mr John Morton
Principal Petroleum Geologist
Oil, Gas and Coal Division
Department of Mines and Energy
191 Greenhill Road
PO Box 151
EASTWOOD SA 5063

Telephone: (08) 274 7565 within Australia
(IAC)* 61 8 274 7565 overseas
Facsimile: (08) 373 3269 with Australia
(IAC)* 61 8 373 3269 overseas

* *Dial the appropriate International Access Code*

COST *(October 1993, includes postage and packaging)*

• All modules for all wells in South Australia, (approximately 1000 wells). *Includes quarterly updates for 12 months at no extra cost*	$4000
Quarterly updates thereafter	$400 for full year
• All modules for a specific basin *Includes quarterly updates for 12 months at no extra cost*	Otway *or* Cooper/ Eromanga: $2000 Officer/Stansbury/Arrowie *or* Bight/Duntroon: $1000
Quarterly updates thereafter	10% of purchase price for full year.

Note: Formats other then ASCII or MAPINFO may be subject to an additional charge- please enquire

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DME 251/90 Credit Account: 86-H17-D09-126-000

SA Department of Mines and Energy
PO Box 151
EASTWOOD SA 5063
Facsimile: (08) 373 3269 within Australia
(IAC)* 61 8 373 3269 overseas
*Dial the appropriate International Access Code

Attention: Mr J. Morton
Oil, Gas and Coal Division

Payment Options:

☐ MASTERCARD ☐ VISA
☐ BANKCARD ☐ Cheque

Card Number:

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry Date: ☐☐/☐☐

Amount:.....

Signature:.....

I wish to: ☐ order
☐ be quoted for PEPS-SA as specified

Basins:

☐ All ☐ Otway
☐ Cooper/Eromanga ☐ Bight/Duntroon
☐ Offiicer/Stansbury/Arrowie

Format:

☐ Hardcopy
☐ DAT ASCII screen format *(includes menu-driven software)*
☐ MAPINFO *(spatial data only, excluding shot point data)*
☐ Other *please stpecify* .....

Media

☐ 3½ inch diskette ☐ 5¼ inch diskette
☐ CD-ROM

and I accept the following conditions of sale:

1. These conditions apply to all PEPS-SA data purchased or acquired.
2. All data must be kept exclusively for the use of the purchaser/ purchasing company and must not be transmitted, traded or sold to any third-party without the permission in writing of the Director-General, Department of Mines and Energy, South Australia.
3. All efforts are made to record best possible data and to correct errors or omissions made known to DME-SA. However, DME-SA takes no responsibility for the consequence of errors or omissions in these data .

Company .....

Address .....

.....

..... Postcode .....

Contact Person .....

Telephone ..... Facsimile .....

Signed .....

F04793.JGM

SA DEPARTMENT OF MINES AND ENERGY

DIGITAL PETROLEUM WELL LOG DATA ORDER FORM

For further information please contact:

Mr John Morton
Principal Petroleum Geologist
Oil, Gas and Coal Division
Department of Mines and Energy
191 Greenhill Road
PO Box 151
EASTWOOD SA 5063

Telephone:(08) 274 7565 within Australia
(IAC)* 61 8 274 7565 overseas
Facsimile:(08) 373 3269 with Australia
(IAC)* 61 8 373 3269 overseas

* *Dial the appropriate International Access Code*

COST *(October 1993, includes postage and packaging)*

$0.026 per recorded log metre, per log type. For a typical 2000m well, with 6 log types, cost would be $312.00

Note:

(1) For orders on 9 Track Tape, a $50 per well surcharge will apply.
(2) For LAS requests where format conversion is required, a $50 per well surcharge will apply.
(3) For large orders or regular clients, a 50% discount will apply.

Credit Account: 86-H17-D09-126-000

I wish to: ☐ order

☐ be quoted as specified

and I accept the following conditions of sale:

1. These conditions apply to all data purchased or acquired.
2. All data must be kept exclusively for the use of the purchaser/ purchasing company and must not be transmitted, traded or sold to any third-party without the permission in writing of the Director-General, Department of Mines and Energy, South Australia.
3. All efforts are made to record best possible data and to correct errors or omissions made known to DME-SA. However, DME-SA takes no responsibility for the consequence of errors or omissions in these data .

Company.....

Address .....

.....

..... Postcode .....

Contact Person .....

Telephone..... Facsimile .....

Signed.....

Payment Options:

☐ MASTERCARD ☐ VISA

☐ BANKCARD ☐ Cheque

Card Number:

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry Date: ☐☐/☐☐

Amount:.....

Signature:.....

Format:

☐ LIS

☐ CWLS-LAS (ASCII)

☐ DLIS *(limited wells only)*

Wells:

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Media:

☐ 3½ inch diskette ☐ 5¼ inch diskette

☐ DAT tape ☐ 9 Track tape

☐ Cartridge

☐ CD-ROM (basin packages only)

F04793.JGM

SA DEPARTMENT OF MINES AND ENERGY

SEISMIC SHOTPOINT DATABASE ORDER FORM

For further information please contact:

Mr John Morton
Principal Petroleum Geologist
Oil, Gas and Coal Division
Department of Mines and Energy
191 Greenhill Road
PO Box 151
EASTWOOD SA 5063

Telephone:(08) 274 7565 within Australia
(IAC)* 61 8 274 7565 overseas
Facsimile:(08) 373 3269 with Australia
(IAC)* 61 8 373 3269 overseas

* *Dial the appropriate International Access Code*

COST *(October 1993, includes postage and packaging)*

- All onshore and off shore data for all years in South Australia, (approximately 200 000 line kms). *Includes an update after 12 months at no extra cost* $4000
  Annual update ..... $400 per year
- All data for Otway Basin
  Includes quarterly updates for 12 months at no extra cost $2000
  Annual update ..... $200 per year.

Note: A discount of 25% will apply for ARCINFO or MAPINFO exchange formats. A $50 surcharge wiill appl;y for orders on 9 Track tape.

Other areas available please enquire

Credit Account: 86-G17-XXX-126-100

I wish to: ☐ order

☐ be quoted as specified

and I accept the following conditions of sale:

1. These conditions apply to all data purchased or acquired.
2. All data must be kept exclusively for the use of the purchaser/ purchasing company and must not be transmitted, traded or sold to any third-party without the permission in writing of the Director-General, Department of Mines and Energy, South Australia.
3. All efforts are made to record best possible data and to correct errors or omissions made known to DME-SA. However, DME-SA takes no responsibility for the consequence of errors or omissions in these data .

Company .....

Address .....

.....

..... Postcode .....

Contact Person .....

Telephone ..... Facsimile .....

Signed .....

Payment Options:

☐ MASTERCARD ☐ VISA

☐ BANKCARD ☐ Cheque

Card Number:

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Expiry Date: ☐☐/☐☐

Amount:.....

Signature:.....

Format:

☐ Hardcopy ☐ ASCII (UKOOA)

☐ ARCINFO interchange format

☐ MAPINFO data exchange format

☐ Other *please specify* .....

Area:

☐ All ☐ Otway

☐ Other *From* *LAT*.....*LONG*.....
To *LAT*..... *LONG*.....

Years:

☐ all historical data

or

From 19☐☐ to 19☐☐

Media:

☐ 3½ inch diskette ☐ 5¼ inch diskette

☐ CD-ROM ☐ 9 Track tape

☐ DAT Tape ☐ Exabyte Tape

☐ 150 mb Cartridge

F04793.JGM

South Australian Department of Mines and Energy

DOCUMENTS STORAGE CENTRE

REQUEST FORM

Phone 379 724
Fax 379 813

Customer Name:

Company Name:

Mailing Address:

Contact Telephone No: Fax No:

Customer Order No: Tax Exemption No:

WORK REQUIRED:

Quote ( ) View reports/env ( ) search for data ( ) transfer of data ( ) copying ( ) printing ( )

COPYING REQUIREMENTS:

Report ( ) plans ( ) paper ( ) transparency ( ) logs ( ) magnetic tape ( ) staple ( )
bound ( ) unbound ( ) folded ( ) rolled ( ) colour prints ( ) data packages ( ) fiche ( )

DELIVERY REQUIREMENTS;

Post ( ) DSC Courier ( ) Airfreight ( ) To be picked up from ( )
Internal courier ( )

DESCRIPTION OF REQUEST:

APPENDIX 1
ADMINISTRATIVE GUIDELINES FOR PETROLEUM EXPLORATION AND PRODUCTION TENEMENTS

ONSHORE EXPLORATION GUIDELINES

Petroleum Act, 1940

The area to which this Act applies covers all of onshore SA exclusive of Commonwealth Lands; it extends south to the State Territorial Sea Baseline and includes the waters of Spencer and St Vincent Gulfs.

	ONSHORE PETROLEUM EXPLORATION	Petroleum Act Reference
Title of Tenement	Petroleum Exploration Licence (PEL)	
Who Can Apply	An individual, a body corporate (ie. a company) or an unincorporated association of persons and bodies corporate (ie. a joint venture involving several persons and/or companies). A foreign corporation applicant must be registered under the provisions of the Corporations Law.	6(1)
	Where application is made on behalf of a company, the application must be made under the company seal.	41(b)&(c)
When Application Can be Made	Initial licence - at any time over any area not already under licence.	6(1a)
	Renewal of licence - not less than 3 months before existing licence is due to expire.	18(5b)
Maximum Area	26 000 km^2	15(1)
Application Fee	For initial application - $2 000 For each renewal - $1 000	7(2) 7(2)
Bond (to ensure compliance with licence conditions)	$15 000 minimum. Amount required is specified in letter of offer. Bond may be in the form of cash, cheque or bank guarantee.	13(1)
Term of Licence	Initial term - 5 years Each renewal (to a maximum of 3) - 5 years	15(2) 15(2)
Annual Rental Payable	Initial 5 year licence term - 24 c/km^2	18c(a)
	First renewal (2nd 5 year licence term) - 36 c/km^2	18c(b)
	Second renewal (3rd 5 year licence term) - 48 c/km^2	18c(c)
	Third & final renewal (4th 5 year licence term) - 60 c/km^2	18c(d)

Minimum Work Commitments	As negotiated with applicant after application (which must contain a proposed 5 year work program) has been received.	
Minimum Expenditure Commitments	Initial 5 year licence term - first two years - $16 per sq. km per year - last three years - $24 per sq. km per year.	17(1)(a) 17(1)(b)
	First renewal (2nd 5 year licence term) - $100 per sq. km per year.	18a(1)(a)
	Second renewal (3rd 5 year licence term) - $125 per sq. km per year.	18a(1)(b)
	Third & final renewal (4th 5 year licence term) - $150 per sq. km per year.	18a(1)(c)
Area to be Relinquished on each Renewal	25% of original licence area. This is in addition to any areas voluntarily surrendered during each 5 year licence term.	18(2)
Fee for Minister's Consent to Dealings in Licence	$1 000 per transaction (document).	42(3)
Fee for Inspection of Register	$100	Reg.13(2)
Fee for Copy or Extract from Register	$1 per page	Reg.13(4)
Method of Application	Letter of application addressed to the Director-General, SADME (there is no prescribed form).	7(1)
	Attached to the application should be:	
	(1) full names and addresses of the party/ parties making the application, including (where applicable) the percentage interests of the various parties.	
	(2) two copies of a map and description of the area being applied for.	7(3)
	(3) a table showing the work intended to be carried out, and the estimated cost of that work, during each year of the five year licence term. (Expenditure estimates should satisfy the minimum expenditure commitments set out in Sections 17 and 18.)	7(3a)
	(4) particulars of the technical qualifications and expertise available to the applicant party/parties (e.g. qualifications and experience of employees, consultants retained etc.).	7(4)
	(5) particulars of the financial resources available to the applicant party/parties to carry out the proposed terms and conditions of the licence. (In the case of a company application, this is generally supplied in the form of a copy of the company's most recent Annual Report.)	7(4)
	(6) the $2 000 application fee. Where the application is made on behalf of a company, the application must be made under the company seal.	7(2) 41(b)&(c)

Penalty for Non-Payment of Annual Rental Fees	All fees are payable in advance. If fees are not paid by the due date, a fine of 10% is imposed and in addition, interest accrues at the rate of 6% per annum. If any fee is in arrears for 3 months or more, the licence may be cancelled.	83(1)&(2)
Licence Variations	Only on application by the licensee, the Minister may at any time during the term of the licence, vary or revoke a condition of the licence or attach new conditions to the licence.	17(3)
Environmental Conditions	As set out in the Regulations. Any special conditions will be outlined in the letter of offer attached to the licence.	
Surrenders (Partial or Whole of Licence)	The Act requires the licensee to: (1) apply to the Minister for permission to surrender (2) give 3 months notice in writing (3) pay all outstanding fees (4) pay all outstanding monies and wages to workmen and employees.	38(1) 38(1)(a) 38(1)(b) 38(1)(c)
	Surrenders are only permitted if the licensee has fulfilled all the terms and conditions of the licence up to and including the year in which the application to surrender is lodged.	38(2a)
	Licensees are required to lodge all outstanding data on their licences and carry out the cleanup and rehabilitation of their licence areas (where necessary) as a condition of surrender.	
	Surrenders are effective from the end of the appropriate year of the term of the licence (unless specified otherwise).	38(2b)
Required Notice for Approval to Undertake Work in Licence Area	Three months notice is required to arrange necessary clearances with other Government Agencies. This is carried out by SADME on the licensee's behalf.	
Required Notice of Entry to Landholders	No risk of damage to land or improvements thereon - 14 days.	51(1)
	Risk of damage to land or improvements thereon - 28 days.	51(1)
Gazettals	Gazettals occur on: (1) grant of licence (2) surrender of licence (3) cancellation of licence.	6(2) 71(1)
Suspension and Cancellation	The Act provides for suspension and/or cancellation for failure to comply with licence conditions.	87a(1)

All monetary amounts are subject to review. Current 1 March 1993.