PETROLEUM
EXPLORATION OPPORTUNITY

SOUTHEASTERN ARCKARINGA BASIN

AREA E

DATA PACKAGE BROCHURE

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

May, 1989
PETROLEUM EXPLORATION OPPORTUNITY
SOUTHEASTERN ARCKARINGA BASIN

DATA PACKAGE BROCHURE - AREA E

ENVELOPE 8083
SR27/2/94

Prepared by
OIL, GAS & COAL DIVISION

DEPARTMENT OF MINES & ENERGY
SOUTH AUSTRALIA

MAY, 1989
<table>
<thead>
<tr>
<th>CONTENTS</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. STATEMENT OF INTENT</td>
<td>1</td>
</tr>
<tr>
<td>2. GEOLOGICAL SUMMARY</td>
<td></td>
</tr>
<tr>
<td>2.1 Geological setting</td>
<td>3</td>
</tr>
<tr>
<td>2.2 Hydrocarbon potential</td>
<td>6</td>
</tr>
<tr>
<td>2.3 Previous exploration</td>
<td>7</td>
</tr>
<tr>
<td>3. DATA PACKAGE CONTENTS</td>
<td>13</td>
</tr>
<tr>
<td>3.1 Geological data</td>
<td>13</td>
</tr>
<tr>
<td>3.2 Geophysical data</td>
<td>16</td>
</tr>
<tr>
<td>4. BIBLIOGRAPHY</td>
<td>20</td>
</tr>
<tr>
<td>4.1 General</td>
<td>20</td>
</tr>
<tr>
<td>4.2 SAMREF bibliographic data base</td>
<td>29</td>
</tr>
<tr>
<td>5. LICENCE APPLICATION PROCEDURES</td>
<td>30</td>
</tr>
</tbody>
</table>
TABLES
1. Well details Area E 8
2. Petrophysically logged wells Area E 8
3. Seismic surveys Area E 9
4. Magnetic surveys Area E 10
5. Gravity surveys Area E 11
6. Onshore petroleum exploration guidelines 31

FIGURES
1. Areas available for application 2
2. Northeastern South Australia, sedimentary basins 2
3. Northeastern South Australia, parks and reserves 2
4. Geological summary showing leads & prospects Area E 3
5. Arckaringa Basin stratigraphic column 4
6. Regional cross sections Areas D and E 4
7. Seismic line locations Area E 9
8. Magnetic surveys Area E 10
9. Gravity surveys Area E 12
10. Seismic data included in data package, Area E 17
PETROLEUM EXPLORATION OPPORTUNITY
SOUTHEASTERN ARCKARINGA BASIN
DATA PACKAGE BROCHURE - AREA E

1. STATEMENT OF INTENT

Applications are invited by 31st September, 1989 for a Petroleum Exploration Licence (PEL) over all or part of AREA E which covers 15,327 km² of the southeastern Arckaringa Basin. The area is one of seven covering portions of the Mesozoic Eromanga and Simpson Desert Basins, Permian Pedirka and Arckaringa Basins and the Cambrian Arrowie and sub-Arckaringa Basins (Figs. 1 and 2) which came available following the relinquishment in early 1989 of 88,406 km² of the Pedirka Sector and 4,589 km² of the Arrowie Sector of PELs 5 and 6, plus the relinquishment of PEL 31 (held from 1985 until late 1988). Several of these areas incorporate parks or reserves (Fig. 3).

A data package has been prepared for each of the seven areas which contains a selection of regional gravity and magnetic data, seismic sections, well completion reports from petroleum, mineral and stratigraphic wells and relevant geological maps. This selection forms the basis for assessment of each area and is not intended to be totally comprehensive.

References to all relevant petroleum exploration work carried out to date in Area E are listed in the bibliography.

A brief review of the geology and hydrocarbon potential of Area E is set out below (Section 2), together with a detailed breakdown and costing of the data package (Section 3) a bibliography, (Section 4) and licence application information.
(Section 5). An order form is provided at the rear of this brochure. Please note that the orders received prior to May 31st 1989 will receive preference. Packages will be supplied promptly after that date.
2. GEOLOGICAL SUMMARY

2.1 Geological Setting

The Early Permian intracratonic Arckaringa Basin (Fig. 2) is composed of a central platform area of gently undulating shallow crystalline basement surrounded by peripheral depressions. It was established by downfaulting along the marginal depressions, principally the Boorthanna and Phillipson Troughs which contain up to 1,300 m of Permian sediments, underlain unconformably by 880 metres or more of unmetamorphosed Early Palaeozoic rocks or by Precambrian metasediments. Eromanga Basin sediments unconformably overlie the Permian sequence in most areas varying in thickness from zero to about 200 m in Area E.

The eastern edge of Area E corresponds to the eastern margin of the Arckaringa Basin and is marked in part by the Peake and Denison Ranges comprising four north-trending inliers (Fig. 4). They comprise a core of crystalline rocks overlain by folded and metamorphosed Late Precambrian sediments of the Adelaide Geosyncline and dissected by Early Palaeozoic intrusives.

Graben development was probably initiated in the Early Palaeozoic, marking the start of a Cambrian-Devonian depositional phase during which the adjacent Officer and Warburton Basins developed. In the Boorthanna Trough a shallow marine clastic/carbonate sequence, the Cootanoorina Formation is now presumed to be of Cambrian age. Harris and McGowran (1973) initially determined a Devonian age for part of the sequence, however subsequent examinations have been unable to verify this. Substantial mineral and petroleum exploration by Comalco Aluminium Limited in the Officer Basin
Figure 4  Geological summary showing leads & prospects, Area E
during the period 1980-89 led to a revision of the stratigraphy of the Officer Basin (Brewer et al, 1987) and enabled correlation with units below the Arckaringa Basin. Comalco consider the Cootanoorina Formation to be a lateral extension of the Early Cambrian age Ouldburra Formation of the Officer Basin, however, it also has a similar lithofacies sequence to the Kalladeina Formation of the Warburton Basin which is of Middle to Late Cambrian age.

The main period of tectonic activity commenced in Late Carboniferous or Early Permian times. Faulting is assumed to be synchronous with deposition. Three Permo-Carboniferous formations are present in the subsurface. Proglacial diamictites and outwash sands of the Boorthanna Formation are overlain by the Stuart Range Formation, a fine-grained clastic-rich shallow marine sequence. This is in turn overlain by coal swamp and associated facies of the Mount Toondina Formation (Fig. 5). There is no preserved record in the Arckaringa Basin of Middle or Late Permian sediments.

Diapirism is evident in the Arckaringa Basin as indicated by seismic reflection, gravity and outcrop data. Extensional tectonics and differential loading are postulated as the driving mechanisms for initial diapiric movement and subsequent growth with Adelaidean age salt as the source (Jones, 1988). Jones suggested that diapiric activity occurred during the Adelaidean and Cambrian with some reactivation caused by tectonic activity during the Tertiary. Outcrop evidence to support diapirism occurs at Mount Toondina where Permian sediments form a piercement structure (Freytag, 1967; Wopfner, 1977). Mount Toondina is located immediately north of Area E and within Area D. Two drillholes sited on this structure, Toondina-1 (total depth [TD] 93 m) and -2 (TD 93 m) were completed in 1963 but did not penetrate below the
<table>
<thead>
<tr>
<th>AGE</th>
<th>ROCK UNIT</th>
<th>LITHO.</th>
<th>DEPOSITIONAL ENVIRONMENT</th>
<th>COMMENTS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>COORIKIANA SANDSTONE</td>
<td>Regressive marine</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>BULLDOG SHALE</td>
<td>Open marine transgressive.</td>
<td></td>
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<td></td>
<td>MT. ANNA SANDSTONE</td>
<td>Non-marine to marginal marine.</td>
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<tr>
<td></td>
<td>CADNA-OWIF MEMBER FORMATION</td>
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</tr>
<tr>
<td>Early/Late Jurassic</td>
<td>ALGEBUCKINA SANDSTONE</td>
<td>Braided fluvialite.</td>
<td></td>
<td></td>
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<tr>
<td>Permain</td>
<td>MT TOONDINA FORMATION</td>
<td>Lacustrine, meandering fluvial and back swamp.</td>
<td>Generally low porosity, immature but could provide good source rock at depth.</td>
<td>Could provide excellent seal, Mostly immature but could provide good source rock at depth. Oil shale potential. Reservoir sands may be developed in Boorthanna Formation. Hydrocarbon charge also possible from underlying carbonates.</td>
</tr>
<tr>
<td></td>
<td>STUART RANGE FORMATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boorthanna Formation</td>
<td>Shallow marine - fluvial periglacial.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Boorthanna Trough</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Warburton Basin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late Caledon/ Cambrian</td>
<td>Officer Basin</td>
<td>Shallow platform/slope carbonate (K.F.), Shallow subtidal and intertidal carbonate (C.F., O.F.), associated evaporative sarms (O.F.).</td>
<td>Carbonates mostly require secondary porosity enhancement. Hydrocarbon charge is possible from both Cambrian and Pre-Cambrian sources. The Paraekelya Member of the O.F. is a self sourcing and sealing thin but extensive. Laminated dolomitic silts/limestones. Lean but extensive source beds (R.B. 1, A.S.). Excellent reservoir at shallow depth. Predominantly structural traps (M.F.).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Murnaroo Fm.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rodda Beds</td>
<td>Undifferentiated</td>
<td>Slope and basin (R.B.). Braidied fluvial to shallow marine (M.F.) Salt diapir.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crystalline Basement</td>
<td></td>
<td></td>
<td>Intrusives, volcanics and metamorphic complexes.</td>
</tr>
</tbody>
</table>

600m Maximum known thickness

**ARCKARINGA BASIN**

Stratigraphic column Figure 5
Figure 6. Regional cross sections Areas D and E

Figures from Allender et al. 1987 Location of cross sections shown on Figure 4.
Permian sequence. Two other attempts have been made to drill a diapir but results were inconclusive. They were mineral drillholes Todmorden-1 (TD 400 m) and -2 (TD 406 m) completed in 1986 and located within Area D (Allchurch, 1988). Diapirs are located on figure 4 and shown in cross section on figure 6.

Four petroleum exploration wells have been drilled in the Boorthanna Trough. SADM Cootanoorina-1 drilled in 1967 (TD 948 m) and Pexa Weedina-1 drilled in 1970 (TD 1,625 m) found no hydrocarbons in the Permian section, but minor gas shows (Cootanoorina-1) and bituminous material (Weedina-1) were recorded from the underlying ?Cambrian sequence. Weedina-1 intersected 883 m of carbonate sequence. In 1986-87 Delhi drilled two exploration wells, Birribiana-1 (TD 1,427 m) and Hanns Knob-1 (TD 1,537 m), in the Boorthanna Trough. The wells were dry, however low levels of ditch gas were recorded in Birribiana-1. Both wells terminated in previously unknown pre-Permian sequences. Birribiana-1 in dolerite and Hanns Knob-1 in a sandstone quartzite and siltstone sequence, dolomitic in places and containing rare anhydrite. There are two deep mineral drillholes in Area E. Boorthanna-1 drilled in 1970 (TD 1,226 m) intersected 1,113 m of Permian sediments before terminating in a volcanic sequence. Warriner Creek-1 drilled in 1977 (TD 464 m) intersected 217 m of Permian sediments and 128 m of possible Ouldburra Formation equivalent before terminating in crystalline basement.
2.2 Hydrocarbon potential

i) Source rocks

Low total organic carbon content (TOC) values on six Early Palaeozoic sediment samples suggest that the facies intersected to date would provide poor source rocks if mature.

Basal Stuart Range Formation and Boorthanna Formation range from immature to mature. The Mount Toondina Formation and much of the Stuart Range Formation, while immature where sampled, have high TOC values indicating that they could be good source rocks at depth. They are predicted to be oil-prone. The top of the Permian sequence occurs at about 25 to 200 m KB in Area E and extends to about 1,200 m KB maximum. A maximum thickness of 1,100 m Permian is expected in Area E. The basal Permian section in the deeper parts of the Boorthanna Trough are expected to be within the oil window. A Proterozoic volcanic sequence intersected at 1,159 m in mineral drillhole Boorthanna-1 suggests that Permian sediments may thermally be more mature in this southern part of the Boorthanna Trough.

The Jurassic-Cretaceous Eromanga Basin sequence is thin, shallow and expected to be immature throughout the area in traditional terms. However in Santos well Oodnadatta-1 (TD 403 m) oil shows were recorded in the Early Cretaceous sequence. The well was drilled in 1957 and is located north of Area E and within Area D.

\footnote{S. Aust. Dept Mines and Energy open file Envelopes 62, 111 and 260 (unpubl.).}
Long distance migration of hydrocarbons is possible in laterally extensive Palaeozoic and Mesozoic units. Stratigraphic and structural traps are likely to occur. Leads and prospects for Area E are shown on figure 4.

ii) Reservoirs and seals

Secondary vugular porosity and minor open partings along stylolites are observed in the Early Palaeozoic sequence of Cootanoorina-1. However, in Weedina-1, porosity in this sequence is low. Parts of the Boorthanna Formation consist of moderately porous and permeable sandstones. The overlying Stuart Range Formation could provide an excellent seal. Sandstones in the Mount Toondina Formation and the Early Cretaceous Coorikiana Sandstone generally exhibit low porosity. The Cadna-owie Formation (sandy facies) and Algebuckina Sandstone could provide excellent petroleum reservoirs with the Cadna-owie Formation (shaley facies) providing a local seal and the Bulldog Shale a regional seal. The Oonnadatta Formation also provides a regional seal.

iii) Diapirs

Diapirs occur in the area and are potentially interesting targets. Increased understanding of these structures and the associated pre-Permian units may help delineate further prospects.

2.3 Previous exploration

Well data, petrophysically logged wells, seismic lines, magnetic surveys and gravity surveys relevant to Area E are detailed in Tables 1-5 and Figures 7-9.
### Table 1: Well details Area E

<table>
<thead>
<tr>
<th>Well</th>
<th>Company/Authority</th>
<th>Tieament Number</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Elevation Ground + KBRT (m)</th>
<th>Total Depth (m)</th>
<th>Date Spudded</th>
<th>Date Dilled</th>
<th>Wall Completion Report (SADME Ref)</th>
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<tbody>
<tr>
<td>Biribirra-1</td>
<td>Barosa PEL 5 &amp; 6</td>
<td>28°14.55'</td>
<td>122°30'71&quot;</td>
<td>314.8' 328.4' 1427.1</td>
<td>19/11/68</td>
<td>01/12/66</td>
<td>Env. 7034/6</td>
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<tr>
<td>Booranna-1</td>
<td>Occidental SMIL 326</td>
<td>28°56.34&quot;</td>
<td>131°45.18&quot;</td>
<td>111.6' 115.3' 1226.4</td>
<td>13/01/70</td>
<td>27/01/70</td>
<td>Env. 1315</td>
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<tr>
<td>Coolabunia-1</td>
<td>SADME Kva</td>
<td>28°00.35&quot;</td>
<td>131°20.20&quot;</td>
<td>106.2' 108.3' 948.2</td>
<td>29/04/67</td>
<td>15/06/67</td>
<td>Rep. 6504; RI 40</td>
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<tr>
<td>Hanns Knob-1</td>
<td>Santos PEL 5 &amp; 6</td>
<td>28°30.07&quot;</td>
<td>131°52.24&quot;</td>
<td>226.9' 281.4' 1526.8</td>
<td>26/12/66</td>
<td>15/01/67</td>
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<td>Warrner Gap-1</td>
<td>Kennecon E340</td>
<td>29°27.28&quot;</td>
<td>135°49.54&quot;</td>
<td>46.5' 464.3 71/77</td>
<td>20/11/77</td>
<td>Env. 3137</td>
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<td>Weecka-1</td>
<td>Pexa PEL 5 &amp; 6</td>
<td>28°29.21&quot;</td>
<td>135°52.20&quot;</td>
<td>86.7' 100.3' 1625.3</td>
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<td>26/03/70</td>
<td>Env. 1374, 1365</td>
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### Table 2: Petrophysically logged wells Area E

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<th>Well</th>
<th>Logger</th>
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<th>Sonic</th>
<th>Gamma</th>
<th>Spont. Potential</th>
<th>Resist.</th>
<th>Density</th>
<th>Neutron</th>
<th>Caliper</th>
<th>Other</th>
<th>SADME Reference</th>
<th>Digital Tape Available</th>
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<tr>
<td>Birribra-1</td>
<td>Schlumb. Dec. 86</td>
<td>5-1423</td>
<td>5-1425</td>
<td>23-1423</td>
<td>25-1429</td>
<td>219-1426</td>
<td>5-1426</td>
<td>MSFL dipmeter, velocity, sidewall coring.</td>
<td>Log caps, Index 7034/4</td>
<td>Yes</td>
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<td>Booranna-1</td>
<td>SADM Jan. 70</td>
<td>0-222  1226</td>
<td>226- 1226</td>
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<td>Temperature Geophys, log nos. 1162-66</td>
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<td>Coolabunia-1</td>
<td>SADM Jan. 67</td>
<td>0-190  969</td>
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<td>Temperature Geophys, log nos. 20410</td>
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<td>Weecka-1</td>
<td>Schlumb. Mar. 70</td>
<td>244-1622</td>
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<td>244-1625</td>
<td>248-1625</td>
<td>Oil, gas &amp; coal invasion</td>
<td>DTG only</td>
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<td>Survey Name</td>
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<td>RB 58/120, 59/104, 59/149</td>
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<td>Lake Conway - ARC seismic and gravity survey</td>
<td>Peza</td>
<td>United Geophysical Corporation</td>
<td>1970</td>
<td>Env. 1235, 1718</td>
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<td>Peake Creek - ARC seismic and gravity survey</td>
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<td>United Geophysical Corporation</td>
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<td>Env. 1495, 1718</td>
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<td>Christmas Creek - ARC seismic survey</td>
<td>Delhi</td>
<td>Geophysical Exploration Services Pty Ltd</td>
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<td>Hogarth - ARC seismic survey</td>
<td>Delhi</td>
<td>Norpac International Incorporated, Seiscom Delta United (Australia) Pty Ltd</td>
<td>1964</td>
<td>Env. 5561 (interpretive report vol. 10)</td>
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<td>Morphett - ARC seismic survey</td>
<td>Delhi</td>
<td>Norpac International Incorporated</td>
<td>1965</td>
<td>Env. 5995 (interpretive report vol. 9-10)</td>
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Figure 7. Seismic line locations, Area E
<table>
<thead>
<tr>
<th>Survey Name</th>
<th>Year</th>
<th>SADNE Reference</th>
<th>Survey Type</th>
<th>Status</th>
<th>Survey Code</th>
<th>By</th>
<th>For</th>
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<tr>
<td>Oodnadatta aeromagnetic survey</td>
<td>1961/62</td>
<td>Env. 12,202</td>
<td>Airborne Lines E-W Interval 8.0 km Flight height 430 m</td>
<td>Analogue</td>
<td>61SA02</td>
<td>Aero Service Corpn</td>
<td>Delhi</td>
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<td>Peake &amp; Denison Ranges SML 270</td>
<td>1969</td>
<td>Env. 1015</td>
<td>Airborne Lines E-W Interval 400 m Flight height 100 m</td>
<td>Analogue</td>
<td>69SA02</td>
<td>Austral Exploration Services</td>
<td>Aust. Mining Corporation</td>
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<td>Mt Kingston aeromagnetic survey ELS 491, 899 &amp; 1187</td>
<td>1980</td>
<td>Env. 3562</td>
<td>Airborne Lines E-W Interval 150 m Flight height 60 m</td>
<td>Digital</td>
<td>80SA30</td>
<td>Geox Pty Ltd</td>
<td>Pacific Exploration Consultants Gem Exploration &amp; Minerals Ltd</td>
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<td>Nilpinra-Edwards Ck airborne survey ELS 571 &amp; 968</td>
<td>1981</td>
<td>Env. 3771</td>
<td>Airborne Lines N-S Interval 300 m</td>
<td>Digital</td>
<td>81SA07</td>
<td>Geometrics</td>
<td>Ashton Mining Ltd</td>
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<td>Nilpinra. aeromagnetic survey ELS 1010, 1029 &amp; 1153</td>
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<td>Env. 4858</td>
<td>Airborne Lines E-W Interval 300 m Flight height 80 m</td>
<td>Digital</td>
<td>83SA05</td>
<td>Aerodata McPhar</td>
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<td>Mt Puv's aeromagnetic survey EL 343</td>
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<td>Airborne Lines E-W Interval 500 m Flight height 100 m</td>
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Oodnadatta aeromagnetic survey

Peake and Denison Ranges aeromagnetic survey - SML.270

Mt Kingston aeromagnetic survey - EL.491, 699, 1187

Nilpinna - Edwards Creek airborne survey - EL.571, 968

Nilpinna aeromagnetic survey - EL.1010, 1029, 1133

Mt Purvis aeromagnetic survey - EL.345

Figure 8 - Magnetic surveys, Area E
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<th>SADME Reference</th>
<th>Survey Type</th>
<th>Status</th>
<th>Survey Code</th>
<th>Surveyed By</th>
<th>For</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oodnadatta gravity survey 1968</td>
<td>1968</td>
<td>-</td>
<td>Helicopter</td>
<td>Processed</td>
<td>68E2</td>
<td>SADME</td>
<td>SADME</td>
</tr>
<tr>
<td>Boortimna Trough gravity survey</td>
<td>1968</td>
<td>-</td>
<td>Seismic lines</td>
<td>Processed</td>
<td>68B0</td>
<td>SADME</td>
<td>SADME</td>
</tr>
<tr>
<td>Lake Conway seismic &amp; gravity survey</td>
<td>1970</td>
<td>Env. 1236</td>
<td>Seismic lines</td>
<td>Processed</td>
<td>70O4</td>
<td>United Geophysical</td>
<td>Fexa</td>
</tr>
<tr>
<td>Peak Creek seismic &amp; gravity survey</td>
<td>1970</td>
<td>Env. 1495, 1371; BMR Rec. 7046</td>
<td>Seismic lines</td>
<td>Processed</td>
<td>70O5</td>
<td>United Geophysical</td>
<td>Fexa</td>
</tr>
<tr>
<td>William Creek gravity survey EL 341</td>
<td>1977</td>
<td>Env. 3092</td>
<td>Grid Interva 250 m</td>
<td>Not processed</td>
<td>77O0</td>
<td>Solo</td>
<td>Newmont</td>
</tr>
<tr>
<td>Cadarcro Hill EL 340</td>
<td>1977</td>
<td>Env. 3091</td>
<td>Grid Interva 250 m</td>
<td>Not processed</td>
<td>77PO</td>
<td>Solo</td>
<td>Newmont</td>
</tr>
<tr>
<td>Codna Hill</td>
<td>1977</td>
<td>Env. 3056</td>
<td>Grid Interva 250 m</td>
<td>Not processed</td>
<td>77?</td>
<td>Solo</td>
<td>Newmont</td>
</tr>
<tr>
<td>Murangocona EL 581</td>
<td>1980</td>
<td>Env. 3747</td>
<td>Grid/road</td>
<td>Not processed</td>
<td>80P3</td>
<td>Solo</td>
<td>EHP</td>
</tr>
<tr>
<td>Birthday Hill EL 300</td>
<td>1977</td>
<td>Env. 2981</td>
<td>Grid</td>
<td>Not processed</td>
<td>77P6</td>
<td>Solo</td>
<td>Newmont</td>
</tr>
</tbody>
</table>
Oodnadatta gravity survey 1968
Boorthanna Trough gravity survey
Lake Conway seismic and gravity survey
Peak Creek seismic and gravity survey
William Creek gravity survey EL 341
Cadaree Hill EL 340
Birthday Hill EL 303
Codna Hill
Murangoona EL 581
Compeera Hill south gravity survey
Compeera Hill south gravity survey
Wirranga Hill EL 924
Hogarth seismic survey PEL 5 & 6

Figure 9. Gravity surveys, Area E
<table>
<thead>
<tr>
<th>Survey Name</th>
<th>Year</th>
<th>SADME Reference</th>
<th>Survey Type</th>
<th>Status</th>
<th>Survey Code</th>
<th>By</th>
<th>Surveyed</th>
<th>For</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compeeta Hill South gravity survey</td>
<td>1980</td>
<td>Env. 3873</td>
<td>Grid</td>
<td>Not processed</td>
<td>80O8</td>
<td>Solo</td>
<td>Aquitaine</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80O9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wirrangula Hill EL 924</td>
<td>1981</td>
<td>Env. 4562</td>
<td>Grid</td>
<td>Not processed</td>
<td>81P4</td>
<td>Solo</td>
<td>CRA</td>
<td></td>
</tr>
<tr>
<td>Hogarth seismic survey PELs 5 &amp; 6</td>
<td>1984</td>
<td></td>
<td>Seismic lines</td>
<td>Processed</td>
<td>84E1</td>
<td>SADME</td>
<td></td>
<td>SADME</td>
</tr>
</tbody>
</table>
3. DATA PACKAGE CONTENTS

If you wish to purchase the data package for Area E, please complete and mail the order form at the rear of this brochure. Orders received before May 31st will receive preference. Additional reports as listed in the bibliography can be ordered, and will be included in the package at extra cost. The cost of the data package is $Aust 3,110 including freight cost.

Items marked * are to be supplied as microfiche copies. Seismic sections, seismic line and shot point location maps, selected seismic horizon contour maps and petrophysical well logs will be supplied as sepia copies. The remaining data are to be supplied as paper copies.

The SADME person for any enquiries relating to the data package is:

Mr Vic Hilditch
Technical Information Services
(08) 274 7523

3.1 Geological data

3.1.1 Geological maps. 1:250 000 scale geological atlas series

Billakalina (published with explanatory notes, 1981)
Warrina (preliminary, 1972)
3.1.2 Wells

i) Well completion reports

* Birribiana-1  (SADME Env. 7034/6)
* Boorithanna-1 (SADME Env. 1313)
* Cootanoorina-1 (SADME report 65/04; Rep. Invest. 40)
* Hanns Knob-1  (SADME Env. 7043/6)
* Warriner Creek-1 (SADME Env. 3137)
* Weedina-1     (SADME Env. 1374, 1365)

(Rep. Invest. 40 to be supplied as a paper copy.)

ii) Petrophysical logs, 1:240 scale or nearest equivalent

Birribiana-1: sonic, gamma, dual laterolog, microspherically focused log, SP, density, neutron, caliper and composite (SADME log sepa index 7034/4).

Boorithanna-1: gamma, 16" normal resistivity, 6′ lateral resistivity, SP and neutron-neutron (SADME geophysics log nos. 1182-86).

Cootanoorina-1: gamma, 16" and 64" normal resistivity, 6′ lateral resistivity, SP, point resistivity and neutron-neutron. (SADME geophysics log nos. 20 a-g, 419, 419a).

Hanns Knob-1: sonic, gamma, dual laterolog, microspherically focused log, SP, density, neutron, caliper and composite. (SADME log sepa index 7043/4).

Weedina-1: sonic, gamma, laterolog 7, proximity log, microlog, density, caliper and composite. (SADME Oil, Gas and Coal Division.)
Digital tapes, LIS format, of log data are available from the Department at an additional cost of $35/tape plus $30/well (normally 10 wells per tape). Digital log data is listed in Table 3.

3.1.3 Reports

i) PELs 5 and 6 Arckaringa farmout block - general reports

*Amdel, 1986. Analysis of borehole samples for residual hydrocarbons, Mulka and Arckaringa Blocks, Eromanga Basin. SADME Env. 4878 (unpubl.).

*Analabs, 1987. Hydrocarbon characterisation study Warriner Creek-1 and bore NB/SR-12 Arckaringa Block. SADME Env. 4878 (unpubl.).

*Cook, A.C., 1981. The organic petrology of samples from a selected group of wells in or near the Arckaringa Basin. SADME Env. 4878 (unpubl.).


*Moore, P.S. 1983. Block prospectivity summary Arckaringa Block. SADME Env. 4878 (unpubl.).

*Santos Ltd. 1988. Arckaringa Block acreage assessment report. SADME Env. 4878 (unpubl.).

(ii) Other

3.2 Geophysical Data

3.2.1 PELs 5 and 6 Arckaringa farmout block—geophysical interpretation reports.


3.2.2 Regional Bouguer gravity contour maps, 1:250 000 scale

Billakalina (1984), plan no. 71-411.

Both plans are based on a density of 1.90 gm/cm³.
(Gravity station values maps are available but are not included in this data package.)

3.2.3 Total magnetic intensity maps, 1:250 000 scale

Billakalina (1984), plan no. 84-319.
Warrina (1984), plan no. 84-325.

(1:100 000 sheets 6040, 6041 and 6140 published in 1905, are available, but are not included in this data package.)
3.2.4 Seismic data

i) Seismic line location base maps at 1:250 000 scale

ii) Seismic shot point location base maps at 1:100 000 scale

iii) Selected seismic sections

Compressed sections to be supplied where available. The selected sections are illustrated on figure 10.

Christmas Creek - ARC seismic survey, 1982.

82-RAA
82-RAB
82-RAC
82-RAD
82-RAE
82-RAF
82-RAG
82-RAH
82-RAJ
82-RAK
82-RAV
82-RAZ
82-RBA
82-RBB


84-XEQ
84-XER
84-XES
84-XET
84-XEW
84-XEX
84-XEY
84-XFA
84-XFB
84-XFC
84-XFD
84-XFE
84-XFF
Figure 10  Seismic data included in data package, Area E

85-XQE
85-XQF
85-YQS
85-YRB
85-YRC
85-YRD
85-YRE
85-YRF
85-YRG
85-YRH
85-YRJ
85-YRK
85-YRL
85-YRM
85-YRN
85-YRP
85-YRQ
85-YRR

iv) Selected seismic horizon contour maps
The maps listed below are contained in Wilmot (1987)$^1$ and Allender et al. (1987)$^2$ which are included in the data package.

$^1$Top Stuart Range Formation time structure, 1:50 000 scale, enclosures M-ARC-NTH-1, M-ARC-CENT-2 and M-ARC-STH-3.

$^2$Base Stuart Range Formation time structure, 1:50 000 scale, enclosures M-ARC-NTH-4, M-ARC-CENT-5 and M-ARC-STH-6.

$^3$Delamerian unconformity time structure, 1:50 000 scale, enclosures M-ARC-NTH-7, M-ARC-CENT-8 and M-ARC-STH-9.

$^4$Stuart Range Formation time interval, 1:50 000 scale, enclosures M-ARC-NTH-10 and M-ARC-CENT-11.
1Base Stuart Range Formation to Delamerian unconformity time structure, 1:50 000 scale, enclosures M-ARC-TH-12 and M-ARC-CENT-13.

2Pre-Permian unit D1 to D6 time structure, 1:50 000 scale, enclosures M-ARC-COOT-14 to 16 and M-ARC-HANNS-17 to 20.

3Time structure top Stuart Range Formation, 1:100 000 scale, enclosure M-ARC-BLK-21.

4Time structure base Stuart Range Formation, 1:100 000 scale, enclosure M-ARC-BLK-22.

5Time structure Delamerian unconformity, 1:100 000 scale, enclosure M-ARC-BLK-23.

6Time structure contours Delamerian unconformity showing location of salt diapirs, 1:100 000 scale, ARC 2, enclosure 12.
4. BIBLIOGRAPHY

4.1 General

This bibliography encompasses the entire Arckaringa Basin area as well as including pertinent references from surrounding basins.

References marked * are included in the data package. Copies of other unpublished references are available on request. It is assumed most companies will have access to published material.

Agip Australia Pty Ltd and Stockdale Prospecting Ltd, 1982-83. ELs 796-799. (Exploration was for coal and diamonds. Over 80 holes were drilled. Most intersected Stuart Range and Boorthanna Formations.) SADME Envs. 4272 and 6498 (unpubl.).

Allchurch, P.D., 1988. EL 1328 - Todmorden, South Australia. (Reports for Roebuck Resources NL). SADME Env. 6687 (unpubl.).


Amdel, 1981. Oil analysis on Stuart Range Formation samples from Newmont/Dampier drillholes SR-1 and 16. SADME Env. 3859 (unpubl.).

*Amdel, 1986. Analysis of borehole samples for residual hydrocarbons, Mulka and Arckaringa Blocks, Eromanga Basin. SADME Env. 4878 (unpubl.).

Analabs, 1984. Total organic carbon and rock evaluation pyrolysis data for samples from 11 wells, onshore South Australia. (CooLanoorina-1, Weedina-1) SADME Env. 6846 (unpubl.).

*Analabs, 1987. Hydrocarbon characterisation study Warriner Creek-1 and bore NB/SR-12 Arckaringa Block. SADME Env. 4878 (unpubl.).

Aquitaine Australia Minerals Pty Ltd, 1981. EL 626. (Exploration was for base metals and uranium. One stratigraphic hole was drilled through the Permian sequence.) SADME Env. 3873 (unpubl.).


Belperio, A. P., 1987. Hydrocarbon potential of Late Proterozoic graben sediments, South Australia. SADME report 87/075 (unpubl.).


*Cook, A. C., 1981. The organic petrology of samples from a selected group of wells in or near the Arckaringa Basin. SADME Env. 4878 (unpubl.).


CRA Exploration Pty Ltd, 1982. EL 924. (Exploration was for coal. Four holes were drilled and samples submitted for oil analysis.) SADME Env. 4562 (unpubl.).

CRA Exploration Pty Ltd, 1986. EL 1165. (Exploration was for evaporite minerals. Drillhole 83LCD1 (TD 408 m) intersected Stuart Range Formation). SADME Env. 5250 (unpubl.).

CRA Exploration Pty Ltd, 1984-87. Quarterly reports on PEL 24, South Australia. SADME Env. 5648 (unpubl.).


*Delhi Petroleum Pty Ltd and Santos Ltd, 1982-86. PELs 5 and 6 Arckaringa farmout block reports. (Authors various and include outside consultants. Selected reports referenced separately.). SADME Env. 4878 (unpubl.).


Frankcombe, K.M., 1984. Gravity interpretation of PEL 24, South Australia. SADME Env. 5648 (unpubl.).

Frankcombe, K.M., 1984. Aeromagnetic interpretation of PEL 24 South Australia. SADME Env. 5648 (unpubl.).


Newmont Pty Ltd and Dampier Mining Company ltd, 1977-78. ELs 303-305 and 326-327. (Exploration was for Olympic Dam type mineralization. Drillholes SR-1 to 5, 10 to 12 and 15 to 16 intersected Permian sediments). Lithological logs are given in SADME Envs. 2981, 3017, 3031, 3055 and 3056 (unpubl.).


Reinman, K. and Dielwart, J.E.A.M., 1973. Source rock and carbonization evaluation, well Cootanoorina-1. SADME Env. 2333(2) (unpubl.).

*Santos Ltd, 1988. Arckaringa Block acreage assessment report. SADME Env. 4878 (unpubl.).

Saxby, J.D., 1977. Source rock analyses on samples from 13 Australian sedimentary basins. (Extract from CSIRO restricted report 868r) (Weedina-1) SADME Env. 1365 (unpubl.).

Shell Development Australia Pty Ltd, 1974. EL 104. (Exploration was for coal. Nine holes were drilled Stuart Range and Boorthanna Formations were intersected.) SADME open file Env. 2387 (unpubl.).

Stobie, C. D., 1986. Water and mineral bore study of Lake Eyre and Mulka Blocks and adjacent areas. SADME Env. 4882 (unpubl.).


Watson, B.L., 1987. Maturity of limestone samples from the Warburton and Arckaringa Basins (Cootanoorina-1), S.A. SADME Env. 5510 (unpubl.).


Western Mining Corporation Ltd, 1981. Summary oil yield analysis on 20 samples of cutting material from the Arckaringa Basin, Wallira-1 and 2 and Wallira West-1. SADME Env. 3859: 327-330 (unpubl.).


4.2 SAMREF bibliographic data base

Comprehensive information is available in the Department's SAMREF bibliographic database. SAMREF is available for public access either at this Department, or through ARID (Australian Resources Industry Database), forming part of GEOPAC on INFO-ONE International. Prior to November 1, 1988, INFO-ONE International was known as CLIRS Information Services. With this change of name, there is now a lower price schedule applying to membership and annual fees and connect times rates. New access menus have also been provided to facilitate use by casual and inexperienced users. INFO-ONE International is available Australia-wide and overseas and can be accessed online by computer.

The South Australian Department of Mines and Energy is progressively adding abstracts to the SAMREF database on INFO-ONE International, including:

- company reports released since 1983
- Departmental reports and publications released since 1981 and
- some pre-1961 revised company and Departmental reports.

Other references are only available at the Department in Adelaide.
5. LICENCE APPLICATION PROCEDURES

Petroleum exploration and development in South Australia are administered under the Petroleum Act, 1940 (onshore) and the Petroleum (Submerged Lands) Acts, 1967 of the Commonwealth and 1982 of the State (offshore). Vacant onshore areas are continuously available for licence applications, whereas offshore permits are open to application only after gazetted of areas by the Commonwealth and State Governments.

There is no set form for making an application other than by a written request addressed to the Director-General, Department of Mines and Energy. Application guidelines, licence conditions, obligations, etc. for onshore petroleum exploration are summarised in Table 6.

In summary, all applications should be signed under seal and include a $400 application fee (cheques should be made out to SADME), a proposed program cost for each year of the initial 5 year licence term, evidence of the applicant's financial ability to undertake such a program and the technical qualifications and expertise of personnel available to the applicant to undertake the program. For any enquiries relating to licence applications contact:

Mr. Bob Laws
Director, Oil, Gas and Coal Division
Phone (08) 274 7612
### Table 6: Onshore petroleum exploration guidelines

**PETROLEUM ACT, 1940**

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

<table>
<thead>
<tr>
<th>ONSHORE PETROLEUM EXPLORATION</th>
<th>Petroleum Act Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title of Tenement</td>
<td>Petroleum Exploration Licence (P.E.L.)</td>
</tr>
<tr>
<td>Who Can Apply</td>
<td>An individual, a body corporate (i.e. a company) or an unincorporated association of persons and bodies corporate (i.e. a joint venture involving several persons and/or companies). Where application is made on behalf of a company, the application must be made under the company seal.</td>
</tr>
<tr>
<td>When Application Can be Made</td>
<td>Initial Licence - At any time over any area not already under licence</td>
</tr>
<tr>
<td></td>
<td>Renewal of Licence - not less than 3 months before existing licence is due to expire</td>
</tr>
<tr>
<td>Maximum Area</td>
<td>26 000 sq km.</td>
</tr>
</tbody>
</table>
| Application Fee               | For initial application - $400  
                               | For each renewal - $400 |
| Bond (to ensure compliance with licence conditions) | $4 000 minimum. Amount required is specified in letter of offer. Bond may be in the form of cash, cheque or bank guarantee. |
| Term of Licence               | Initial Term - 5 years  
                               | Each Renewal (to a maximum of 3) - 5 years |
| Annual Rental Payable         | Initial 5 Year licence term - 16 c/sq km  
                               | First Renewal (2nd 5 Year licence term) - 24 c/sq km  
                               | Second Renewal (3rd 5 Year licence term) - 32 c/sq km  
                               | Third & Final Renewal (4th 5 Year licence term) - 40 c/sq km. |
| 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  
                               | First Renewal (2nd 5 Year licence term) - $62 per sq km per year  
                               | Second Renewal (3rd 5 Year licence term) - $80 per sq km per year  
                               | Third & Final Renewal (4th 5 Year licence term) - $94 per sq km per year |
| Area to be Reinquished on each Renewal | 25% of original licence area. This is in addition to any areas voluntarily surrendered during each 5 Year licence term. |
| Fee for Minister's Consent to Dealings in Licence | $400 per transaction (document) |

<table>
<thead>
<tr>
<th>Petroleum Act Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>6(1)</td>
</tr>
<tr>
<td>41(b)</td>
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<td>6(1a)</td>
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<td>18(5b)</td>
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<td>13(1)</td>
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<td>17(1)(a)</td>
</tr>
<tr>
<td>17(1)(b)</td>
</tr>
<tr>
<td>18a(1)(b)</td>
</tr>
<tr>
<td>18(2)</td>
</tr>
<tr>
<td>42(3)</td>
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</tbody>
</table>
Fee for Inspection of Register $2 Reg.7(1)
Fee for Copy or Extract from Register 50¢ per page Reg.7(2)

Method of Application Letter of application addressed to the Director-General, Department of Mines and Energy (there is no prescribed form). 7(1)
Attached to the application should be:
(1) full names and addresses of the party/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.
(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)
(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(3)
(5) particulars of the financial resources available to the applicant party/parties to carry out the proposed terms and conditions of the licence. 7(4)
(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).
(6) the $400 application fee. Where the application is made on behalf of a company, the application must be made under the company seal. 7(2)

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. 41(b) 83(1)

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. 8(2)

Environmental Conditions These will be outlined in the letter of offer attached to the licence.

Surrenders The Act requires the licensee to:
(Partial or Whole of Licence) 38(1)
(1) apply to the Minister for permission to surrender.
(2) give three months notice in writing.
(3) pay all outstanding fees.
(4) pay all outstanding monies and wages to workmen and employees.
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.
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(2a)

<table>
<thead>
<tr>
<th>Required Notice for Approval to Undertake Work in Licence Area</th>
<th>Three months notice is required to arrange necessary clearances with other Government Agencies. This is carried out by DME on the licensee's behalf. 38(2b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Notice of Entry to Landholders</td>
<td>No risk of damage to land or improvements thereon - 14 days. Risk of damage to land or improvements thereon - 28 days. 51(1)</td>
</tr>
<tr>
<td>Gazettals</td>
<td>Gazettals occur on: Grant of Licence 6(2)</td>
</tr>
<tr>
<td>Suspension and Cancellation</td>
<td>The Act provides for suspension and/or cancellation for failure to comply with licence conditions. 87a(1)</td>
</tr>
</tbody>
</table>

N.B. All monetary amounts are subject to review.

March 1989
SR 27/2/94

To the Director-General
South Australian Department of Mines and Energy
PO Box 151
EASTWOOD SA 5063

ATTENTION: Oil, Gas and Coal Division

Dear Sir/Madam,

Re: Area E Data Package

Please provide the Area E data package as specified in Section 3.

Company  .................................................................
Address  ................................................................. Postcode....
Contact  .................................................................
Telephone  ................................. Telex  .................
Facsimile  .................................

Please enclose a cheque for $Aust 3,110, made out to: Dept. Mines and Energy, account # 86G25 144/076.

Date  .........................  Signed  .........................