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PEL 21

Petroleum Exploration – Onshore Polda Basin - SA

Australian Occidental Pty Ltd 1982

Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

Government of South Australia
Primary Industries and Resources SA

CONTENTS ENVELOPE 4932

TENEMENT: P.E.L. 21.

TENEMENT HOLDER: Australian Occidental Pty. Ltd.

REPORT ON PETROLEUM EXPLORATION

LICENCE NO. 21

ONSHORE POLDA BASIN - SOUTH AUSTRALIA

for AUSTRALIAN OCCIDENTAL PROPRIETARY LIMITED

R.B. Kirk
July, 1982

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1. HISTORY OF EXPLORATION PERMIT

Petroleum Exploration Licence 21 (P.E.L. 21) taken out by Australian Occidental Proprietary Limited (AOPL) on the 24th February, 1982, covers that area of the onshore Polda Basin, on Eyre Peninsula, South Australia, shown in Enclosure 1.

This permit was applied for prior to the drilling by AOPL of two exploration wells in the offshore extension of this graben in permit EPP-SA 15. Very little is known about the hydrocarbon potential of the onshore graben but it was considered prudent to have an interest in this area pending an offshore discovery.

The licence boundaries were determined using gravity and outcrop data to ensure that the entire east-west graben, and associated northwest-southwest extension, were included.

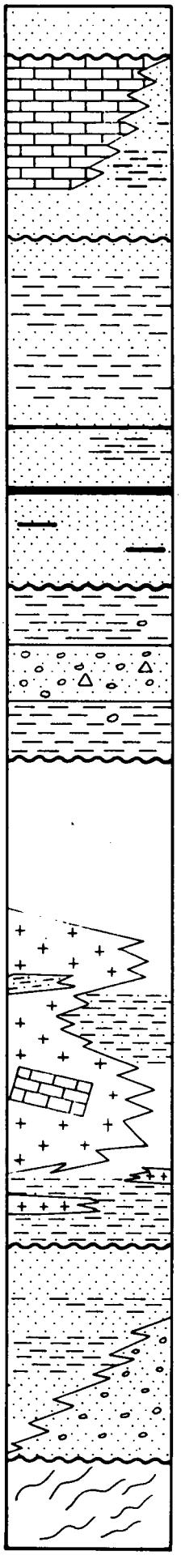
2. INTRODUCTION

The Polda Basin is an east-west, intracratonic graben extending some 400 kilometres from its western limit at the shelf of the Great Australian Bight to its onshore extension across the Eyre Peninsula to Cleve. EPP-SA 15 contains the central deep trough of this basin, where seismic evidence had suggested that at least 5000m of sediment fill could be expected. A basement swell separates the main offshore trough and the onshore trough (with its small offshore extension). No good data exist to indicate the possible sediment thickness onshore.

The onshore trough contains a non-marine sequence of Jurassic, Permian and probably older sediments. A sub-economic coal deposit exists in the Jurassic section near Lock. This is overlain by Tertiary sands which are in turn overlain by Quaternary dune sands which provide important aquifers in the area - see Figure 1 for the geological column, on- and offshore and Enclosure 2 for a schematic cross section.

A series of shallow stratigraphic drill holes were put down by the South Australian Department of Mines and Energy (SADME) and these give limited information on the occurrence of Jurassic and Permian sediments - See Enclosure 1 and Table 1.

Regional gravity, magnetic and electrical surveys have provided broad trough - definition and a small amount of seismic data (refraction and reflection) give more specific information.

AGE	W COLUMN E	FORMATION	GEOLOGY
QUATERNARY		BRIDGEWATER	Calcareous cemented dune sands with some clayey interbeds.
TERTIARY (Eocene)		POELPENA	Carbonaceous dark brown sediments from coarse sands to lignites .Limestone offshore.
LATE JURASSIC (J6 Onshore)		POLDA	Grey to black carbonaceous fine sands, silts and lignites grading to coarse sands. Some brown -black coal seams up to several metres thick.
EARLY PERMIAN (Stage 2 Onshore)		Unnamed Glacial Unit	Brown to grey silty claystone and shale containing igneous metasedimentary and sedimentary conglomerates and clasts varying from granule to boulder size.
Undated		Unnamed Red Bed Unit	Highly oxidised, calcareous and dolomitic redbeds varying from variegated claystone and siltstone to poorly sorted fine to coarse sandstone. Halite is both massively intruded and interbedded with red-brown claystone and siltstone.
PROTEROZOIC		Unnamed offshore	White sandstone interbedded with hard red-brown siliceous sandy siltstone.
		MOUNT WEDGE GRITS	Coarse feldspathic sands, grits and conglomerates.
PRE-CAMBRIAN			Metasediments and granites of the Gawler Craton sequence.

POLDA BASIN - GEOLOGICAL COLUMN

Figure 1

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PETROLEUM DIVISION

Author: R. K. Drafted: T. B. JULY 1982 File: D-2

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FORMATION TOPS (METRES) / (THICKNESS)

DRILL HOLE (P=POLDA)	BRIDGE WATER	POELPENA	POLDA	(PERMIAN) unnamed	MT. WEDGE GRITS	T.D. (metres)
P2	SURFACE (12.4)	12.4 (32.2+)	-	-	-	46.6
P3	SURFACE (14.4)	14.4 7.8	-	-	22.6 (4.4)	27.0
P4	SURFACE (4.2)	4.2 (81.8)	-	-	-	85.0
P5	SURFACE (16.2)	16.2 (68.1)	-	84.3 5.7+	-	94.0
P8	SURFACE (3.2)	3.2 (100.5)	103.7 (45.0)	148.0 (108.2)	-	256.2
P9	SURFACE (5.0)	-	5.0 (38.0+)	-	-	43.0
P10	SURFACE (5.4)	- -	5.4 (24.6+)	-	-	30.0
P11	SURFACE (3.4)	3.4 (21.3)	24.7 (15.3+)	-	-	40.0
P12	SURFACE (5.3)	5.3 (10.4)	15.7 (47.5)	63.2 (11.8)	-	75.0
P13	SURFACE (9.0)	9.0 (38.5)	47.5 (10.5+)	-	-	58.0
P21	SURFACE (4.6)	4.6 (91.7)	96.3 (16.7)	?118.2 (4.8+)	-	123.0
P28	SURFACE (6)	6 (10)	16 (32)	-	-	48
Lock 1	SURFACE (2)	2 (10)	18 (170)	188 (181+)	-	368.7

ONSHORE POLDA BASIN WELL FORMATION TOPS

TABLE I

3. GEOLOGY

Basement

In a regional context, the onshore Polda Basin lies within the Gawler Block and is surrounded and probably underlain by older Precambrian basement. The time of formation of the basin is uncertain, but basement faulting and subsidence possibly began in late Precambrian or Cambrian times (Morgan, 1974, McInerney, 1977).

Older basement metamorphics and metasediments outcrop extensively just east of the basin in the Cleve Uplands, and at scattered points north of the basin. Warrow Quartzite, which forms the prominent Darke Ranges is present in the Tooligie Range south of Lock. The conglomerates, grits and sandstones outcropping near Cleve and at Blue Range are probably younger basement rocks (Corunna Conglomerate equivalents). Precambrian granites outcrop at Bramfield, around Cocata Hill north of the basin, and have been intersected in drill holes beneath basin sediments both east and west of Lock (Morgan, 1974; Painter, 1970).

Precambrian ?

At the foot of Mount Wedge is an outcrop of coarse-grained and conglomeratic sandstones of ?Precambrian age (Harris and Foster, 1974). A similar outcrop occurs at Talia Caves south of Venus Bay; Nelson (1974) refers to this as "Precambrian (Mount Wedge grit)".

Pale grey feldspathic sandstone with interbeds of pebbly sandstone in drillhole Polda 3, is considered to be Precambrian in age and related to outcrop strata as illustrated by Harris and Foster (1974). No other occurrences of this unit are known.

Permian

Palynomorphs found in drillhole Polda 8 (Harris 1979) and Lock 1 (Kwitko 1978) indicated a Permian age - this unit is, as yet, unnamed.

Drillholes Polda 5, Polda 12 and Polda 21 intersected rocks which lithologically are comparable with Permian sediments in Polda 8 and Lock 1.

The Permian sequence in Lock 1 is predominantly a conglomeratic green to grey-brown mudstone with several thin interbeds of sandstone, conglomerate, claystone and siltstone.

Clasts are generally rounded and vary from granule to boulder size. They are predominantly fragments of granite and granitic gneiss, with minor fragments of dolorite, quartzite, fine grained carbonate, marble, calc-silicate and amphibolite.

Towards the bottom of Lock 1, however, there is an increase in the percentage of (calcite-veined) calcareous, red-brown siltstone pebbles. The majority of sediments in this well are grey-green to dark brown in colour and not red-brown. The pebbles are considered, by Kwitko, to be reworked Permian sediments but their lithology is similar to that of the thick sequence of undated (Pre-Permian?) red beds penetrated in the two AOPL offshore wells - Mercury 1 (2300m thick, including salt sequence) and Columbia 1 (1300m thick) - (AOPL, 1982). This suggests that this sequence could underlie the onshore Permian section.

A Permian (Carboniferous?) diamictite overlies the red-beds in both offshore wells. (87m thick in Mercury 1 and 65m in Columbia 1).

Permian glacigene sediments, are also known in the Cooper Basin (Merrimelia Formation) and Arckaringa Basin (Stuart Range Beds and Lake Phillipson Beds) (Ludbrook, 1969). The latter contain arenaceous foramininfera and indicate marine enviroments of deposition during Early Permian in the St. Vincent Basin.

Jurassic

The Polda Formation of Late Jurassic (J6) age onshore, contains interbedded coal, carbonaceous clay, pale grey claystone, sandy claystone and fine-grained sandstone; it overlies either Permian glacigene sediments or metamorphic "basement". Harris and Foster (1974) consider that spores and pollen in this unit indicate an arboreal despositional enviroment.

Within the PEL 21, the Polda Formation was intersected in all the drillholes in the eastern area. No Late Jurassic sediments were found in the western area.

Two holes - Lock 1 and Polda 8 passed through Late Jurassic rocks into sediments of Permian age and possibly other wells also penetrated the Permian.

The Polda Formation does not crop out and its distribution is known only from the limited, shallow drillhole information.

The Polda Formation was penetrated offshore by Gemini 1A, Mercury 1 and Columbia 1 and is very similar to that onshore. offshore the upper part of the formation is predominantly interbedded sticky grey claystone and fining-upwards, poorly consolidated, fine to coarse grained feldspathic sandstone. A fluvial point bar depositional enviroment, with granitic source area for the sandstones, is envisaged.

The lower part of the formation consists of regularly interbedded sandstone, poorly consolidated, fine-to-very coarse grained, occasionally lithified with calcareous cement and siltstone, grey to brownish-black and carbonaceous. Discrete beds of brown-black coal are present, being often silty and lignitic with fine laminations of pyrite.

Tertiary

Two Tertiary units have been recognised in the trough. The Middle Eocene Poelpena Formation containing sapropelic sediments (Harris 1974) northwest of Mount Wedge has been partly penetrated in many bores, although it is absent in places. The unit is lithologically similar to the Jurassic Polda Formation, although the sediments are commonly dark brown. A younger unnamed unit of Middle Miocene (?) age has been recognised in the eastern part of the trough (Harris, 1973). The lithologies of this unit range from coarse grey snads and clays, through carbonaceous sands and clays, to lignites.

Quaternary

The calcareous, cemented dune sands of the Bridgewater Formation occur at or near the surface, over almost the entire trough. The unit forms the main aquifer in the groundwater basins west of Lock, and ranges in thickness from a few metres to over 180m near the coast. Surface outcrops are usually represented by strongly cemented calcrete, which is widespread for about 60km inland from the west coast. Further east, a thin calcrete (up to 10m) is generally covered by Recent soils and siliceous dune sands, with interdunal claypans.

4. GEOPHYSICS

The onshore trough has good gravity and magnetic regional control but has very limited seismic data and little is therefore known about smaller scale structuring within the trough.

Magnetic Surveys (Nelson, 1974)

Central Eyre Peninsula was investigated using a high level aeromagnetic survey by the Bureau of Mineral Resources during 1953-1955. This survey was flown at a height of 1,500 feet and as detail was lacking a low level aeromagnetic survey was flown for SADME in 1960, covering several previously defined "hard-rock" anormalies.

In 1966 an aeromagnetic survey was flown over part of the Great Australian Bight offshore from Eyre Peninsula (O.E.L. 33 and O.E.L. 38) on behalf of Outback Oil Co. N.L.

Follow up ground magnetic surveys were carried out over individual magnetic anomalies in 1963, 1965 and 1966 (Nelson, 1974).

The depth-to-magnetic basement (DMB) map , produced by SADME shows, in a regional sense, the same basic graben elements as does the gravity map. This map indicated a 2000m maximum DMB offshore whereas seismic gives at least 5000m of sediment. The greatest DMB in the Lock area is 1250m.

Caution must be exercised when using this map quantitatively. The DMB basin axes on-and offshore, in the area (as well as in the Officer Basin, in northern South Australia) are displaced to the south of the gravity basin axes. The low axes of the total magnetic intensity maps are displaced north of the gravity axes.

A study of the offshore Polda magnetic data (as well as that in Officer Basin) has determined that (in Australian latitudes), it is necessary to transform the magnetic data to the pole (Cribb and Vickers, 1973) particularly when working with sedimentary basins. On accomplishing this it seems that the magnetic low axes are moved south some 5 to 10 kilometres in the offshore Polda Trough. The gravity and magnetic axes then very nearly coincided in this area and in the Officer Basin. It is not understood why the DMB axes are south of the gravity axes as is the case in the onshore Polda trough (and in the Officer Basin where seismic shows that, as far as the sedimentary section is concerned the DMB map is incorrect).

Gravity Surveys

Widely spaced gravity readings were taken from 1956 to 1961 by SADME on the Eyre Peninsula. A denser station network was established in 1967 (approx. 4 mile station spacing).

Rowan (1968) related certain features on the gravity map, to the known geology. In particular he noted a low of about 40 milligals north of Elliston corresponding to the onshore continuation of the magnetic trough. The outcrops of grits, sandstones and conglomerates may form the basal part of the infill to the trough and that younger sediments may possibly overlie them in the deepest parts of the trough.

Comparing the outcrops map with the Bouguer gravity map suggests a possible relationship, around the edges of the trough, between granite age and gravity effect. This effect is that granites older than 1500 million years give positive gravity anomalies whereas younger granites give relative lows.

The gravity map indicates that the deepest sedimentary section onshore may be on the west coast (assuming a direct correspondence between sedimentary thickness and

the Bouguer gravity effect). This trough extends a few kilometres offshore and then the gravity increases over a north-south basement swell which separates the offshore basin-proper from that onshroe - See Enclosure 1.

A gravity low extends to the northeast, while the main low extends eastward to a basement swell just west of Lock. Another east-west low extends east of here from Lock to past Tuckey.

The northeast low is a problem, as there is no offshore indication of it on the seismic data whreas the east-west low is seen on lines 81-02 and 81-04. This suggests that this low is due to a gravity contrast in miniholder sediments/basement.

The maximum Bouguer gravity contrast (around 40m gals) between the basin and known crystalline outcrop is similar to that immediately offshore where seismic indicates a minimum of 3000m of probable sediment. (The maximum offshore gravity contrast of some 50m gals is near Gemini 1A where the sedimentary section could be over 4500m in thickness).

The contrast within the Lock-Tuckey gravity low is around 30m gals, which is not significantly different from that further west onshore. This implies that a reasonably thick sedimentary section could be present in the Lock-Tuckey area. (Obviously this is an over simplification for changes in basement density would alter the gravity-relativity picture).

Electrical Surveys

Electrical surveys were conducted by SADME in 1963, 1964 and 1967 to aid hydrogeological study. Nelson (1974) reinterpretated this data, in the light of recent geological control, to produce a basement depth map for the western, onshore trough. This should be used, as Nelson says, "as an exploration guide only", as the method is not normally definitive.

For example basement could be crystalline or Mount Wedge grit. Maximum depth, using this map, is near (Colton and is 100m. At Polda 1 the depth is 75m - these values appear to be too shallow for crystalline basement.

Seismic Refraction (Nelson 1974 and McInerney 1977)

Two small refraction surveys have been undertaken in the licence area by the S.A. Department of Mines and Energy.

The first survey was conducted in 1967 at Colton in the western part of the onshore basin and the second survey in 1977 across the Lock-Tuckey portion of the eastern Polda Basin, and in the Mount Wedge-Mucka Cudla area. Some of the results from these surveys are given in Table 2.

The Colton survey suggested Cainozoic and Mesozoic sediments to 240m, Pre-Cambrian (?) sediments from 240m to 700m and possibly crystalline basement below this.

The Lock-Tuckey survey, with the addition of later geological information, indicated that Jurassic and Tertiary sediments existed from the surface to between 200 and 300m, Permian sediments from here to 700m and Pre-Cambrian? (Mount Wedge Grit?) sediments (or weathered crystalline basement) below 700m.

Seismic Reflection

Only one 4km high resolution (12 fold) seismic line is available for study over the onshore graben - See Enclosure 3. This line is located within the ETSA coal permit - see Enclosure 1. In this area, the graben was formed by simple normal block faulting in the north and the south. The high amplitude events are probably the Jurassic coal measures (no deeper than 300m. sub-datum on this line) - no good data exist below this level.

LOCATION	AGE	VELOCITY (m/s)	DEPTH (m)
Onshore Polda - Lock Area (Refraction Data)	Tertiary-Jurassic	1270	<100
	Tertiary-Jurassic	2000	100-300
	Tertiary-Jurassic	2200	100-300
	Permian	2600	200-500
	Permian	3000	200-700
	Pre-Cambrian (?)	4500	>700
Onshore Polda - Colton Area (Refraction Data)	Tertiary	1370	20
	Tertiary	2040	80
	Permian (?)	3350	230
	Pre-Cambrian (?)	4110	690
	Pre-Cambrian (?)	4940	>690
	Archean (?)	>6000 (Nelson, 1974)	-
Offshore Polda - Mercury 1 (Velocity Survey)	Tertiary-Jurassic	2160	810
	Permian	2500	870
	Red Beds	4160	1380
	Salt	4570	2260
	Red Beds	4950	3180
Offshore Polda - Extension of Onshore trough (Reflection Data)	Tertiary-Jurassic?	2090	650
	Red Beds (?)	3700	1610
	Red Beds (?)	4390	2900

POLDA BASIN VELOCITY DATA

TABLE 2

A possible unconformity (Tertiary-Jurassic) is present near 80m.

This line was recorded using high resolution (Shallow - penetration) techniques and so we cannot study the deeper section.

The seismic-derived velocity data are probably too unreliable, below the coals, to predict possible gross lithology changes.

5. GEOPHYSICAL REPROCESSING

Computer medelling could be undertaken on the gravity (and magnetic) data to better define the basin configuration. However, the lack of deep well data and the resulting control on such parameters as density and susceptibility would make the modelling solutions non-unique - that is, many different models could be created to satisfy the field readings. In addition, an attempt to locate small intra-basin structures would probably require a tighter sampling grid than already exists.

The one reflection line was processed using modern techniques and probably could not be significantly improved. The initial recording parameters preclude the study of any deeper section below the coals.

In conclusion, reprocessing of the small amount of data will not greatly advance our understanding of the thickness, type, nor structuring within the sedimentary basin-fill. A new reflection seismic survey would be required to achieve this aim.

6. HYDROCARBON PROSPECTIVITY

Tertiary

The thickest Tertiary section drilled onshore is 100m (Polda 8). This early Tertiary sequence consists of fluviatile sands and lignites in the south and marginal marine, sapropelic clays and sands (Harris, 1972) north of Mount Wedge.

This section is considered immature for hydrocarbon generation and good seals are lacking. There is almost no data regarding structuring within the onshore sedimentary sequence.

Jurassic

The Upper Jurassic (J6) sequence consists of non-marine (arboreal) lignites, sands and silts. A subeconomic coal deposit has been located west of Lock.

This shallow sequence has a maximum drilled thickness of 170m (Lock 1) and is considered immature. No good seals exist and no good structural control exists. (Offshore a geothermal gractient of 4.4 °C/100m was recorded in this section, but no onshore temperature data are known of).

Permian

This unit of early Permian (Stage 2) diamictites has only been positively identified in two wells (Lock 1 and Polda 8) and has not yet been completely penetrated. (Wells in the onshore basin proper have penetrated no further than the top of this glacigene section).

In South Australia, Permian sediments are important hosts for fossil fuel deposits. In the Cooper Basin, economic oil and gas deposits occur in sediments of Permian Stage 3 to 5 age and in the Arckaringa Basin, potentially economic coal seams occur in Stage 3 sediments. However, in both these basins Permian Stage 2 sediments are non-carbonaceous, glacigene units comparable to those drilled in Lock No. 1. No carbonaceous matter or hydrocarbons were observed in the cored Permian sediments from this well (Kwitko, 1978). Reservoir development was poor and this section is not considered prospective. A more prospective, younger Permian section may be preserved in the deeper, western portions of the Polda Basin and further exploratory drilling should concentrate in areas west of Polda 1 and Polda 5 (Kwitko, 1978).

Pre-Glacial Section

No geological data exists for this section in the onshore trough.

The Mount Wedge grits found near Mount Wedge, Talia Caves and possibly in Polda 3 maybe Pre-Cambrian in age (Harris and Foster, 1974), but these occurrences are outside the basin.

Harris (1974) suggests that these sediments may underlie the Permo-Jurassic sequence in the basin. McInerney (1977) suggests that these rocks may exist at around 700m in the Lock 1 area.

The offshore Polda Basin drilling by AOPL in 1982, revealed a thick section of red beds (with some mobilized and in-situ salt deposits) consisting of red-brown, calcareous siltstone. As mentioned in Section 3, this red bed sequence could underlie the onshore Permian glacials. (Due to the offshore basement swell, a direct pre-Tertiary seismic tie between the troughs is not possible).

No source rocks were found in the red beds and reservoir development was very poor. A low geothermal gradient (1.7°C/100m) in this section also downgraded the prospectivity.

7. REFERENCES

0025

- Columbia No. 1, 1982. Well Completion Report. Australian Occidental Pty Ltd (unpublished)

- Cribb, J.L., Vickers, I.R., 1973. Experience with Transformation of Aeromagnetic Data to the Pole. Bull. Aust. Soc. Explor. Geophys. 4, 1-8.

- Gatehouse, C.G., 1980. Investigation of Lock Coal Under E.L. 280. S. Aust. Dept. Mines and Energy report 79/141 (unpublished).

- Harris, W.K., 1973. Chevron Exploration Corpn. palynological examination of selected drillholes, Polda Basin, Eyre Peninsula, EL 37. S. Aust. Dept. Mines palaeontological report 13/73 (unpublished).

- Harris, W.K. & Foster, C.B., 1974. Stratigraphy and Palynology of the Polda Basin Eyre Peninsula. Miner. Resour. Rev. S. Aust. 136, 56-78.

- Harris, W.K., 1979 Palynology of the Lock Coalfield: Synoptic Report, S. Aust. Dept. Mines and Energy Rept. Bk. No. 813. (unpublished).

- Kwitko, G., 1978. Lock No. 1 Well Completion Report. Report Book, Dept. of Mines and Energy, S. Aust.

- Ludbrook, N.H., 1969. Palaeozoic Era. IN Parkin, L.W., (Ed.) Handbook of South Australian Geology. Geol. Surv. S. Aust., 84-132.

0024

- McInerney, P.M., 1977. Seismic Refraction Investigation in the Polda Basin. S. Aust. Dept. Mines and Energy Rept. Bk. No. 77/74.

- Mercury No. 1, 1982 Well Completion Report. Australian Occidental Pty Ltd (unpublished)

- Morgan, P.J., 1974. Progress and Final Reports, Exploration of E.L. 37 Lock Area, South Australia. SADME Report 2256.

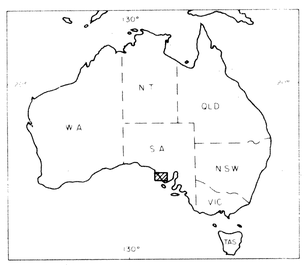
- Nelson, R.G., 1974. A review of geophysical work in the Polda Basin, Eyre Peninsula. Mineral. Resour. Rev. S. Aust. 136:91-98

- Painter, J.A.C., 1970. Groundwater basins of county Musgrave, Eyre Peninsula, Mineral Reservoir, Rev. S. Aust., 133:52-79.

134°30'
135°00'
135°30'
136°00'
136°30'
33°00'
33°30'
33°45'
34°00'

135°05'
33°10'
135°35'
33°20'
136°20'

VENUS BAY
81-03
81-01
81-22
81-20
81-18
81-14
Talia Caves
MUCKA CUDLA 1
4
2
3
5
Mount Wedge
COLTON 1
"Polda"
POLDA 1
A'
A
EL 434
29
Lock
21
28
LOCK 1
8
11
10
9
TUCKEY 1
Tuckey
13
12
Cleve
U
D
81-04
81-02
WALDEGRAVE ISLAND
Elliston
GREAT
EPP-SA 15
FLINDERS ISLAND
AUSTRALIAN BIGHT
PEL 21



LEGEND:

- TUCKEY 1 — S.A.D.M.E. stratigraphic well
- 21 — S.A.D.M.E. /ETSA coal exploration drillhole P21
- U / D — Basin Fault
- U / D — Inferred Fault
- Approx. Basin Limit
- 81-02 — AOPL Seismic line
- Gravity Low Axis
- Gravity High Axis
- A' / A — S.A.D.M.E. reflection Seismic line
- E.L. 434 held by ETSA over Lock coal deposit

SCALE 1 : 250 000

5 0 5 10 15 20 25Km

AUSTRALIAN OCCIDENTAL PTY. LTD.
PETROLEUM DIVISION

SOUTH AUSTRALIA

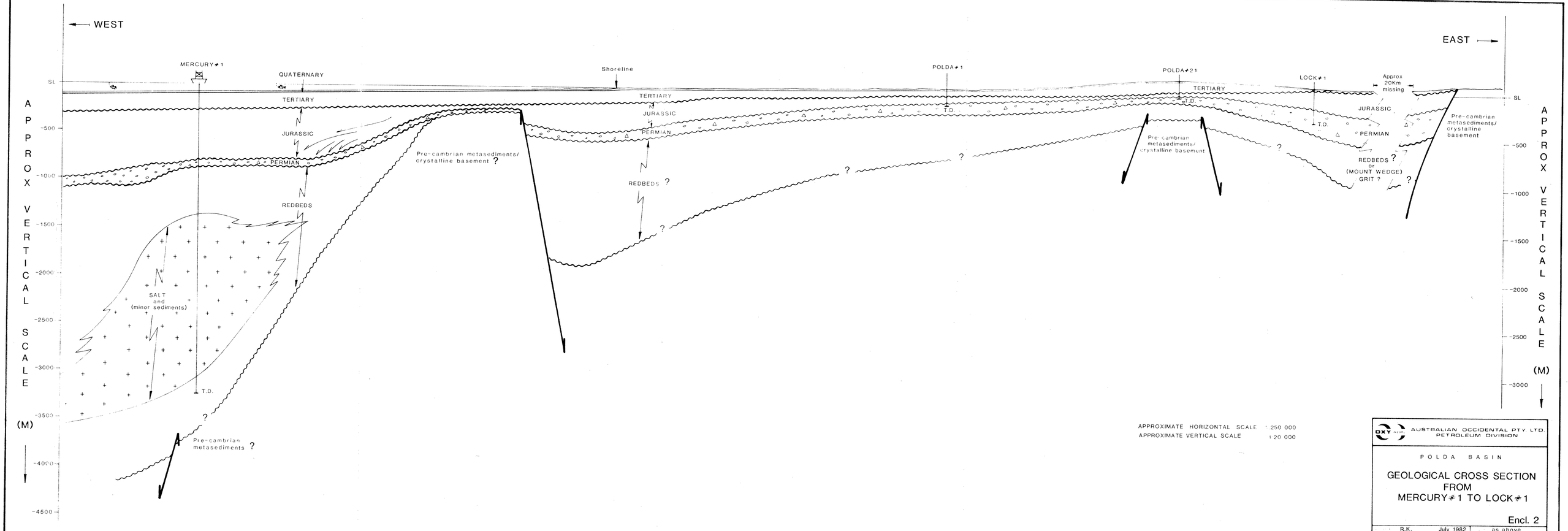
PEL-21 POLDA BASIN LOCATION MAP

Encl.1

DRAWN R. K. T. B. July 1982 SCALE 1:250 000 PLAN No. 8

File: A-3

4932-1



APPROXIMATE HORIZONTAL SCALE 1:250 000
APPROXIMATE VERTICAL SCALE 1:20 000

AUSTRALIAN OCCIDENTAL PTY LTD.
PETROLEUM DIVISION

POLDA BASIN

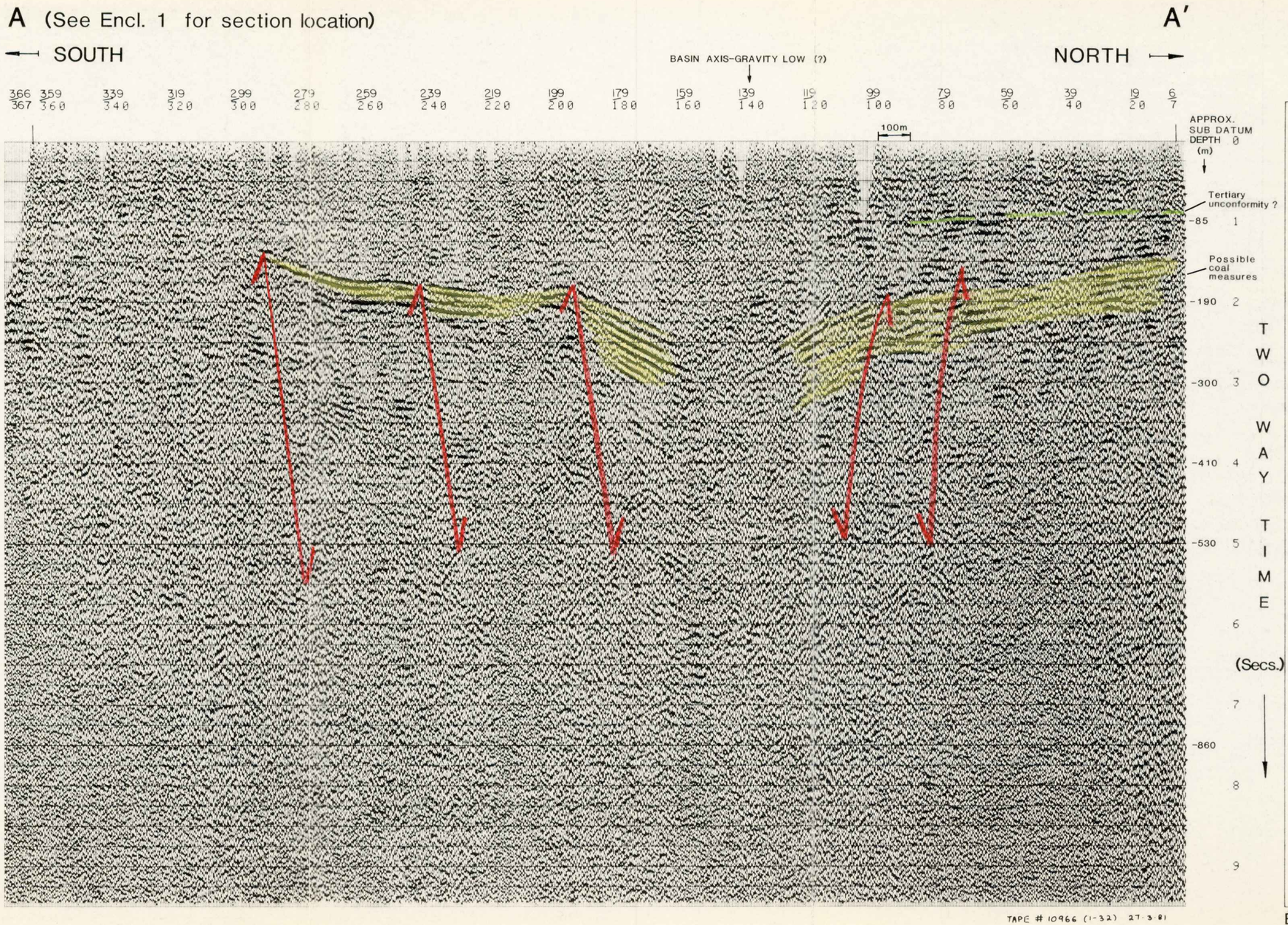
GEOLOGICAL CROSS SECTION FROM MERCURY #1 TO LOCK #1

Encl. 2

R.K.	July 1982	as above
T.B.	July 1982	8

4932-2

File: D-2



TAPE # 10966 (1-32) 27-3-81

DEPARTMENT OF MINES AND ENERGY
(SOUTH AUSTRALIA)

AREA : LOCK
LINE : PB-80-A
SHOTPOINTS : 6/7 – 366/367
DIGISTACK

FIELD DATA

CREW S A DEPARTMENT OF MINES, GEO SURVEY — DATE 29TH JULY – 8TH AUGUST 1980
RECORDING INST DHR-1632 — FORMAT SEG Y
RECORDING FILTER
SPREAD CONFIGURATION
GAIN INFORMATION BINARY
RECORDING LENGTH 1.0 sec — SAMPLE RATE 0.5 ms
GROUP INTERVAL 10 ms — SP INTERVAL 20 ms
NO OF GROUP 24
CHARGE ANZ 3 kg x 5
DATUM 50 m

DATA PROCESSING SEQUENCE

[ ] DEMULTIPLEX
[2] RESAMPLE 1 ms
[3] EDIT AND STATICS SHIFT 10 ms
[4] DATUM STATICS
[5] COMMON DEPTH POINT GATHER
[6] DECONVOLUTION
NO OF FILTER — WHITE NOISE 1 % — FILTER LENGTH 60 ms — GAP 4 ms
DESIGN GATES NEAR OFFSET 50 – 650 ms
DESIGN GATES FAR OFFSET 200 – 800 ms
[7] INITIAL NORMAL MOVEOUT
[8] INITIAL ____ STACK
[9] VELOCITY ANALYSIS BEFORE AUTOSTATICS
[10] RESIDUAL STATICS B 12 FOLD STACK
[11] VELOCITY ANALYSIS AFTER AUTOSTATICS
[12] FINAL NORMAL MOVEOUT
[13] FINAL COMMON DEPTH POINT SUM 12 FOLD DIGISTACK
[14] DIGITAL FILTER — NO OF FILTER 1
TIME (sec) BAND PASS (Hz) — TIME (sec) BAND PASS (Hz)
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[15] TIME VARYING EQUALIZATION — GATE LENGTH 250 ms

DATE 11TH MARCH 1981

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AUSTRALIAN OCCIDENTAL PTY. LTD.

REVIEW OF PETROLEUM EXPLORATION LICENCE NO. 21

SOUTH AUSTRALIA

Brian Barrick

28 October 1982

CONTENTS

INTRODUCTION

Petroleum Exploration Licence 21 (P.E.L. 21) was granted to Australian Occidental Pty. Ltd. on the 24th February, 1982. The main interest in the area centres on the onshore extension of the Polda Trough.

A review of the Petroleum Potential of the area (Kirk, 1982) and a study of the natural environment were undertaken by A.O.P.L. The results of this work together with drilling results in the offshore portion of the Trough (EPPSA-15) downgrade the hydrocarbon potential of the Licence Area.

REVIEW OF PREVIOUS WORK

No previous Petroleum Licence has been issued covering the area of P.E.L. 21. Previous work in the area has largely been conducted by the South Australian Department of Mines and Energy (S.A.D.M.E.). This work can be broadly classified as geological and geophysical.

Geological

A series of shallow stratigraphic holes were drilled by S.A.D.M.E. which yielded limited information on the distribution of sediments in the area. Combining these data with results from the offshore area a reasonably complete geological picture can be constructed. Surface geology was also mapped, but added little to the subsurface picture.

The detail of the available data has been summarized (Kirk, 1982). In essence the section detailed is similar to that found offshore into the Permo-Carboniferous. The one deep well, however, did not reach the base of the diamictites.

Geophysical

The majority of the geophysical work has been regional gravity and magnetics and, therefore, little is known about the detailed structuring of the basin. Only one high resolution seismic line is available. The four kilometre line shows the graben to be formed by simple block faults. High amplitude events at approximately 300m, effectively shadow any data below.

CURRENT WORK

The recent work programme in the block was two fold in its aims. The main thrust was to assess whether or not the onshore basin morphology was similar to the offshore. The ancillary work was an environmental study to assess the feasibility of conducting large scale works in the area.

Basin Studies

Using the data derived from offshore work (EPPSA-15) all available data were studied to ascertain similarities between the two parts of the basin. Excellent correlations were established in the post-Permo-Carboniferous section. The major differences noted were within the Jurassic Polda formation where, although a fluvial point bar depositional environment is postulated for both areas, the development of coals in the offshore area is more restricted.

The Permian in the Licence area appears to be substantially thicker than offshore. The diamictites, as yet unnamed, are similar in appearance throughout the whole trough. It is suggested here that it may be possible to subdivide the diamictites into three based on lithology.

Upper Beds : yellow brown, sticky, soluble claystone found only in Mercury #1 well. Maximum development 19 metres in Mercury #1.

Middle Beds : a conglomeratic green to green-brown mudstone. Clasts are generally rounded and are predominantly granitic and gneissic with minor dolerite, quartzite and basalt. This unit is widely distributed across the area and is of proven Permian age. Maximum development of this unit is in the Lock 1 well.

Lower Beds : this unit is a conglomerate with increasing percentages of calcareous red-brown siltstone clasts. This probably represents a basal unit with pebbles derived from a pre-Permo-Carboniferous section similar to that seen offshore. Kwitco considered that the clasts were reworked Permian but the data recently obtained from the offshore area cast doubts on this.

No sediments have been recorded in the onshore section which would correlate with the massive highly oxidised evaporitic sediments offshore. The Lower Beds of the diamictites suggest that the section may be present in the area and would well underlie the deeper portion of the onshore trough.

Regional studies show no indications of a salt section in the onshore area and therefore it is thought that the pre-Permo-Carboniferous section if present will be similar to the section in the Columbia area and not contain halite.

The only potential source rocks identified by this study are in the Polda Formation and their depth of burial plus rank would appear to preclude them as actual sources.

The pre-Permo-Carboniferous section should not be a potential source based on correlations to the offshore where the same section was both barren and thermally immature.

A review of the limited available geophysical data indicates that reprocessing of these data would not greatly advance the understanding of the basin. A new large scale reflection seismic survey would be required to do this.

Environmental Studies

A detailed study of the environment of the Polda area was undertaken to assess the potential impact in the area of an extensive exploration programme. This study addressed itself to the surface environment only.

The study concluded that damage to a relatively fragile environment would be severe initially but could be rectified by careful remedial action.

The presence of Conservation Reserves and Nature Reserves within the license area would restrict the area which could be explored.

The area is one of low rainfall and as a result ground water is essential to the farming communities in the area. Surface and subsurface contamination of the water resources of the area is a problem that would have to be addressed in detail prior to any exploration activity in the area.

HYDROCARBON POTENTIAL

The prospectivity of the License area is considered to be extremely low. The results of recent drilling in the offshore portion of the Trough have substantially downgraded the license area. A major facies change in the pre-Permo-Carboniferous would have to be invoked to engender any prospectivity in the area. The general evidence available precludes this.

REPORTS APPLICABLE TO PERMIT

1. Kirk R.B., 1982. Report on P.E.L. No. 21

2. 1982. Declaration of Environmental Factors, P.E.L. No. 21.

BIBLIOGRAPHY

Cribb, J.L., Vickers, I.R., 1973. Experience with Transformation of Aeromagnetic Data to the Pole. Bull. Aust. Soc. Explor. Geophys. 4, 1-8.

Gatehouse, C.G., 1980. Investigation of Lock Coal Under E.L. 280. S. Aust. Dept. Mines and Energy report 79/141 (unpublished).

Harris, W.K., 1973. Chevron Exploration Corpn. palynological examination of selected drillholes, Polda Basin, Eyre Peninsula, EL 37. S. Aust. Dept. Mines and Energy palaeontological report 13/73 (unpublished).

Harris, W.K. & Foster, C.B., 1974. Stratigraphy and Palynology of the Polda Basin Eyre Peninsula. Miner. Resour. Rev. S. Aust. 136, 56-78.

Harris, W.K., 1979. Palynology of the Lock Coalfield: Synoptic Report, S. Aust. Dept. Mines and Energy Report. Bk. No. 813 (unpublished).

Kwitko, G., 1978. Lock No. 1 Well Completion Report. Report Book, Dept. Minesf and Energy, S. Aust.

Ludbrook, N.H. 1969. Palaeozoic Era. IN Parkin, L.W., (Ed.) Handbook of South Australian Geology. Geol. Surv. S. Aust., 84-132.

Morgan, P.J., 1974. Progress and Final Reports, Exploration of E.L. 37 Lock Area, South Australia. SADME Report 2256.

Nelson, R.G., 1974. A review of geophysical work in the Polda Basin, Eyre Peninsula. Mineral. Resour. Rev. S. Aust. 136:91-98.

Painter, J.A.C., 1970. Groundwater basins of county Musgrave, Eyre Peninsula, Mineral Reservoir, Rev. S. Aust., 133:52-79.

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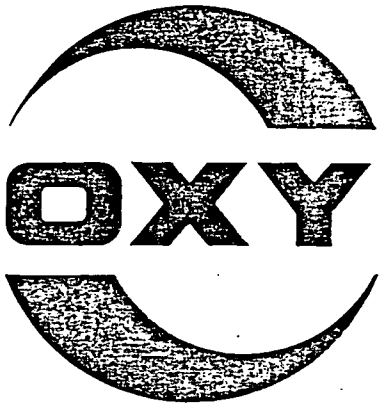
DECLARATION OF ENVIRONMENTAL FACTORS

PEL 21



AUSTRALIAN OCCIDENTAL PTY. LTD.

AUSTRALIAN OCCIDENTAL PTY. LTD.

PETROLEUM DIVISION

DECLARATION OF ENVIRONMENTAL FACTORS

EYRE PENINSULA

S.A. PEL 21

AUSTRALIA

CONTENTS

1. INTRODUCTION

The Onshore Polda Basin, PEL 21, is located on the west-central area of Eyre Peninsula.

Should exploration be carried out in this lease, one of the prime considerations is environmental damage.

Therefore, in order to minimize this damage, a study must be undertaken to identify any rare or threatened elements of the environment.

The knowledge of such elements can be taken into account when planning the exploration, so that minimal risk will be placed upon these elements.

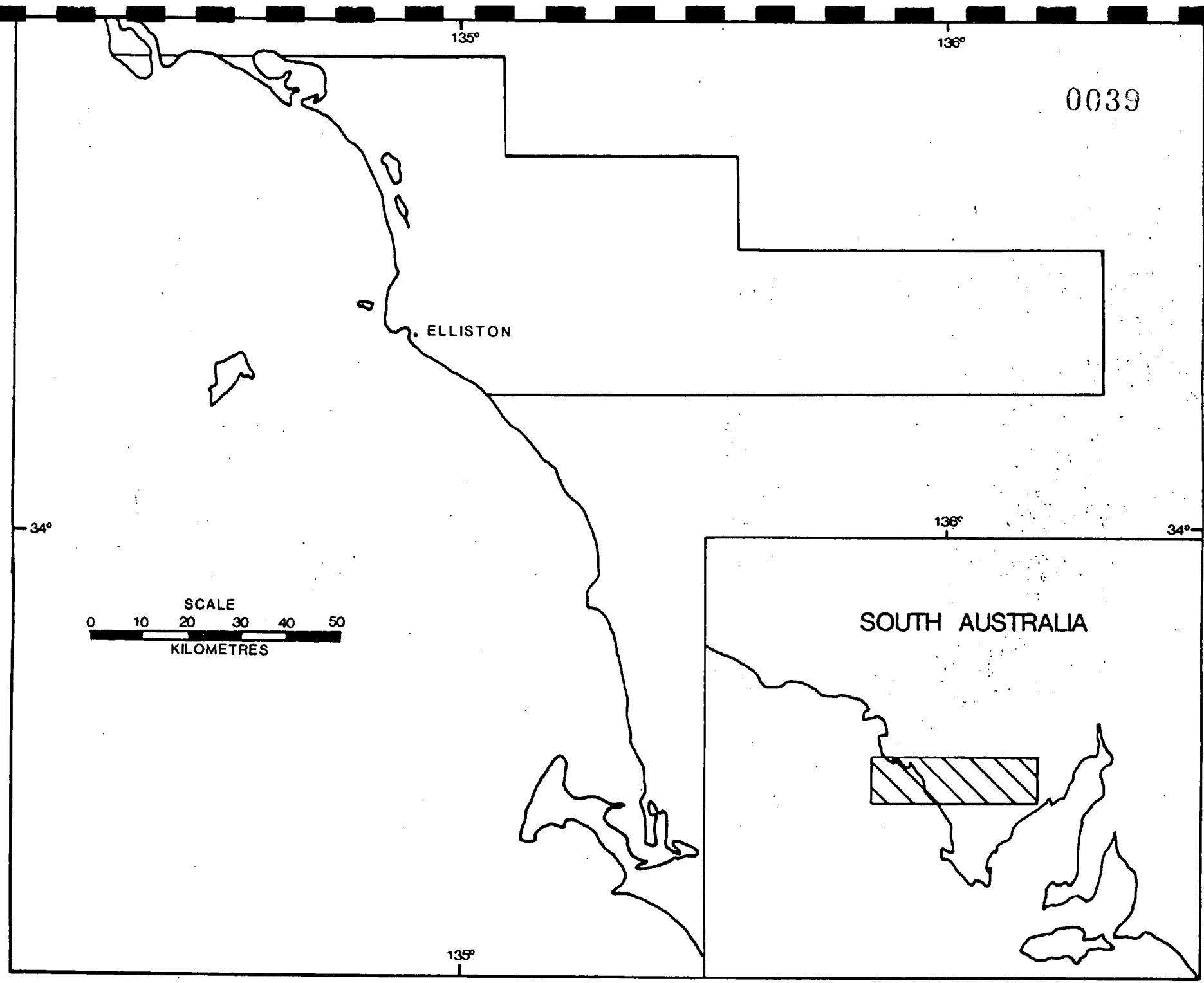


FIG. 1: LOCATION OF THE EXPLORATION LEASE

2. DATA AQUISITION

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As the lease was not visited for the purpose of this study, all the information had to be obtained from photographs and previous surveys.

Sattelite imagery (Bands 5 and 7, False Colour) was used extensively for the identification of natural vegetation areas, coastal features and significant quartzite / granite formations. These features were mapped directly from the sattelite imagery (scale 1:250 000) with clarification from aried mozaics (1:50 000).

Several surveys had been done in this area of Eyre Peninsula. Blesing, Hambidge and Hincks Conservation Parks had all been studied by the Nature Conservation Society of South Australia. Considerable use was made of the flora and fauna species list compiled by these surveys.

A report on the natural vegetation of Eyre Peninsula, by F.A. Mowling, was also used considerably.

A list and description of the aboriginal sites was obtained from the Heritage Unit of the Department of Environment and Planning.

All other information was derived from the sources listed in the Reference Section.

3. ENVIRONMENTAL DESCRIPTIONS

3.1 PHYSICAL GEOGRAPHY

Eyre Peninsula is part of the Western Shield and has been covered by recent deposits of sand, sand dunes and kunkar limestone. The sand dunes are all roughly parallel to the west coast of the peninsula. The old crystaline rocks of the shield outcrop along the east coast and occasionally in the western and central regions, giving rise to some spectacular but not very high hills, such as Darke Peak, Wudinna Hill and Mt. Wedge. These hills are often surrounded by fertile soils, which have been used for agricultural purposes, while the poor soil, lying further away have generally remained uncleared.

On the Western side of the Peninsula, travitine, (a hard limestone) commonly occurs on the surface, resulting in an inhospitable appearance. The vegetation reflects this by tending to be sparse and dwarfed. To the north it is drier, and the myall, saltbush and bluebush are typical of these sparselands.

Sheep grazing for wool is the main farming activity on Eyre Peninsula, and wheat is the main cereal crop, but barley and oats, especially around Elliston are also grown.

The surface of the Western plains is characterized by rolling hills and vales, but the underlying limestone is exposed in some places, such as near Bascombe Well Conservation Park. This limestone generally lacks any surface drainage, but where the water table is close to the surface tall, well grown River Red Gums can be found.

3.2 FLORA

3.2.1 NATURAL VEGETATION

Objectives

The main objective is to describe the natural vegetation of the area, and then to determine the effect of exploration activities on the vegetation.

Vegetation

Because the lease area covers a fairly large area, many vegetation associations can be found. These associations are described in terms of life form, height of the tallest stratum and the canopy cover. These terms are described in table 1.

THE VEGETATION ASSOCIATIONS

Figure 2 shows the areas where the Vegetation Associations are found.

1. Vegetation associated with undulating flats with calcrete ridges.

1.1 A three strata vegetation of mid dense to sparse mallee shrub containing *Eucalyptus sect Dumosa* and *E. socialis* with or without *E. foecunda*. The understorey consists of sparse to mid dense lon shrub containing *Melaleuca lanceolata* with or without *M. acuminata* over very sparse tussock and hummock grasses of *Gahnia lanigera* and *Triodia irritans*.

This vegetation type is predominant in area 3 and is also found in areas 1 and 5.

Life Form & Height of Tallest Stratum	PROJECTED FOLIAGE COVER OF TALLEST STATUM			
	Dense (71-100%)	Mid Dense (31-70%)	Sparse (11-30%)	Very Sparse (11%)
Trees Over 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland
Trees Over 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland
Trees Over 5-10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland
Shrubs 2-8m	Closed Scrub	Open Scrub	Tall Shrubland	Tall Open Shrubland
Shrubs 0-2m	Closed Heath	Open Heath	Low Shrubland	Low Open Shrubland
Hummock 0-2m	-	-	Hummock	Open Hummock
Grasses	-	-	Grassland	Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Emphemeral Herbland

TABLE 1 STRUCTURAL VEGETATION FORMATIONS IN AUSTRALIA

from THE NATIVE FOREST & WOODLAND VEGETATION OF SOUTH AUSTRALIA.

1.2. Another 3 strata vegetation form with a mid dense to sparse upper strata of *Eucalyptus sect Dumosa*, *E. diversifolia* and *E. socialis* over a sparse middle strata of *Melalueca lanceolata* with or without *M. uncinata* and *M. acuminata*. The bottom strata consists of very sparse dwarf shrub containing *Acrotriche patula* and/or *Pimelea serpyllifolia* with very sparse tussock and hummock grass, *Gahnia lanigera* and *Triodia irritans*.

This vegetation type is predominant in areas 5 and 10, and is also found in areas 1, 2, 3, 4 and 6.

1.3. A single strata association of mid dense dwarf mallee shrub containing *Eucalyptus socialis* and mid dense low shrub of *Melalueca lanceolata* over litter.

This vegetation is present in area 1 only.

1.4. A three strata vegetation with a top strata of mid dense to sparse mallee shrub containing *Eucalyptus diversifolia*, sometimes with *E. socialis* or *E. sect Dumosa*, over a middle strata of low shrub formation, containing *Melalueca lanceolata* and *Hakea cycloptera* with or without *Melalueca lanceolata* and *M. acuminata*. The lower strata is of mid dense to sparse dwarf shrub, *Dodonaea hexandra* and sparse tussock grass, *Gahnia lanigera*.

This vegetation type is predominant in areas 2 and 4, and is also found in area 5.

3.2. Vegetation associated with calcrete flats. 0045

2.1. A single strata vegetation of sparse *Eucalyptus porosa* and *Callitris preisii* with *Eucalyptus socialis* and *E. sect Dumosa* with or without a very sparse medium shrub of *Melalueca lanceolata* over herbaceous grasses.

This vegetation type is found in areas 1, 2, 6, 10, 12, 14, 15 and 18.

2.2. Another single strata vegetation containing both mallee shrub and tree which are represented by *Eucalyptus diversifolia, E. socialis, E. sect Dumosa, E. gracilis, E. oleosa, Pittosporum phillyneoides* and *Casuarina stricta* over herbaceous grasses.

This vegetation is found in areas, 8, 10, 14, 16 and 18.

3. Vegetation associated with glades.

3.1. A single strata association of mid dense to very sparse tussock grass, *Gahnia lanigera, Triodia irritans,* with or without hummock grass, and occasionally with the dwarf shrub formation of *Pimilea serphifolia* and *Acrotriche patula.*

This vegetation is found in areas 1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 14, 15, 16 and 18.

3.2. Another single strata association of mid dense to sparse emphemeral grass, *Poa sp,* over a mid dense moss carpet.

This vegetation is found in areas 1, 6, 10, 12 and 18.

3.3. A 2 strata association with a top strata of very sparse mallee tree *Eucalyptus gracilis* and/or *E. diversifolia* and *E. sect Dumosa*, over a dwarf shrub formation of *Pimelea serphyllifolia* with *Acrotriche patula*.

This vegetation is found in areas 1, 2, 4 and 5.

4. Vegetation associated with clay soils underlain by calcrete.

4.1. A 2 strata association of very sparse, emergent *Eucalyptus camaldulenses* and *E. diversifolia* over a mid dense low shrub formation of *Melalueca neglecta* and *Callistemon macropunctatus*.

This vegetation is found in areas 1 and 4.

4.2. A single strata association of dense low shrub containing *Callistemon macropunctatus*.

Found in area 1 only.

4.3. A multi-strata association with a top stata of very sparse *Eucalyptus camaldulensis* over a very sparse mallee shrub formation containing *Eucalyptus diversifolia* over a mid dense low shrub formation of *Melalueca neglecta, M. uncinata, M. acuminata* and *Thryptomene miqueliana* over a bottom strata of sparse dwarf shrub containing *Baeckea crassifolia, Hakea cycloptera, Dodonaea, hexandra* and *Acrotriche patula*.

This vegetation is found in areas 1 and 2.

5. Vegetation associated with unconsolidated sand dunes.

5.1. A 3 strata association with a top strata of sparse mallee shrub formation, *Eucalyptus incrassata, E. foecunda* and *E. socialis* over sparse medium shrub of *Melalueca uncinata* and *M. lanceolata* over a mid dense lower strata of hummock and tussock grasses, *Gahnia lanigera* and *Triodia irritans* with the occasionally dwarf shrub formation of *Phebalium bullatum, Leucopogon cordifolius* and *Grevillea ilicifolia.*

This vegetation is found in areas 4, 5 and 6.

6. Vegetation associated with dunes.

6.1. A 2 strata association of mid dense to sparse *Callitris preissii* and *Eucalyptus porosa* over a very sparse medium shrub formation of *Melaleuca lanceolata* over litter.

This vegetation is predominant in areas 6, 12 and 18 and is also found in areas 10 and 14.

6.2. A single strata association of sparse mallee shrub and tree containing *Eucalyptus sect Dumosa, E. porosa* and *E. diversifolia* over herbaceous grasses.

This vegetation is predominant in area 16 and present in areas 6, 8, 12, 14, 15 and 18.

7. Vegetation associated with flats.

7.1 A multi-strata association with a mid dense mallee shrub formation of *Eucalyptus oleosa* and *E. Sect Dumosa* with or without *E. socialis* and *E. gracilis* over very sparse medium shrub of *Melaleuca lanceolata* with *Acacia merralii* over a very sparse low shrub formation of *Melaleuca lanceolata, Acacia merralii* and *A. sclerophylla* over a very sparse dwarf shrub of *Westringa rigida* with or without sparse hummock/tussock grass. *Triodia irritans* and *Gahnia Lanigera.*

This vegetation is predominant in areas 13 and is also found in areas 10 and 12.

8. Vegetation associated with the flat topped insetherg, Mt. Wedge.

8.1 This 3 strata association consists of very sparse emergent *Callitris preissii, Santalum sp.* and *Casuarina stricta* over a very sparse to mid-dense medium shrub formation of *Melaleuca uncinata* over very sparse low shrub formation of *Daviesia polyphylla, Thryptomene miqueliana* and *Leucopogon cordifolius* over sparse hummock grass, sp. *Triodia irritans.*

This vegetation is only found on Mt. Wedge (Area 7).

9. Vegetation associated with the Darke Peak Ranges (Area 9).

9.1 This 3 strata association is found on the footslopes of the Darke Range. The top strata is a mid dense to sparse Mallee shrub formation of *Eucalyptus oleasa, E. sect Dumosa, E. calycogona* and *E. foecunda* over a very sparse low shrub formation of *Acacia calamifolia, Melaleuca uncinata, Baeckea behrii* and *Lasiopetalum baueri* over a bottom strata of very sparse dwarf shrub and hummock grass, containing *Acacia calamifolia, Dodonaea bursariifolia, Lasiopetalum baueri* and *Eutaxia microphylla* with *Triodia irritans.*

9.2 This 2 strata association is found on the ridges of the Darke Range. The upper strata is a very sparse low shrub formation of *Melaleuca uncinata* and *Calythrix involucrata* with *Hebbertia stricta*, *Grevillea pauciflora* and *Baeckea behrii* over the lower strata of very sparse to sparse hummock and tussock grass, *sp. Triodia irritans* and *Lepidosperma viscidum* with very sparse dwarf shrub of *Hibbertia stricta* and *Boronia inorata*.

Both these associations are only found in the Darke Range Complex of area 9.

10. Vegetation associated with low, lightly consolidated dunes.

10.1 A 3 strata association with a mud dense to sparse mallee shrub formation of *Eucalyptus sect. Dumosa*, *E. foecunda* and *E. Obesa* over sparse to very sparse medium shrub of *Melaleuca lanceolata* over very sparse dwarf shrub formation of *Westringia rigida* with a mid-dense to sparse covering of hummock and tussock grasses, *Triodia irritans* and *Gahnia lanigera*.

This vegetation is found in areas 10 and 13.

10.2 A 3 strata association with mid-dense to sparse mallee shrub of *Eucalyptus foecunda* and *E. Sect Dumosa* with or without *E. obesa* over a very sparse medium shrub formation of *Melaleuca lanceolata* either with or without a very sparse low or dwarf shrub formation of *Melaleuca lanceolata* and *Westringia rigida* over very sparse hummock and tussock grasses, *Triodia irritans* and *Gahnia lanigera*.

This vegetation is found in areas 12 and 13.

11. Vegetation association with the exposed sheet and rubble calcrete of the Polda lowlands.

11.1 A multi-strata of very sparse *Callitris preisii* over a very sparse to sparse mallee shrub formation of *Eucalyptus sect Dumosa* and *E. obesa var.* over very sparse low shrub of *Melaleuca lanceolata* with *Acacia merrallii*

over a very sparse to sparse carpet of tussock grass and dwarf shrub. *spp. Gahnia lanigera* with *Pimelea serphyllifolia* and *Acrotriche patula*.

This is the predominant vegetation in area 14.

11.2 A 3 strata association with a top strata being a mid dense mallee shrub formation of *Eucalyptus sect Dumosa* and *E. Obesa var*. over a mid-dense to sparse low shrub of *Melaleuca lanceolata*, *Acacia lingulata*, *Daviesia polyphylla* and *Acacia merrallii* over very sparse dwarf shrub of *Pimilea serphyllifolia* with mid dense tussock grass *Gahnia lanigera*.

The vegetation is found in area 14.

12. Vegetation associated with wetlands, such as saline and fresh water systems subject to inundation.

12.1 A 1-2 strata association of sparse to mid dense, tall to medium shrub containing *Melaleuca halmaturorum* with or without sparse to mid dense dwarf shrub *Anthocnemum sp*. and *Sahcornia sp*.

This vegetation is found in areas 11 and 17.

12.2 A single strata association of mid dense to sparse dwarf shrub *Anthorenemum sp*. and *Salicornia sp*.

This vegetation is found in area 11.

12.3 Another single strata association with mid dense to dense tussock grass, *Gahnia trifida* with or without *Scirpus nodosus*.

This is the predominant vegetation in area 17.

13. Vegetation association with a coastal complex, in particular with calcareous aoelian dunes overlying calcrete.

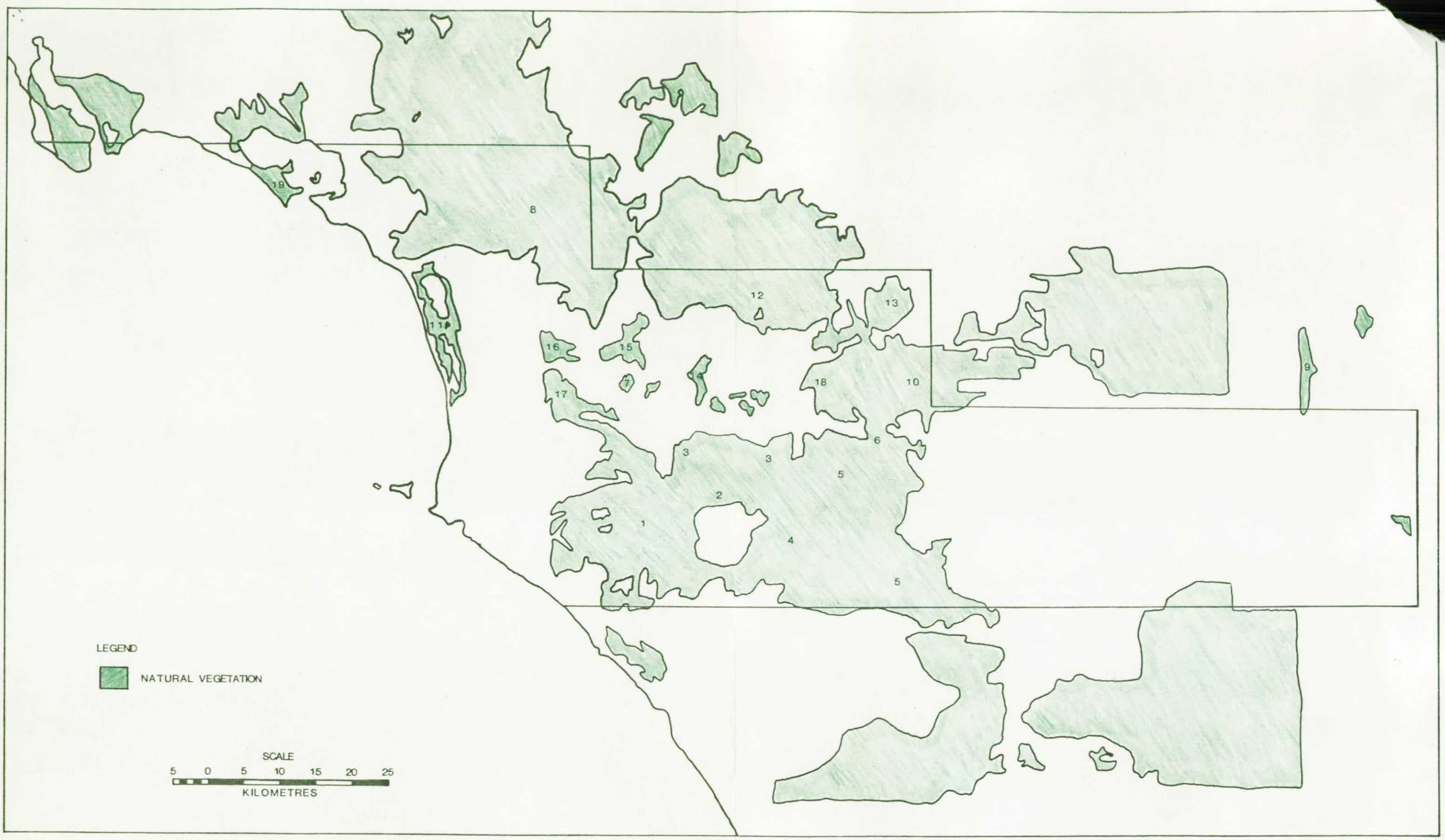

FIG. 2
AREAS OF SIGNIFICANT NATURAL VEGETATION

13.1 A 2 strata association of sparse to mid dense, low shrub containing *Leucopogon parviflorus*, *Olearia axillaris* and *Acacia sophorae* over sparse to very sparse *Carpobrotus aequilaterus*, *Lepidosperma gladiatum* and *Scirpus nodosus*.

This is the predominant vegetation of area 11.

14. Vegetation associated with coastal cliff tops.

14.1 A single strata association of mid dense swarf shrub containing *Opercularia varia* with *Templetonia retusa*, *Scaevola crassifolia*, *Lasiopetalum bauerii*, *Melaleuca lanceolata*, *Leucopogon parviflorus* and *Spyridium subochreatum*.

Found in area 19.

14.2 A 2 strata association with sparse low shrub formation of *Alyxia buxifolia* with *Melaleuca lanceolata* over sparse dwarf shrub of *Pomaderris obcordata* with *Lesiopetalum baueri*, *Epacridaceae sp.*, *Acacia spinescens*, *Exocarpus sparteus* and *Eucalyptus diversifolia*.

This vegetation is found in area 19.

VEGETATION AREAS (SEE FIG 2)

There are many different vegetation areas, each of which have many varying landforms. A description of some of the vegetation areas follows.

AREA 1: Undulating flats with outcropping calcrete ridges constitute the major geography with the corresponding vegetation being types 1.1 and 1.2 and 1.4.

Another distinct landform in this region are the tongues of light brown calcareous sand, underlain by calcrete rubble. This landform extends in from the west.

The vegetation found in association with the calcareous sand is generally a sparse to mid dense mallee shrub

(Eucalyptus sect Dumosa), over a very sparse to sparse medium and low shrub *(Melaleuca lanceolata)* over litter.

The tongues of calcareous sand lie between linear consolidated dunes, which are covered in a mid-dense to sparse mallee shrub *(Eucalyptus diversifolia* and *E. socialis)* over very sparse medium and low shrub *(Melaleuca lanceolata)* over very sparse dwarf shrub *(Acrotriche patula)*.

Glades are found throughout this region and vegetation types 3.3.1 and 3.3.3 appear to be the more prominent.

Callitris preissii, *Callitris canescens*, *Eucalyptus porosa*, and *Pittisporum phillyreoides* occur throughout this area.

AREA 2: This region is uniformly covered by exposed sheet calcrete, forming undulating flats and ridges, which are overlain by red sandy soils or red clay soils.

The calcrete sheets are characterized by 3 strata mallee shrub formations. Types 1.4 on the exposed sheet calcrete and type 1.2 on the sandy soils. Glades are again common throughout. Where the calcrete is overlain by the clay soils very sparse *Eucalyptus camaldulensis* is found, generally without an understorey.

Callitris preissii occurs throughout.

AREA 3: The major landform consists of undulating plains with calcrete ridges, as well as calcrete flats overlain with skeletal soils.

The prominant vegetation is type 1.1. The sandy flats consist of a whipstick mallee formation (1.2) with grasses *Gahnia deusta*, *Gahnia lanigera* and *Triodia irritans* widely distributed. Glades again occur throughout.

AREA 4: Very similar to area two in all respects. The only difference being the presence of unconsolidated siliceous sand dunes containing vegetation type 5.1 in the north eastern section.

AREA 5 + 6: Undulating flats of calcrete with isolated ridges form the major part of the geography. The flats are generally overlain by siliceous sands and occasional unconsolidated siliceous dunes.

A vegetation of sparse mallee (*Eucalyptus foecunda, E. incrassata)* over mid dense low shrub *(Melaleuca uncinata)* over sparse dwarf shrub.

(*Dodonaea bursariifolia)* and grasses *(Triodia irritans, Gahnia deusta)*are associated with the sandy flats to the north.

The sandy flats with calcrete ridges have vegetation types 7.1 present, with mallee shrub *(Eucalyptus obesa)* over medium shrub *(Melaleuca lanceolata)* Vegetation 6.1 and 6.2 can be found in association with the consolidated dune to the north, however, this vegetation has been heavily grazed.

AREA 7: (Mt. Wedge): Mt. Wedge is a flat topped inselberg with steep sided slopes and footslopes. Mt. Wedge is a prominent land mark, as it rises abruptly from the Polda Basin complex

The vegetation is solely of type 8.

AREA 9: Darke Peak Range Complex.
A conglomerate quartzite ridge which is gently sloped on the eastern side and steep sloped on the western side. The footslopes are long and gradual. The soil on the slopes is generally skeletal while the footslopes consist of shallow sands overlying calcrete.

The vegetation associated with Darke Peak is of type

Darke Peak is a prominent and scenic landform feature of Eyre Peninsula and although the vegetation is similar to other quartzite ridges (e.g. Blue Ranges: Hincks Conservation Park), but it has been well conserved, and it is recommended that Darke Peak should continue to be preserved. *

* F.A. MOWLING " THE NATURAL VEGETATION OF EYRE PENINSULA " 1979.

AREA 11: This area comprises of a coastal dune and saline lake system. A parabolic dune system with tongues of type 12.1 vegetation is backed by a land-locked saline lake (Lake Newland). This area is similar to the coorong in some respects and should be given a high priority for conservation. *

* As on previous page.

3.2.2 PROTECTED PLANT SPECIES

There are several plant species which are protected under the National Parks and Wildlife. These species cannot be removed or damaged without written permission from the Minister of Enviroment and Planning.

The following protected species are likely to be found in the lease area :

Orchids :

Acianthus exertus
Acianthus reniformis
Caladenia carnea
Caladenia deformis
Caladenia dilatata
Caladenia filamentosa var. tentaculata
Caladenia latifolia
Caladenia tesselata
Diuris maculata
Eriochilus cacullatus
Leptoceras fimbriatum
Lyperanthus nigricans
Microtis parviflora
Microtis unifolia
Prasophyllum elatum
Prasophyllum fitzgeraldii
Prasophyllum fuscoviride
Prasophyllum odoratum
Prasophyllum pallidum
Pterostylis babarta
Pterostylis cycnocephala
Pterostylis cf. hamiltonii
Pterostylis mitchellii
Pterostylis mutica
Pterostylis pursilla
Pterostylis rufa

Pterostylis squamata
Pterostylis vittata
Thelymitra antennifera
Thelymitra aristata
Thelymitra var. megcalyptra
Thelymitra azurea
Thelymitra luteocilium

Other Species :

Eromophila longifolia (Emu Bush or Long Leaved Eremophila)
Heterodendron oleifolium (Bullock Bush)
Pittosporum phillyreoides (Native or Weeping Pittosporum)
Myoporum platycarpum (Sugar Wood)
Satalum acuminatum (Eucarya acuminata) (Native Peach)
Santalum murrayanum (Eucarya murrayana) (Bitter Quondong)
Cheiranthera linearis (Hand Flower)

DESCRIPTION OF SPECIES

Orchids

Orchids form a well defined family, and may be recognised by two important characteristics. Firstly, all orchids possess an organ called the column, which is formed by the union of the male and female elements, of the flower.

Secondly, orchids possess another organ called the labellum, which in most orchids is different in shape from the other perianth segments.

After a flower owes its chief beauty to the labellum, which even in the smallest species can assume beautiful or fantastic shapes.

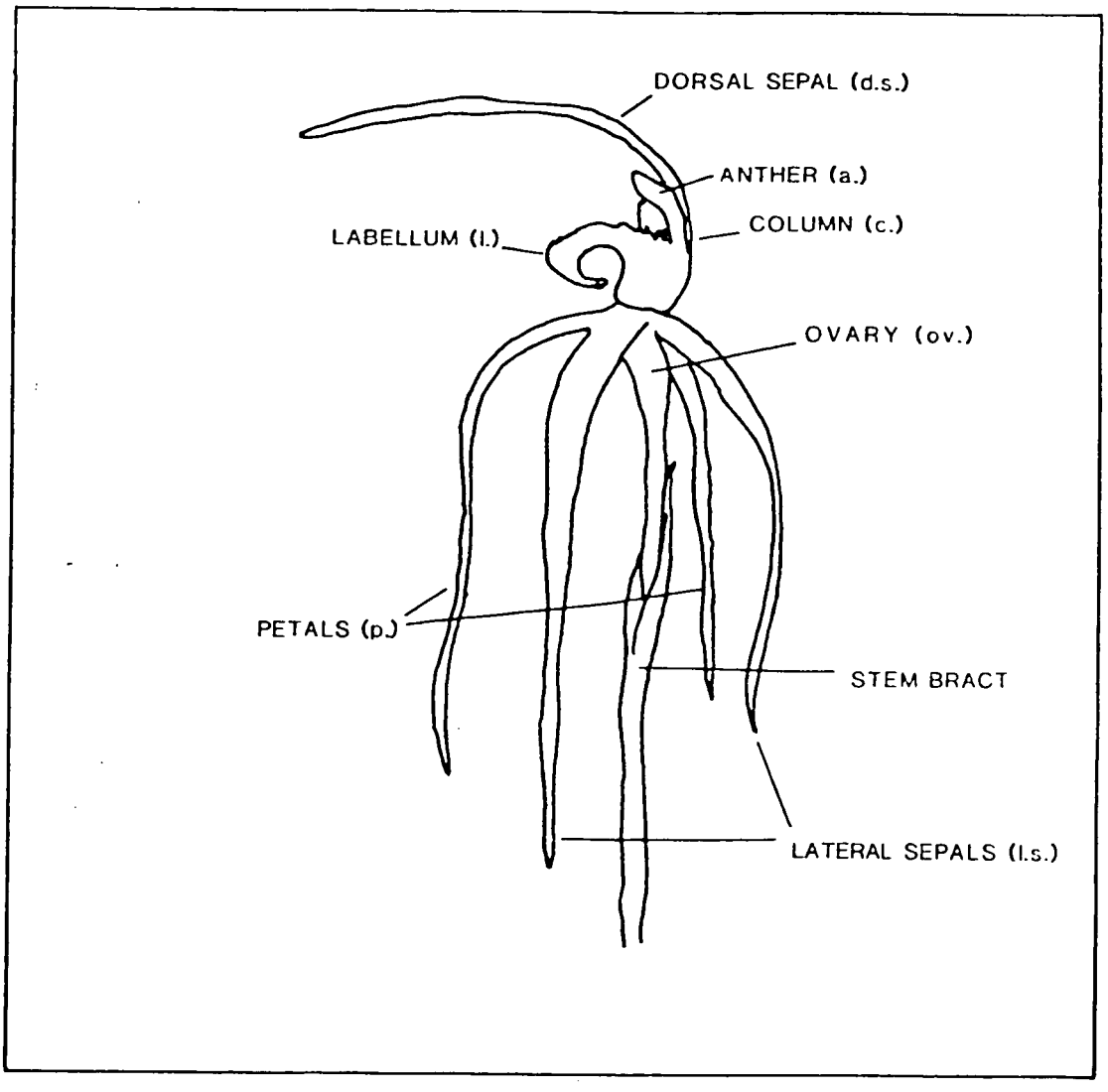

FIG. 3
THE ORCHID

GENERA : ACIANTHUS

Acianthus exertus Mosquito Orchid

This is a slender glabrous plant, 7-22cm high, with a single radical, heart shaped leaf, which is green on the upper surface and often red underneath. There a 3-20 flowers, which are in terminal racemes. The flowers are usually a reddish-purple or rarely a verdant green. The dorsal sepal is about 5-6mm long, with the lateral sepals being slightly shorter. The petals are lanceolate and 2-3mm long. The labellum is ovate-lanceolate in shape and is generally a deeper red than the perianth segments. It is 3mm in length.
See Fig 4.

This orchid flowers between May and June.

Acianthus reniformis Gnat Orchid

A slender plant 7-15cm high. The solitary leaf is sessile, round or heart shaped and is green above as well as underneath. There are generally only 3-6 flowers, but at times only one solitary flower is present. They are reddish brown in colour and rarely verdant green. The dorsal and lateral sepals are 10mm long, with the petals being of the same length, but narrower. The labellum is 10mm long and 4½mm wide, and is oblong in shape, with a point at its tip. There appear to be two varieties of this orchid. The early form flowers in July and August, while the later form, which is darker in colour flowers in September and October.
See Fig 5.

GENERA : CALADENIA

Caladenia Carnea Pink Fingers

Slender plant from 5-25cm high, with one or more blooms which are a pale pink or rarely white in colour. The perianth segment is a dusky green with glandular hairs and pink stripes on the outside.

FIG. 4
Acianthus exsertus

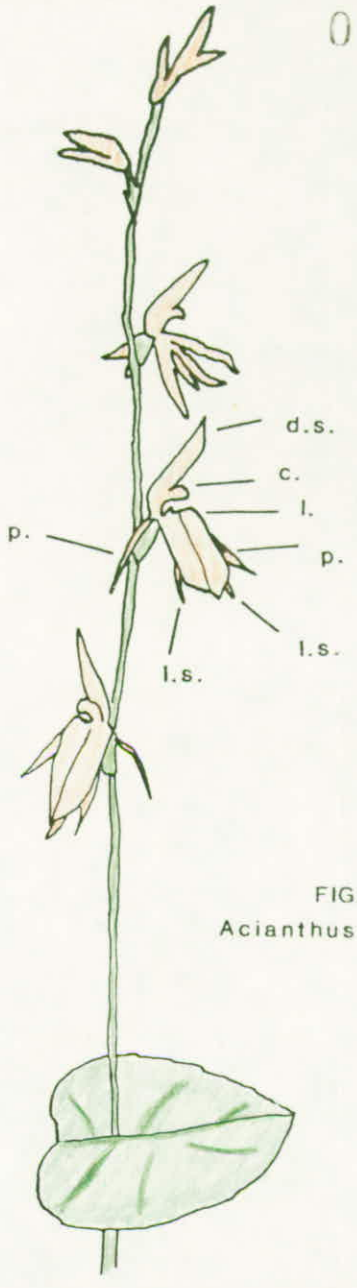

FIG. 5
Acianthus reniformis

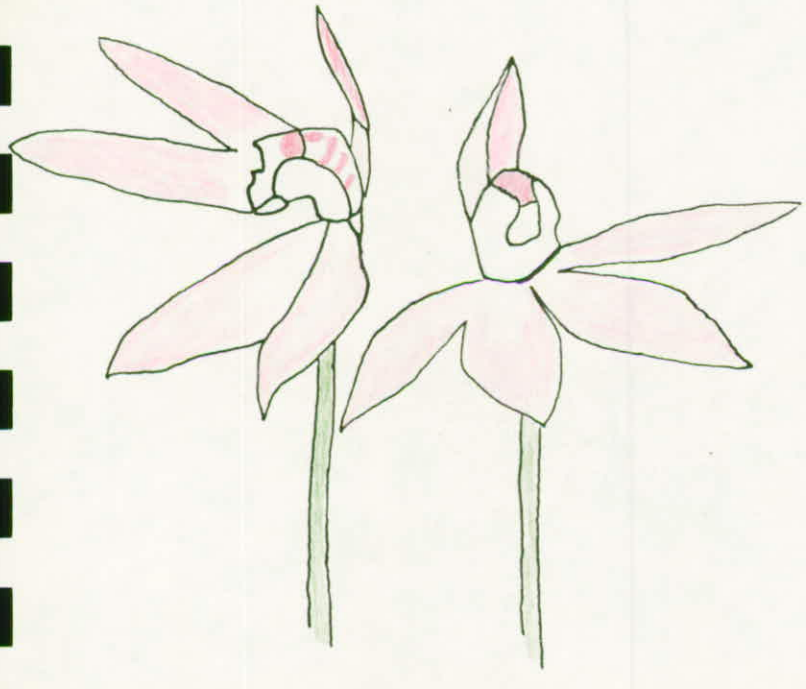

FIG. 6
Caladenia carnea

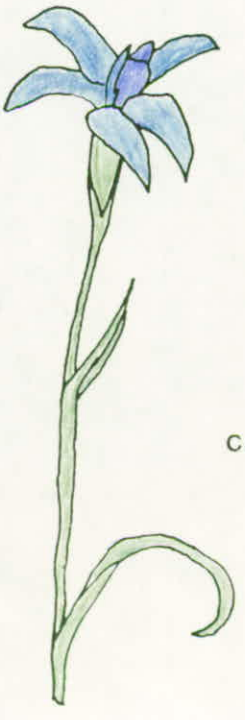

FIG. 7
Caladenia deformis

The dorsal sepal is 6-14mm long which is much shorter than the lateral sepals and petals (6-17mm). The calli is a bright yellow in colour. The labellum is sessile and is divided into 3 parts, being erect at the base and recurved beyond the middle. The labellum has red transverse strips on it. This orchid is spring flowering.

See Fig 6.

Caladenia deformis Blue Fairies

Grows from 6-15cm high. The leaf is almost glabrous and is linear lanceolate in shape, about 6cm long and 4mm wide. There is one solitary flower which is deep blue or occassionally white in colour. The perianth segments are light coloured on the outside, with many scattered minute purple glands. The dorsal sepal is 19mm long, with the lateral sepals and petals being 17mm long. The labellum is contracted towards its base and is 11mm long by 7mm wide. The column is about 10mm long. Flowers in August.

See Fig 7.

Caladenia Dilatata Green or Fringed Spider Orchid

This moderately robust orchid grows 15-45cm high. The leaf is very hairy and is oblong to elliptical-lanceolate. The leaf is often rather wide and between 6-12cm long. There is one large solitary flower which grows up to 10cm in diameter. Green, yellow and maroon are the predominant colours. The tongue has a long green fringe with a maroon tip. The perianth segments are all spreading except the dorsal sepal. They are yellowish green in colour with a central red strip. The dorsal and lateral sepals are about 5cm long. The petals are laceolate and taper to a fine point, they are 3cm long. The labellum is maroon, green and yellowish white and is on a movable claw. Flowers in Spring.

See Fig 8.

Caladenia filamentosa var. tenticulata

This is a very slender plant which is slightly hairy and grows to a height between 15 and 30cm. The leaf, narrow and linear, is 7-15cm long. There are usually 1-3 flowers which are cream coloured with dark markings. The perianth segments are cream coloured with a reddish brown central stripe and tips. The labellum has conspicuous divergent reddish brown veins. The dorsal and lateral sepals are about 5cm long. The petals are considerably shorter. The labellum, which is ovate or cordate, measures 6mm long by 3mm wide and is located on a short claw.

Caladenia latifolia Pink Fairies

This moderately robust, hairy orchid is 15-30cm high. The leaf is very hairy and grows to 10cm in length. There are 1-3 moderately large flowers which are either pink or white. The perianth segments are lighter on the outside and are all spreading, with the exception of the dorsal sepal. The labellum is pink or white and 6-7mm long. Flowers in Spring.
See Fig 9.

GENERA : DIURIS

Diurus maculata Leopard Orchid

A moderately slender plant up to 30cm high with 2-3 leaves. The leaves are narrow lanceolate up to 10cm long. There are 2-6 flowers on slender pedicels. They are yellow and blotched with dark brown colourings. The under surface of the perianth is more blotched than the upper. The dorsal sepal is 9mm long, the lateral sepals are greenish and are crossed in the mature flower. This is a hardy free flowering species which is often abundant in spring.

See Fig 10.

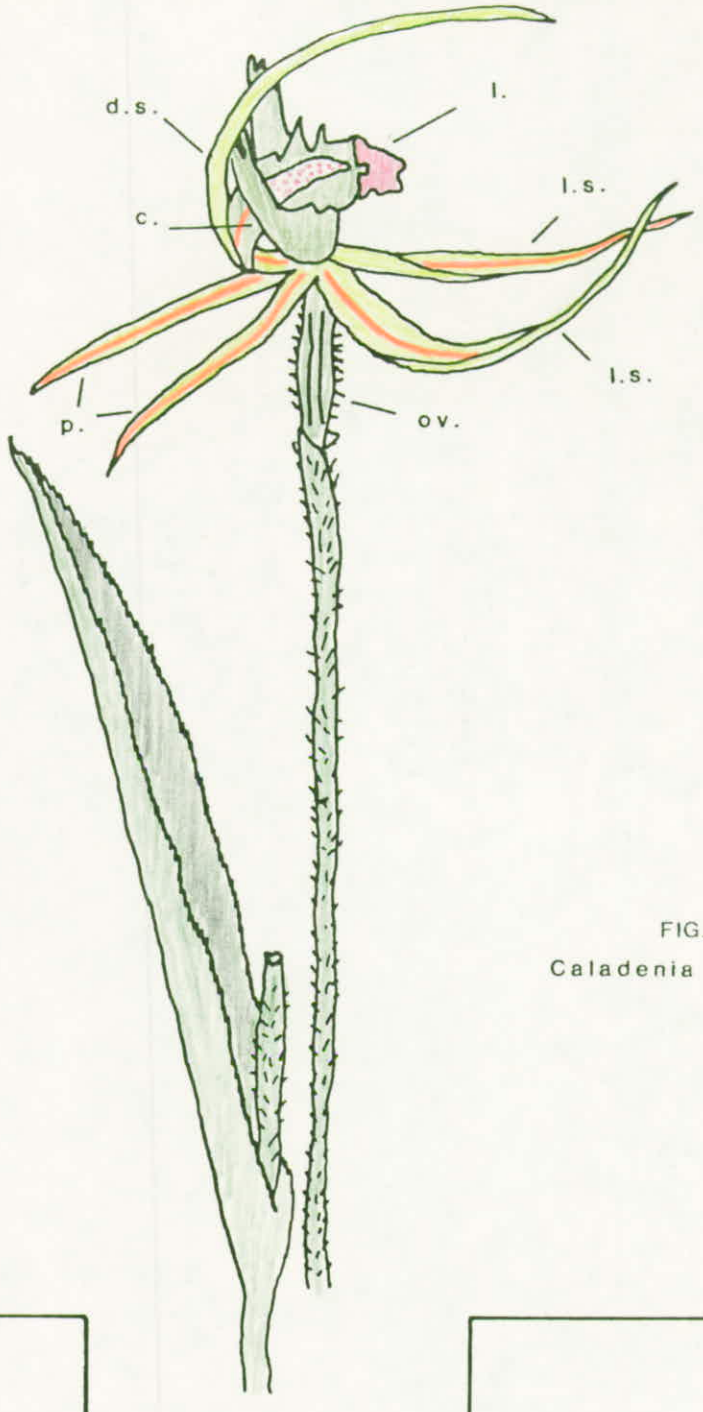

FIG. 8
Caladenia dilatata

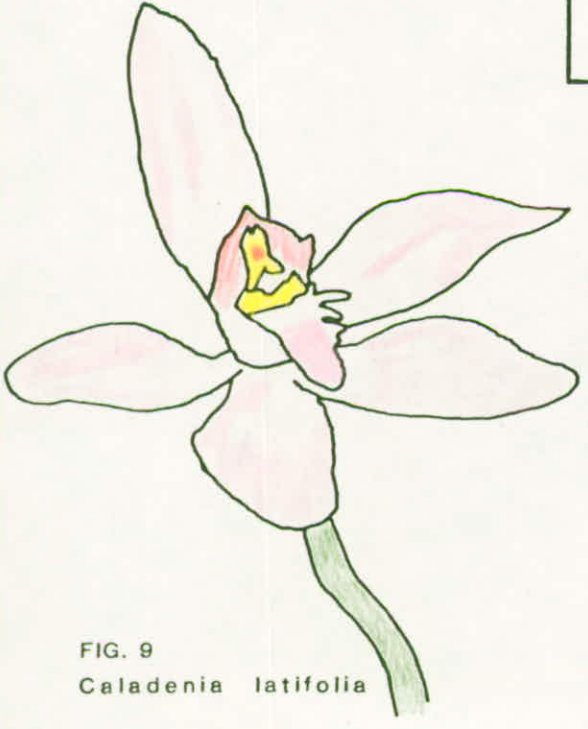

FIG. 9
Caladenia latifolia

FIG. 10
Diuris maculata

GENERA : ERIOCHILIS

Eriochilus cacullatus Parson Bands or Bunny Orchids

A slender plant 7-22cm high with a solitary radical leaf which is ovate. The leaf is often small at the time of flowering and it continues to develop in size thereafter. There are between 1 and 3 flowers which are pink or white in colour. The dorsal sepal is 7-8mm long and green to greenish brown in colour. The lateral sepals are 12-13mm long; while the petals are about the same length as the dorsal sepal. The lateral sepals extend in an ear like manner. The labellum is as long as the petals and is covered in reddish glandular hairs. This orchid flowers in Autumn.

See Fig 11.

GENERA : LEPTOCERAS

Leptoceras fimbriata Fringed Hare Orchid

This orchid is very slender and grows to 20cm high. There are 1-3 reddish or yellowish brown flowers which have purple or green markings. The dorsal sepal is about 9mm long, with the petals being slightly longer. The labellum is greenish with reddish brown pubescent spots. The labellum also has a fringe of hairs around its edge. The orchid flowers in April-June and produces beautiful flowers. The leaves are more numerous than the flowers.

See Fig 12.

GENERA : LYPERANTHUS

Lyperanthus nigricans Red Beak Orchid

A stout plant 10-30cm high. The single radical leaf is fleshy in texture and of variable size, sometimes 10cm long. There are usually 2-8 purple flowers. The dorsal sepal is usually light coloured with purple stripes, and can be up to 2½cm long. The petals are similar to the lateral sepals. The labellum is light coloured with purple veins and a dark tip. Flowers during September and October.

See Fig 13.

FIG. 11
Eriochilus cucullatus

FIG. 12
Leptoceras fimbriatum

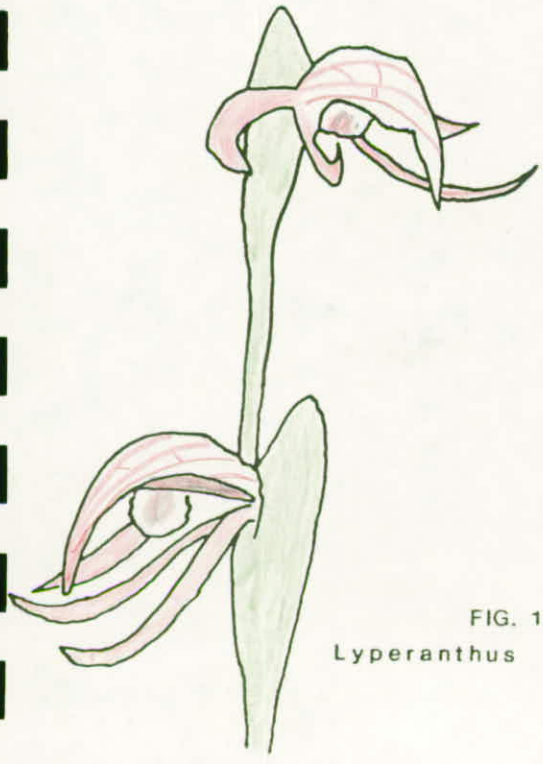

FIG. 13
Lyperanthus nigricans

FIG. 14
Microtis parviflora

GENERA : MICROTIS

Microtis parviflora Small Tongued Onion Orchid

A slender plant 7-45cm high. The flowers are green. The helmet shaped dorsal sepal is about 2mm long with the lateral sepals and petals being even shorter. The labellum is oblong with a rounded or rectangular tip and is about 1½mm long. This orchid flowers in December.

See Fig 14.

Microtis unfolia Common Onion Orchid

This is a very common orchid which flowers in late Spring, and grows to a height of 90cm. The leaf grows to 30cm and there are many numerous flowers. The dorsal sepal is short and helment like in appearance. The lateral sepals are short and spreading. The labellum is oblong and sessile with a blunt tip.

See Fig 15.

GENERA : PRASOPHYLLUM

Prasophyllum elatum Tall Leek Orchid

A robust plant 40-120cm high. The leaf lamina is usually short. The plant varies in colour from pale green to a dark purple or almost black. The flowers are large and sensile. The dorsal sepal is lanceolate and 10½mm long. The lateral sepals are united from the middle to just below the tip. Both the lateral sepals and the petals are 10mm long. The labellum is sensile and only slightly curved, with corrugated edges near the tip, which is red in colour. Flowers from September to December.

See Fig 16.

Prasophyllum fitzgeraldii Fitzgerald Leek Orchid

This very stout orchid grows to 45cm high. The flowers are a prune and green colour, and are also very fragrant. The dorsal sepal is 6mm long and green in colour, whereas the lateral sepals are dull green and 6-6½mm long. The petals are 4-5mm long and green with a dark red longitudinal strip. The labellum is prune coloured. This orchid flowers in October.

Prasophyllum fuscoviride

A diminutive species 5-12cm high, arising from a globular tuber. The flowers are minute green or yellowish green with a dark purple labellum. The dorsal sepal is only 3mm long and widely lanceolate. The lateral sepals are as long and green. They are free except at the extreme base. The petals are green with a reddish central stripe, being about 2mm long. The labellum takes on several shapes, but is usually oblong-ovate and is a dark reddish brown or purple in colour.

Prasophyllum odoratum Sweet Leek Orchid

Usually a tall robust species, up to 90cm high. The leaf is of varying length, often exceeding the length of the spike. The flowers are pink and white and are strongly perfumed. The dorsal sepal is almost 10mm long. The lateral sepals are about the same length, but have a conical point and are very divergent. The petals are rather shorter and are pinkish with white tips or white with a brownish stipe. The labellum is as long as the sepals and is conspicuously white. This orchid flowers in November.

See Fig 17.

Prasophyllum pallidum Pale Leek Orchid

This orchid has small yellowish flowers which are not perfumed. These flowers are carried on swollen ovaries which stand well out on the spike. The lateral sepals are free and the labellum, which is minutely hairy around the edges, is whitish in colour. Flowers in Spring.

GENERA : PTEROSYTLIS

Pterostylis babarta Bearded Greenhood

A moderately robust plant 12-30cm high. The leaves are sessile and generally numerous, growing to between 1½ and 5 cm in length. There is one green solitary flower with the galea being erect with a recurved lower tip in the mature flower. The labellum is 2cm long and is attached to an irritable claw. The labellum consists of golden lateral hairs with a dark green or brown clavate knot. Flowers September-October.

See Fig 18.

FIG. 15
Microtis unifolia

FIG. 16
Prasophyllum elatum

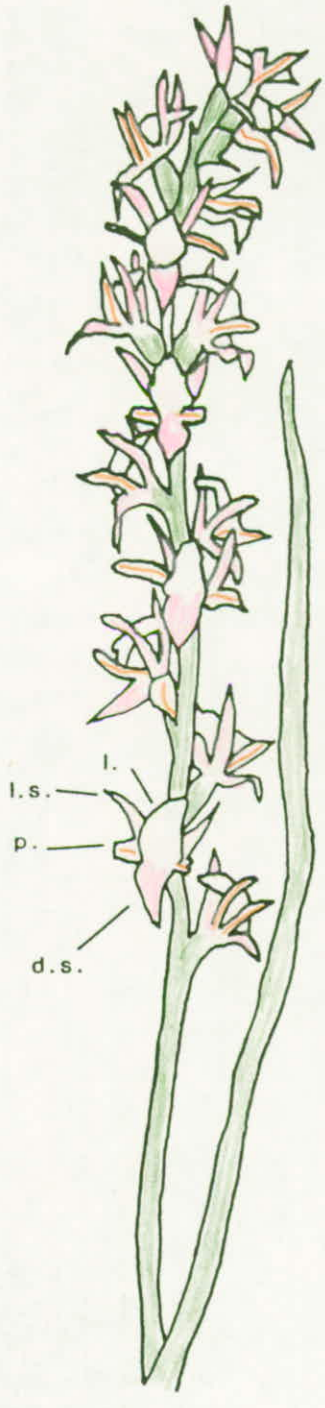

FIG. 17
Prasophyllum odoratum

Pterostylis cycnocephala Swan Greenhood 0069

A rather stout orchid growing to a height of 15cm. There are 7-9 leaves arranged in a rosette pattern. The lamina is 10-15mm long with 1-2 stem bracts. There are 2-6 small green flowers. The galea is incurved, blunt and 7mm long. The lower tip is shorter than the galea. The labellum is on a short broad claw about 1mm long. Flowers in September.

Pterostylis mitchellii

Rather slender plant 7-15cm high. The leaves form a green basal rosette. There are 3-6 flowers, which are rather large and greenish in colour with red tints on the lower lip and galea. The lower lip is 15-17mm long. The labellum is thick and fleshy and is mounted on a irritable claw. August and September Flowering.

Pterostylis mutica Midget Greenhood

A small slender glabrous species, 7-10cm high. The 4-5 leaves form a radical rosette. There are 2-8 green flowers attached to a slightly spiral spike. The galea is 7mm long and is broad and blunt. The labellum is attached by a wide claw of length 1mm. Flowers from July to December.
See Fig 19

Pterostylis nana Dwarf Greenhood

Rather diminutive species only growing to a height of 10cm. The leaves form a rosette at the base of the plant. The stem bracets are oblong-elliptical and 1-1½cm long. There is one solitary flower which is green in colour. The galea is about 12-15mm long and is broad at its apex. The labellum is oblong, blunt with a slightly recurved tip and is attached to a short movable claw. This extremely hardy orchid has a long flowering period from early winter to late spring.

See Fig 20.

FIG. 18
Pterostylis babarta

FIG. 19
Pterostylis mutica

FIG. 20
Pterostylis nana

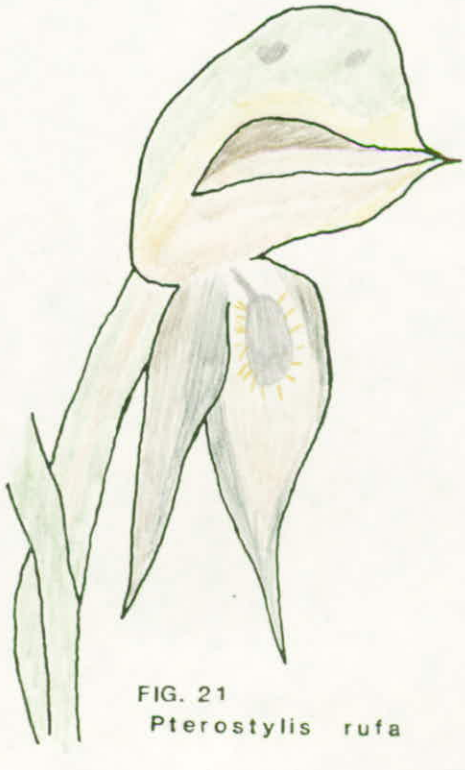

FIG. 21
Pterostylis rufa

Pterostylis pursilla Ruddy Greenhood

Another small orchid growing from 6-9cm high. The green leaves form a radical rosette. There are 2 stem bracts which are closely sheathing. The 1-4 flowers are on slender pedicels and are green with reddish tints on the hood, lower lip, labellum and the margins of the galea. The galea is about 8mm long from the base to crest and has a subulate point. The labellum is oblong, fleshy in texture and very irritable. It is attached to a long wide claw. Flowers in early October.

Pterostylis rufa Rusty Hood

A moderately robust orchid growing to a height of 25cm. The leaves appear withered at the time of flowering. The lamina is 1-2cm long and there are 2-5 stem bracts. The flowers are rather large and there are usually 2-4 on long slender pedicels. The flowers are green with rufous markings. The galea is about 13mm long. The labellum is attached by a long claw to the foot of the column. Flowers in November and December.

See Fig 21.

Pterostylis squamata

A stout plant, 15cm high. The leaves form a withered basal rosette during flowering. The flowers are greenish with rufous markings and number 2-3. Labellum is thick and fleshy, on a very irritable, moveable claw. Flowers in November.

Pterostylis vittata Banded Greenhood

Grows 10-30cm high. The leaf rosette is not present at the time of flowering. The flowers are greenish with red or dark brown bands. The galea is broad, being about 14mm long, is green in colour with dark red longitudinal stripes, and the petals are almost completely red. The labellum is on a long, very irritable claw which responds to the lightest touch. This orchid flowers in early winter.

GENERA : THELYMITRA

Thelymitra antennifera Rabbit Ears

Grows to a height of 20cm. The leaf is terete and the stem is long and wiry. There are 1-3 large yellow flowers which open freely and are sweet scented. The perianth segments are yellow on the inside, with a wide reddish stripe on the outside. The column is erect and rather wide. Flowers during September and October.

See Fig 22

Thelymitra aristata Scented Sun Orchid

A moderately stout orchid which grows to 40cm. The leaf is sheathing towards the base, often 15-22cm long. The flowers are mauve or lavender in colour and are sweet scented, often being 2½cm in diameter. The perianth segments are elliptical-lanceoate and readily expand in sunshine. The column is hooded and has white hair tufts which point forward. Flowers in October to November.

See Fig 23

Thelymitra azurea

A slender species, 10-35cm high. The leaf is long, narrow linear and often filiform. The 1-12 flowers are a deep azure blue. The perianth segments are veined. The column is widely winged with purple hair tufts directed both upwards and forwards. Flowers in October to November.

Thelymitra luteociliata (luteocilium) Fringed Sun Orchid

Another slender orchid growing from 15-37cm high. The leaf is long, fleshy and slightly channeled. The flowers are pinkish to light red, there are usually 2-5 which scarcely open. The perianth segments are oblong-lanceolate. The column is erect with yellow hair tufts directed upwards. Flowers during September and October.

See Fig 24.

FIG. 22
Thelymitra antennifera

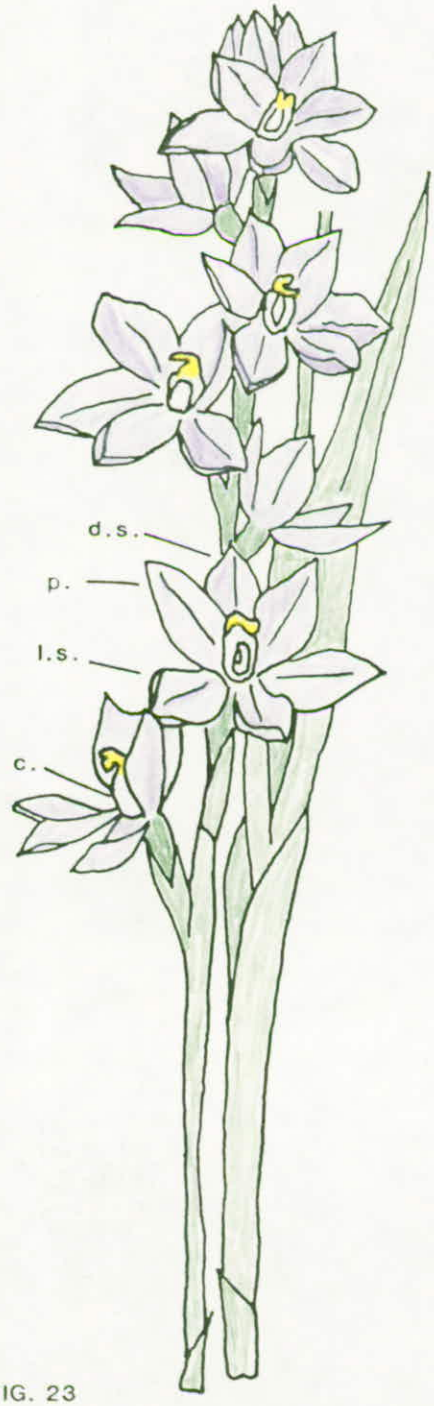

FIG. 23
Thelymitra aristata

FIG. 24
Thelymitra leteocilium

OTHER SPECIES

Eremophila longifolia Emu Bush, Long-Leaved Eremophila

A shrub or small tree 2-6m high, with drooping branches. The branches, young leaves, calyx and the outside of the corolla are densely covered with short hairs. The leaves are broad, linear and flat, they are 6-18cm long and 4-7mm wide. They become glabrous with age. The corolla is 2½-3cm long, densely pubescent outside; and is pink or red with red spots on the inside. Flowers for most of the year.

Heterodendron oleifolium Bullock Bush

A small tree which is covered in almost microscopic hairs. The leaves are lanceolate or linear-lanceolate, stiff and greyish green in colour. They are 4-14mm long. The flowers are usually in small panicles. The calyx is small, cup shaped and irregularly toothed at the summit. There are no petals. This bush flowers during the summer.

Pittosporum phillyreoides Weeping or Native Pittosporum

A shrub or small tree which is glabrous, except for the young shoots. The branches are usually drooping with the leaves being flat, linear-lanceolate and being 3-10cm long by 3-10mm wide. The flowers are pendicellate and are either solitary or clustered in amils. The sepals are 2-3mm long, the petals are pale yellow. Flowers from July to October.

Myporum platycarpum Sugar Wood

This is either a tree, 5-10m high or a shrub, 2-3m high. The young parts of the tree are usually covered in a sticky fluid. The leaves are linear-lanceolate in shape; 3-6cm long, 4-7mm wide. The calyx is ½cm long; the corolla is 6-8mm long and is white in colour, pubescent inside and often yellow inside. The wood of this tree is pale yellow in colour and is sweet scented. Flowers from August to December.

Eucarya or Santalum acuminata Native Peach

A shrub or small tree with linear-lanceolate leaves, 5-10cm long. The young leaves taper a sharp, curved point. The flowers are in a terminal pyramidal panicle and are red. The fruit is also red and is 2-3cm in diameter. This fruit is edible, and the stone deeply pitted. Flowers and fruits during Spring and Summer.

Eucarya or Santalum murrayana Bitter Quandong

This tree resembles the native peach. The leaves are linear - lanceolate and the brownish red fruit is about 2cm in diameter. The fruit is bitter and barely succelent and the stone is only slightly pitted.

Cheiranthera linearis Hand Flower

A small graceful glabrous shrub with linear, acute, chanelled leaves measuring 1½-5cm long. The flowers are on erect pedicels, of which there are usually 2-5 violet or blue ones. The sepals are 4-5mm long. Flowers from October to November.

3.2 FAUNA

3.2.1 BIRDS

Some 90 species of birds are known to occur in or near the lease area, with another 130 species probably occuring. There are several species which are considered as rare or threatened by the National Parks and Wildlife Act.

There seem to be two main factors which influence the distribution of bird species. The first is the frequency and size of fires, which tend to reduce the population of ground dwelling birds, such as the Mallee Fowl. The second factor is the areas of open or cleared ground, which some birds definitely prefer.

Generally the areas of thickest vegetation support the largest bird populations.

Some species are particularly vulnerable to clearing, because the subsequent grazing, or crop crawing destroys the understorey in which they feed. These species included the Shy Ground Wrens, Southern Scrub Robin, Thick Billed Wren, and the Red Throat. The rare Mallee Fowl is very uncommon in the area, mainly because of land clearing and feral animals. The only area in which this bird seems to be present is in Hincks Conservation Park although signs show it used to and still could occur in and around Bascombe Well Conservation Park.

In the event of heavy winter rains it is likely that many water birds will congregate on the sheets of water.

In the open woodland areas of Bascombe Well the White Plumed Honey-Eater was sighted (1969) and at that time it was the first recording of the species for Eyre Peninsula.

RARE OR THREATENED SPECIES

Nine species of birds, whichare known to occur on Eyre Peninsula and probably occur in the lease have been given a rare and endangered status. They are:

Plains Wanderer
Australian Bustard
Glossy Black Cockatoo
Western Whipbird

White Breasted Sea Eagle
Mallee Fowl
Southern Stone Curlew
Major Mitchell Cockatoo
Scarlet Chested Parrot

3.2.2 MAMMALS

The mammal fauna of the lease is fairly small and contains a high proportion of introduced species.

The Western Grey Kangaroo, *Macropus Fuliginosus* appears to be fairly well distributed throughout the whole area, especially in and around Bascombe Well. Euros, *Macropus Robustus* have also been recorded.

The Southern Bush Rat, *Rattus fuscipes,* has been recorded, but it is uncommon for this part of Eyre Peninsula and usually found further south around Pt. Lincoln and Coffin Bay.

The Pygmy Possum, *Cercartetus sp.,* is occasionally found on Eyre Peninsula, and probably occurs around the Bascombe Well area.

The Shore-Nosed Bandicoot, *Isoodon obesulus,* is found in the Rudall region but it may not be common. Remains of the Long-Nosed Bandicoot, *Perameles sp.,* have been found near Bascombe Well, but it is not known if the species still exists.

The Echidna, *Tachyglossus aculeatus,* is found in the Bascombe well area, but is thought to be uncommon, as is the Brush-Tailed Possum, *Trichosurus vulpecula.*
Remains of this mammal have been found at Bascombe Well.

The reported prescence of the Brush-Tailed Rat Kangaroo, *Bettongia penicillata,* to the south of Hincks and also possibly in Hambidge Conservation Park is of interest, since this species is regarded as a rare species (National Parks and Wildlife Act).

The introduced mammals include the rabbit, fox, domestic cat and the house mouse, which appears to be fairly common.

The grazing and clearing of land makes the land suitable for occupation by kangaroos, but not for many of the other native mammals. Fires have had devestating effects on the small mammals. These two factors combine to account for the small number of native mammals recorded.

3.2.3 REPTILES AND AMPHIBIANS

43 species of reptiles are recorded* for the lease area and a further 46 which could occur. A list of these species is given in Appendix

Overall reptiles appear to be relatively abundant and diverse throughout the area, and grazing or clearing land may not have much effect on the reptilian fauna.

None of the reptiles are uncommon or are under any threat, with the possible exception of the Death Adder, whose population has been declining over recent years due to clearance, grazing and preditation by feral animals. However, the Death Adder is not considered an endangered species at present.

* FIELD NATURALISTS SOCIETY.

3.4 THE CONSERVATION PARKS AND OTHER RESERVES.

There are several conservation parks inside the lease and others just outside the lease are. As well as these parks there are numerous other reserves, including recreation, railway and water conservation reserves, many of which are too small to represent accurately on a map (see fig 25)

3.4.1 CONSERVATION PARKS

1. POINT LABATT CONSERVATION PARK:
   This park is outside the lease area, and covers an area of 31 ha.

2. BAIRD BAY B. CONSERVATION PARK:
   This park comprises of two islands, Jones Island, is inside the boundary of the onshore lease, while the other island is further to the north and outside the lease boundary. The two islands cover an area of 24 ha.

3. VENUS BAY CONSERVATION PARK:
   Venus Bay is inside the lease and comprises of the Venus Bay Headlands and most of the islands in Venus Bay. The park covers an area of 1460 ha.

4. WALDEGRAVE ISLAND CONSERVATION PARK:
   Waldegrave Island is part of the offshore Polda Basin, and is located about 6 km offshore from Cape Finnis (near Elliston). The park covers 324 ha.

5. BASCOMBE WELL CONSERVATION PARK:
   Bascombe Well Conservation Park is almost completely inside the exploration lease. The park is 29 186 ha in size. Bascombe Well presents a fairly flat geography with no distinguishing geographical features. There are two main soil types:-
   1. The red soils of the ridges, and
   2. The grey soils of the depressions.

   These soils overlie a bunker limestone sheet which is characteristic of much of the lease.

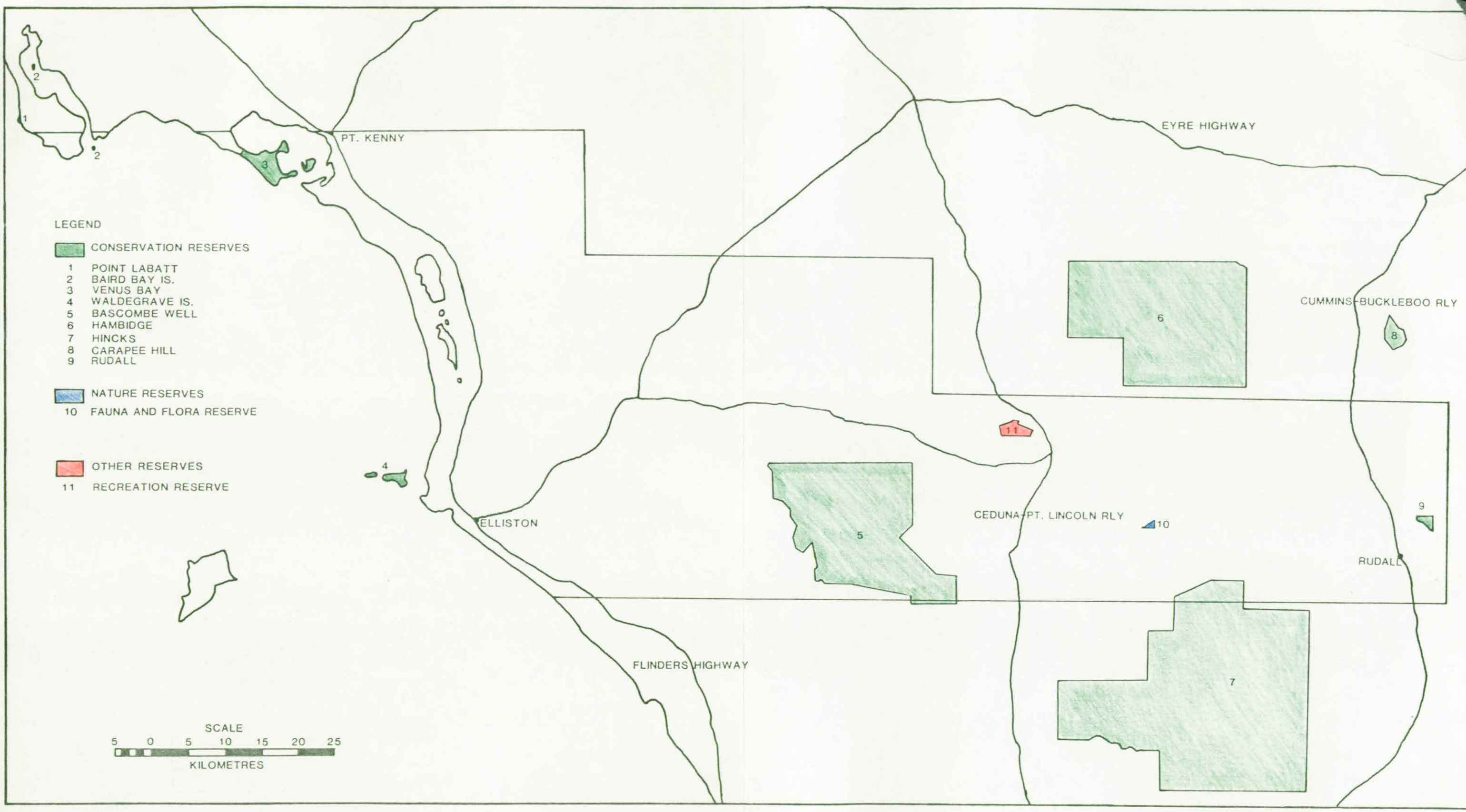

FIG. 25
CONSERVATION PARKS AND OTHER RESERVES

The dominant vegetation is Mallee-Broombrush, with scatters of Bottle brush and Tea Tree in the lower areas and native Pine on the ridges.

A total of 302 species of varieties of vascular flora has been recorded from Bascombe Well*, 46 of which had not been recorded for any other reserve in South Australia (Specht and Cleland, 1963) and 17 of which had not been recorded for Eyre Peninsula (Black, 1943 - 57).

The reptiles of the Park appear to diverse, but not abundantly. A total of three species of gecko, five species of dragon, three species of legless lizard, ten species of skink, two species of front-fanged land snake and one species of blind snake were recorded.*

Some 75 bird species are also recorded* for the park. Those of importance being the White Plumed Honeyeater, which had previously not been sighted on Eyre Peninsula, and evidence of past existence of the Mallee Fowl, now possibly extinct in the park.

Only a few mammals are seen to exist in the park, mainly kangaroos, rabbits, foxes and the Common House Mouse.

6. HAMBIDGE CONSERVATION PARK:
Hambidge Park is 37847 ha in area, but is just to the north of the lease area.

7. HINCKS CONSERVATION PARK:
Hincks is the largest park on Eyre Peninsula, covering an area of 66285 ha. The northern tip of Hincks extends into the lease area.

Hincks Conservation Park has two main landforms, a system of parallel dunes, containing silicious sands in the northern section, and irregular dunes of shallow carcareous sands in the southern and western sections. There are two

* THE CONSERVATION SOCIETY OF STH. AUST: SURVEY OF HUNDRED OF BLESSING.

prominent features, Blue Range and Prominent Hill, both quartzite outcrops.

A total of 419 species of vascular plants have been recorded* for Hincks Conservation Park, with the predominent vegetation being a mallee formation.

Reptiles are diverse and abundant throughout the park, with 29 species recorded*. Species of frogs were found to occur in the swamps and Blue Range creeks.

Sixty bird species were known for the park, including the Mallee Fowl, and good numbers of the Blue Breasted Wren, which is only found on Eyre Peninsula.

The Western Grey Kangaroo is the only native mammal abundant in the Park, with only two other species being seen, namely Mitchell's Hopping Mouse and Southern Bush Rat. Rabbits, foxes, and feral cats were common.

8. CARRAPEE HILL CONSERVATION PARK:
Carrapee Hill Conservation Park is located to the north of the lease, about 9 km north-east of Darke Peak. It occupies an area of 782 ha.

9. RUDALL CONSERVATION PARK:
Rudall Conservation Park is located inside the lease area, about 6km north-east of the town Rudall. The Park covers an area of 438 ha.

* NATURE CONSERVATION OF STH. AUST: SURVEY HINCKS CONSERVATION PARK.

3.4.2 OTHER RESERVES.

There are a large number of other reserves, including Water Conservation reserves and recreation reserves. Most of these are too small to be mapped on Fig 25 .

These reserves can be classed as follows, and only those which occur inside the lease will be considered.

0083

1. OTHER NATURE RESERVES:

   i. The Fauna and Flora reserve (no. 10 on fig 25) is located about 17 km south-east of the town of Lock.

2. RECREATION RESERVES:

   i. There is a recreation reserve at Mt. Damper, which consists of an oval.
   Located at 33° 10' S
   135° 05' E

   ii. A recreation reserve, 5km north-west of Lock, containing a race track, golf course and strip.
   Located at 33° 33' 00" S
   135° 42' 00" E

   iii. 14 km south-west of Darke Peak
   Located at 33° 33' 31" S
   136° 05' 56" E

3. WATER CONSERVATION RESERVES:

   i. On the Flinders Highway, 4 km south east of Pt. Kenny.
   Located at 33° 10' 41" S
   134° 42' 15" E

   ii. In the Venus Bay township.
   Located at 33° 14' 08" S
   134° 41' 00" E

   iii. On the Flinders Highway, 10 km north-west of Talia
   Located at 33° 16' 24" S
   134° 47' 15" E

   iv. 8 km south-east of Talia
   Located at 33° 22' 15" S
   134° 56' 46" E

v. 15 km south-east of Talia
Located at 33° 24' 44" S
135° 00' 00" E

vi. Rock Valley Water Reserve, 14 km east of Mt. Wedge.
Located at 33° 27' 02" S
135° 00' 48" E

vii. Mt. Misery Well, 13 km north-east of Mt. Wedge.
Located at 33° 21' 10" S
135° 15' 13" E

viii. Palkagee Well
Located at 33° 25' 26" S
135° 27' 08" E

ix. On Flinders Highway, 2 km south-east of Elliston.
Located at 33° 39' 15" S
134° 54' 35" E

x. 4km east of Elliston.
Located at 33° 38' 37" S
134° 55' 58" E

xi. On Flinders Highway, 21 km south-east of Elliston.
Located at 33° 44' 16" S
135° 04' 48" E

xii. 6km south-east of Bramfield
Located at 33° 40' 16" S
135° 01' 56" E

xiii. 8 km north-east of Bramfield.
Located at 33° 34' 16" S
135° 03' 06" E

xiv. 6 km south of Mt. Wedge
Located at 33° 31' 44" S
135° 10' 00" E

xv. Located at 33° 31' 02" S
135° 16' 17" E

xvi. ETSA: Polda Pumping Station
Located at 33° 30' 32" S
135° 20' 15" E

xvii. Lock booster station, 6km south-west of Lock.
Located at 33° 35' 41" S
135° 42' 15" E

xviii. Pumping Station, 8½ km south-west of Darke Peak.
Located at 33° 31' 50" S
136° 09' 39" E

4. STONE RESERVES:

1. Flinders Highway, 12 km north of Elliston.
Located at 33° 32' 36" S
134° 53' 27" E

2. Flinders Highway, 8 km north of Elliston.
Located at 33° 34' 42" S
134° 52' 54" E

3. Flinders Highway, 4 km south-east of Elliston.
Located at 33° 40' 01" S
134° 55' 39" E

4. Flinders Highway, 16km south-east of Elliston.
Located at 33° 43' 19" S
135° 01' 45" E

5. CEMETERY RESERVES:

1. Flinders Highway, 4½ km north of Colton
Located at 33° 26' 37" S
134° 54' 48" E

2. Elliston.

Located at 33° 38' 47" S
134° 54' 14" E

3. 2km east of Bramfield.

Located at 33° 37' 24" S
135° 00' 31" E

3.5 HERITAGE

3.5.1 ABORIGINAL HERITAGE

Aboriginal Heritage needs to be considered in two parts. Firstly, there are sites of aboriginal occupation which are of archaeological significance, and secondly there is the traditional significance of the sites to todays aboriginal people.

Aboriginal relics and sites are protected under the Aboriginal and Historic Relics Act. Another act, the Aboriginal Heritage Act, provides protection for sites which are of ceremonial, mythological or historic significance to the Aboriginal people.

ARCHAEOLOGICAL SIGNIFICANCE

There are several types of archaeological sites and those which could be expected to occur are.

1. Surface Scatters of Stone Artefacts

   This is where pieces of worked stone or other similar evidence of aboriginal occupation is found either in or on the ground.

   a) Campsites : There are artefact scatters which may contain flaked or ground stone artefacts, hearth stones, wood charcoal and food remains, such as bones and fish shells.

      Along coastlines, accumulations of shells and other food refuse can often be found. These occurences are known as shell middens and they often contain a small number of stone artefacts.

      Composites can occur as isolated surface scatters of material, generally in the open, or as stratified deposits where there have been multiple occupations.

b) Knapping Floors : These are discrete scatters of artefacts, which has resulted from stone being worked in that area. It is essential that the original block of stone can be reconstructed from the scattered pieces of worked stone for the recognition of this type of site.

2. Quarries

This is an area from which stone, for use in making flaked or ground implements, or orche for rock painting, body and artefact decoration has been taken.

3. Stone Arrangements and Cairns

These objects can have various functions, from route markers to mythological significance to the walls of animal and fish traps.

4. Burial Sites

These usually occur in areas of soft sand or soil where it was easier to dig into the ground.

5. Engraving Sites

Here aborigines have engraved something into a rock surface. This type of site is more likely to be found in the softer rock faces, (sandstone for example). They also occur on the walls of shelters (caves) and rock overhangs.

According to the Heritage Unit of the South Australian Department for Enviroment and Planning there is only one site of archaeological importance in the lease area.

This is the 'Lake Newland Stone Arrangement' (See Figure 26). It is located on the seeward side of Lake Newland, almost opposite the main buildings of the 'Springvale' Property.

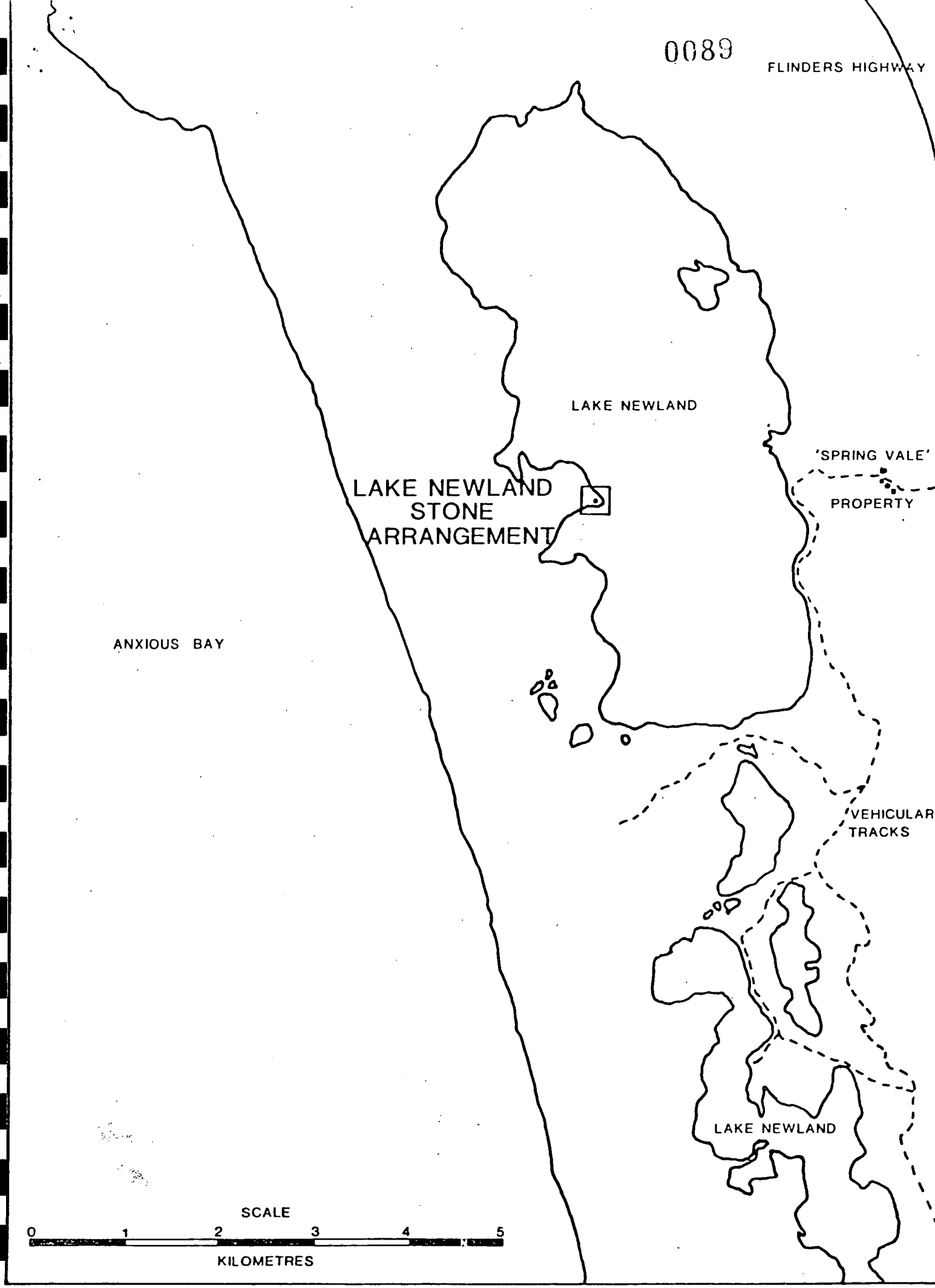

FIG. 26

KNOWN ABORIGINAL SITES IN THE LEASE

The site consists of many boulders, approximately 30cm in diameter, which have been arranged in yards up to 4m. in width. The yards are 2-3 boulder layers high.

There is a total of 4 yards and also an extensive wall, which are all submerged a few centimetres below the lake surface. It is possible that this arrangement was a type of fish trap.

The site is easily accessible by turning off the Flinders Highway 5km south of Talia into the Spring Vale Property. The lake and dune system is crown land.

This site has been given a Historic reserve status, but is not thought to be significant to living aborigines.

There are another four sites which are all to the north of the lease area.

1. Pinkawillinie Rock Hole

   This is a large cistern in a small rock outcrop, with associated surface sites in nearly dunes. The area is now Pinkawillinie Conservation Park.

2. Bascombe Rocks

   This is a large granite dome with small rock holes and a native soak. There are also surface campsites and areas of nadoo plant present. This site is located about 27km north-east of Kimba.

3. Kimba Golf Course Shelters

   Here small occupation shelters and surface implement sites can be found at the base of a small hill overlooking the Kimba Golf Course.

Kimba South Rock Holes

Another cistern, smaller than the Pinkawillinie cistern, with stone caps in a coarse grained rock outcrop. This site is located about 5km due south of Kimba.

It would appear that the sites are most likely to be found in sandy areas, or areas where there was a supply of water, such as the rock-holes.

Exploration will be conducted so as to bring no risk to the Lake Newland site.

OTHER SIGNIFICANCE

There were three different tribes which occupied Eyre Peninsula before white settlement. (Figure 27)

According to N. Tindale, most of the lease fell under the dominion of the now extinct Nauo Tribe, with a small area of the lease in the Pankala Tribe country.

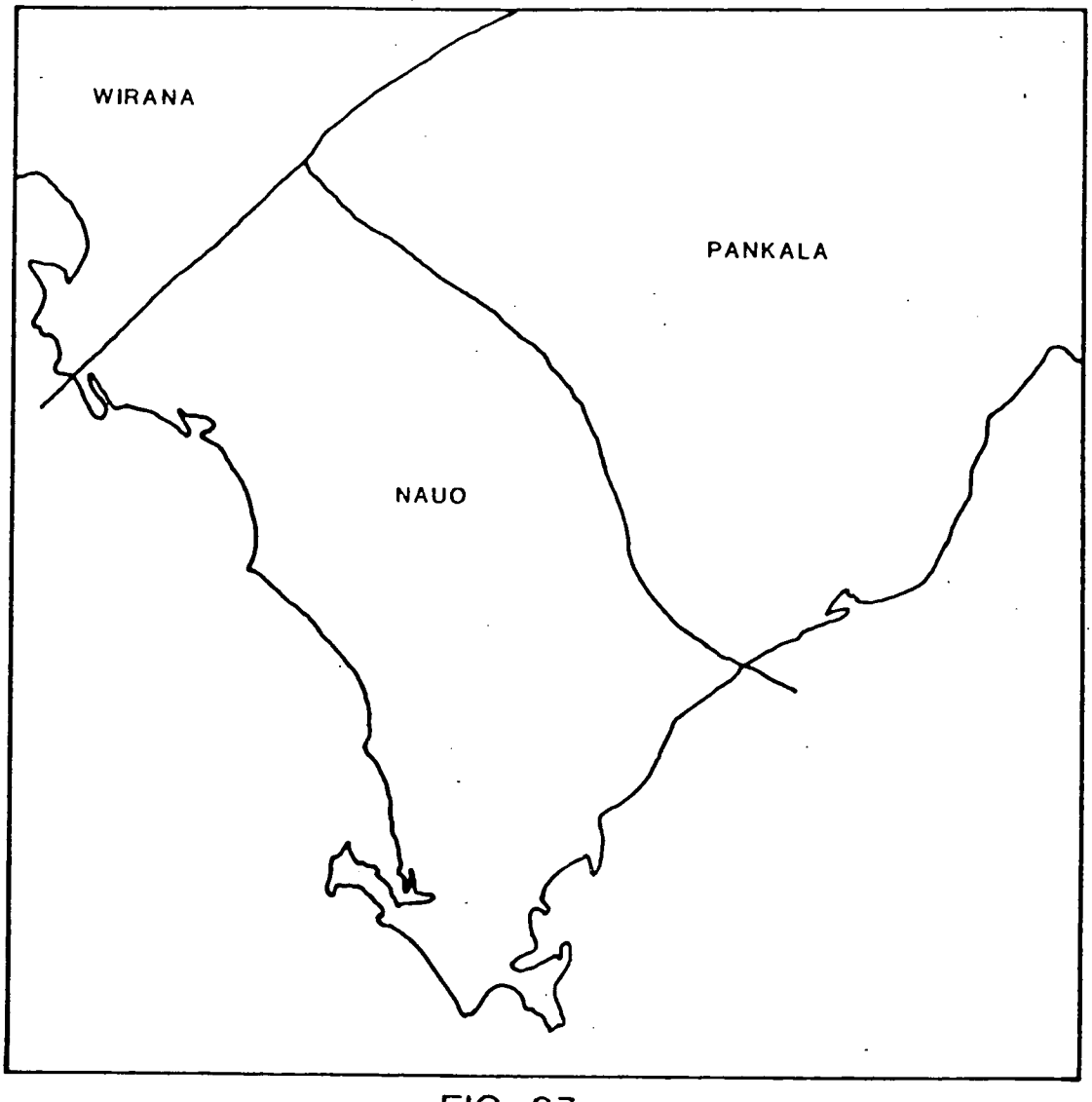

FIG. 27

ABORIGINAL TRIBES OF EYRE PENINSULA

Therefore, any surviving sites of mythological, historic or ceremonial significance are likely to be associated with the travels of Dreamtime figures, particularly 'Moon and the Seven Sisters' and the 'Rainbow Serpent'. These sites usually included natural resources, such as water soaks or important minerals. Stories were often woven around peculiarly shaped objects. Sites which contained sacred objects are of particular interest. Other sites lay along the routes chosen by the Dreamtime figures, because these routes were often representative of good food and water supplies. Many prominent features (Hills, large salt pans, etc) could all have possible significance, as could much of the coastline.

One of the Moon and the Seven Sisters mythical journeys (See Figure 28) passes through the lease area; Moon used to create soaks whenever he camped and left convenient food supplies and mineral deposits in particular places.

Part of the Moons journey passed up the coast between Port Lincoln and Streaky Bay, therefore passing Lake Newland coast front, because of this it is possible that the area of coast contained in the lease has some traditional significance.

3.5.2 EUROPEAN HERITAGE

There are no items of European heritage recorded on the Register of European Heritage for the least area, however the National Trust of South Australia has an old police station, built in 1881, on its recorded list. The police station is located in the town of Elliston on the West Coast of Eyre Peninsula.

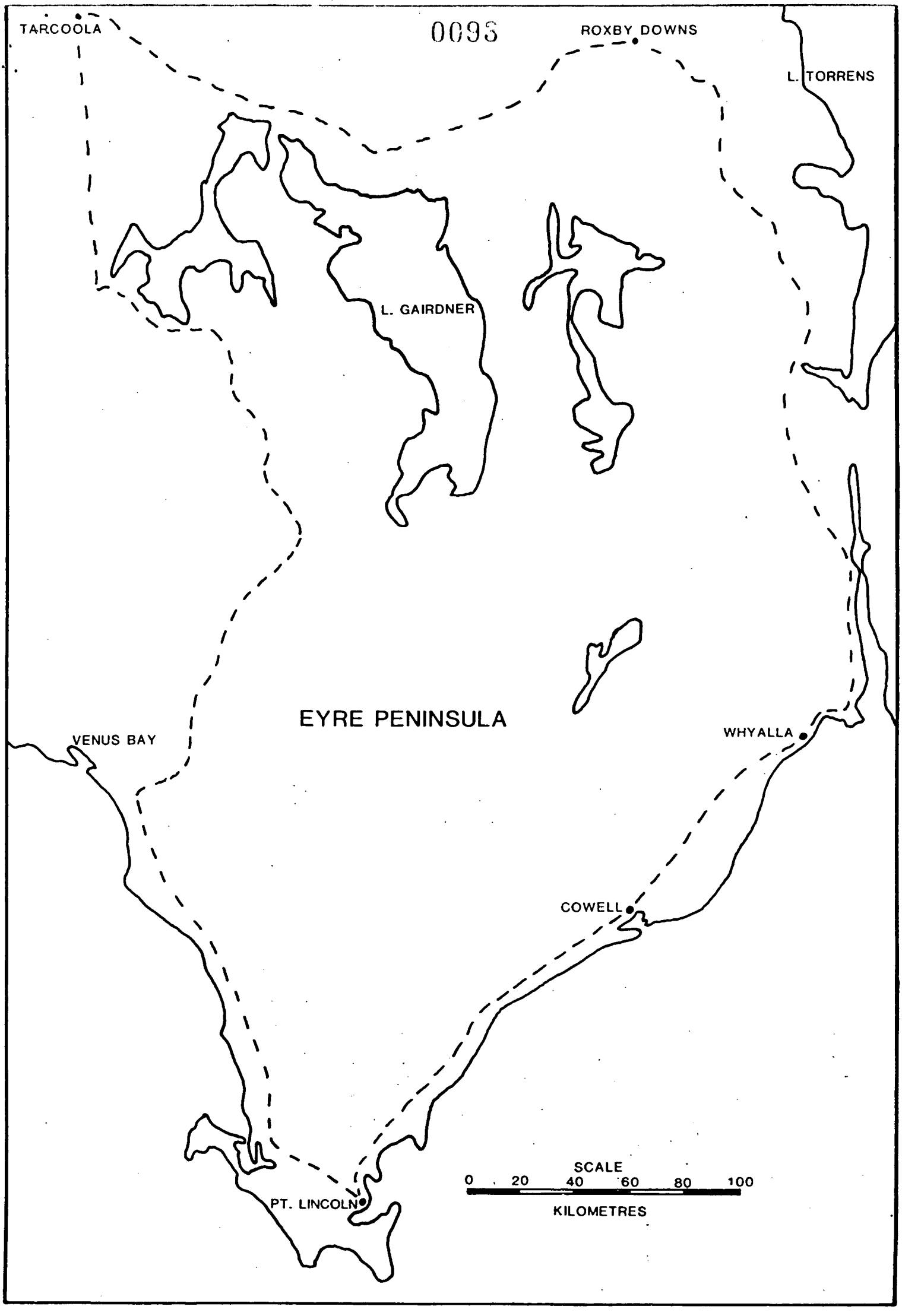

FIG. 28 JOURNEY OF MOON AND THE SEVEN SISTERS

3.6 THE COASTAL REGION

The most spectacular scenery of Eyre Peninsula is to be found on the west coast, which is dominated by vertical cliffs up to 100m high. The rock exposed by these cliffs is aelonate, a kind of limestone which underlies the western plains of the peninsula.

These cliffs are the major landform to the north of the lease (Near Venus Bay) while an extensive dune system exists on the seaward side of Lake Newland, and cliff formations are again present to the south of Elliston (See fig 29).

Germein Island in Venus Bay contains a Mangrove Community.

The Lake Newland dune system is a very delicate ecosystem which can be damaged easily.

During the last 2,000,000 years there have been many glacial and interglacial periods which caused a series of rapid withdrawals and returns of the sea. The cliffs have been formed during the periods of low sea level, when onshore winds blew unconsolidated sand containing high concentrations of lime into the dune systems.

The Lake Newland dune system was formed about 18,000 years ago, during the last period of low sea level, when the sea had retreated to the continental shelf. The dunes were formed by material being swept up off the uncovered ocean floors.

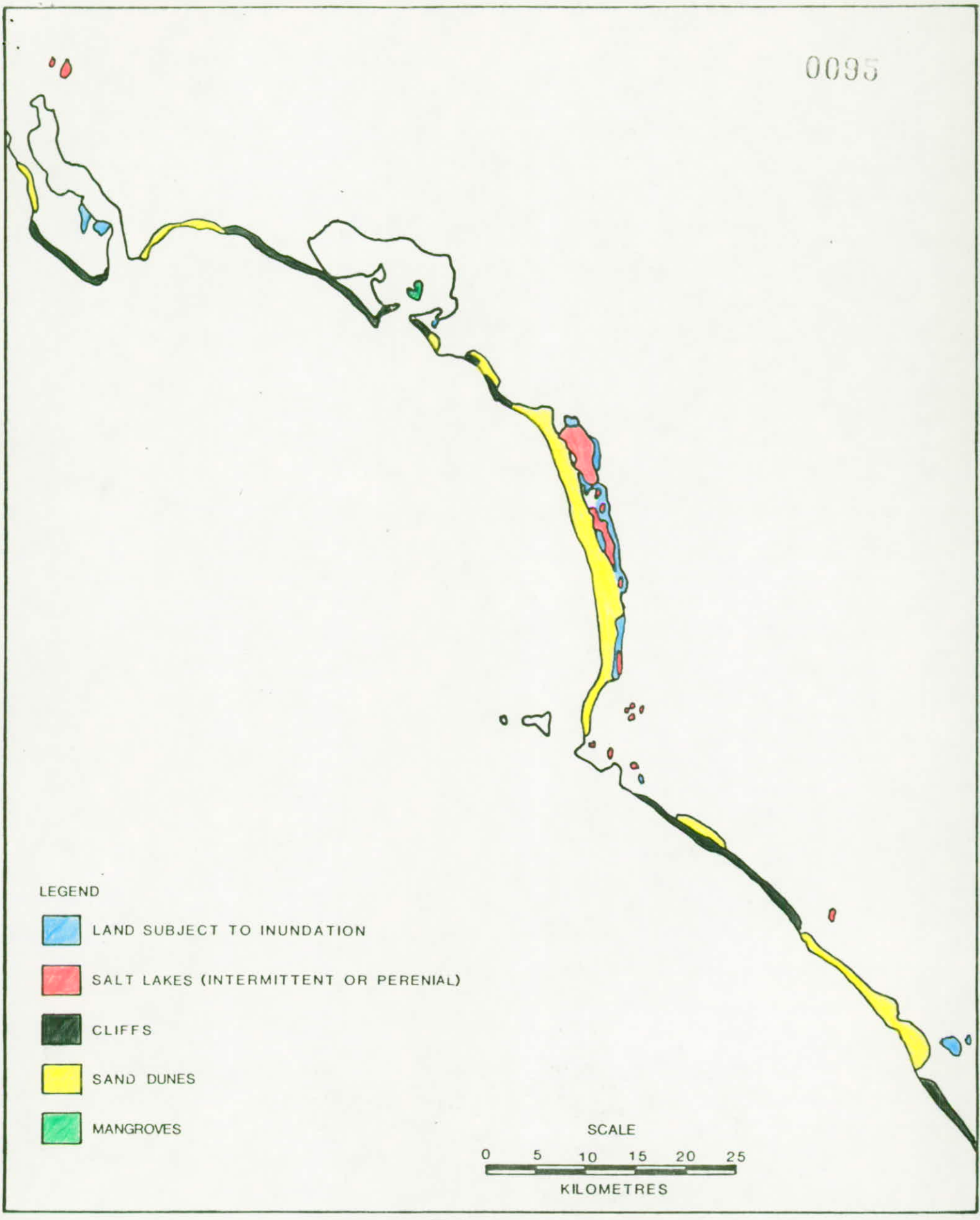

FIG. 29

COASTAL FORMATIONS

3.7 THE GRANITE AND QUARTZITE OUTCROPS

The central plains of the peninsula are an important agricultural region. There are many isolated outcrops of granite. The highest of these is Carapee Hill (496m) but Wudinna Hill and Ucontitchie Hill are also prominent. Weathering and erosion of the granite has created many interesting minor landforms, including caves (such as the ones found near the top of Ucontitchie Hill) and weather pits. Many of these granite outcrops are important watercatchment areas.

The Spencer Uplands border on Spencer Gulf, and reach their greatest height at Mt. Alinthus (453m) in the Cleve Hills. The ridges and valleys of the Cleve Hills have developed on contorted sedimentary rocks laid down some 600 million years ago.

The Lincoln Uplands, to the south between Cowell and Pt. Lincoln, are underlain by crystalline rocks, typically griesses which are rounded.

There are some quartzites to the west of the Spencer Uplands, which form resistant caprocks and subsequent erosion has left them standing above the plains as steep-sided plateaux, mesas and buttes. Examples are Mt. Wedge, Toolgie Hill and Darke Peak.

Many of these granite and quartzite outcrops are important in some way to history and beauty of Eyre Peninsula.

Ucontitchie Hill, Darke Peak, Carapee Hill and Caralue Bluff are all important watercatchment areas. Mt. Wedge and Dark Peak both have important natural vegetation* and Dark Peak is also the site at which the explorer Darke was buried.

* refer section Natural Vegetation.

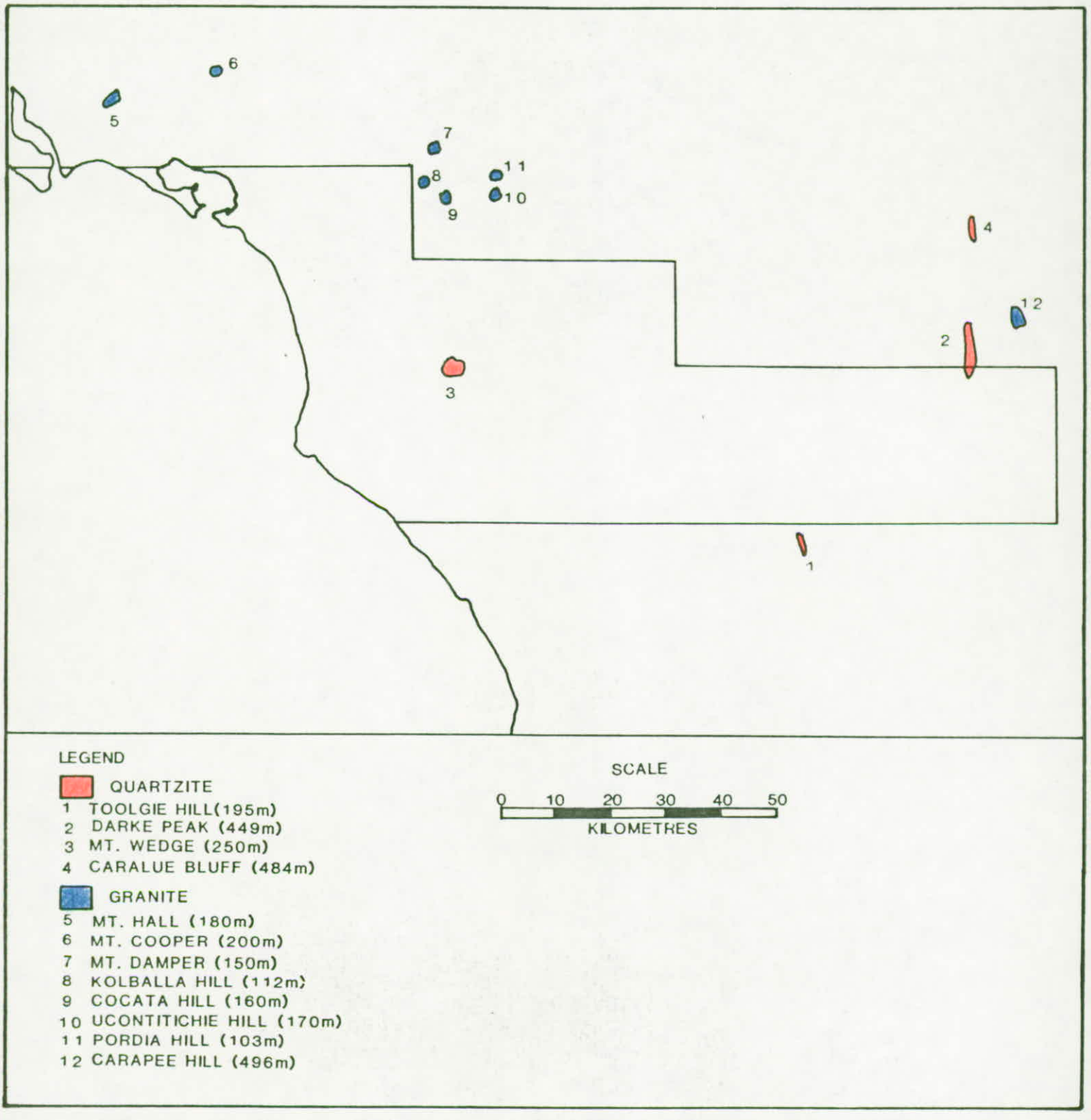

FIG. 30

GRANITE AND QUARTZITE FORMATIONS

4. EXPLORATION METHODS

There are 3 ways of conducting the preliminary exploration. These are :

(1) Surface geological mapping.
(2) Gravity survey using gravity meters.
(3) Aeromagnetics which involves flying over the area to be explored.

Each of the above three methods result in no enviromental damage, apart from access damage in the first two cases. All of this preliminary exploration has already been done by the Department of Mines and Energy.

The final stage in exploration is the seismic survey. There are two methods of seismic surveying :

(1) Vibroseis, which involves the bulldozing of trails in straight lines. These trails must be able to support heavy equipment.
(2) Dynamite, which involves drilling holes every 100 metres and firing shots. Trails must still be bulldozed but they are narrower than those required for Vibroseis, because lighter vehicles are required.

Vibroseis data is the better of the two methods and although more expensive, it is most likely method to be undertaken by the company.

5. EFFECTS AND RECOMMENDATIONS

Both the methods of obtaining seismic data have a considerable impact on the environment. This impact will have effects on the different components of the environment.

5.1 THE FLORA

There will be an immediate destruction of the flora. Once the vegetation has been cleared there is quite a long recovery period (about 10 years) and although this can be reduced by reseeding after exploration has ceased, there are still many other effects on the flora.

The loss of native vegetation will probably promote the growth of alien species, and also increase the erosion of top soils by both wind and rain. To keep erosion to a minimum clearing should only be undertaken when it is absolutely necessary and vegetation should not be cleared from creek lines if it can be avoided.

The clearing of vegetation is also likely to alter run-off patterns. Generally the trail edges will receive more water than previously and this tends to promote ephemeral species, however, if a cleared track ran across sloping ground, the lower side could possibly be deprived of water.

The increase in human activity during exploration could increase the frequency of bushfires.

It is possible that the bulldozing of trails could remove some protected species and the required permission would have to be obtained beforehand.

Overall the impact on the flora will be considerable.

5.2 FAUNA

Because of human activities throughout South Australia, the existing impacts on native fauna include:-

(1) Competition with grazing animals
(2) Habitat modification by grazing and habitat destruction by clearing
(3) Hunting and increased fire frequency

The natural environment of the lease area has already undergone considerable impact from human activities, which has most certainly depleted the natural fauna, especially the mammals. Therefore any exploration is likely to have a small effect when compared to previous damage, however, it still has an effect.

Any land clearing will probably result in the death of a few individuals, but the majority of fauna would move away to adjacent areas.

Roads and trails seem to have an attraction for some animal species (particularly reptiles) and this can lead to a high frequency of road deaths if the trails are to be used often.

Some species can readily adapt to human prescence, while more sensitive species are affected by human activity and machinery noise.

Overall, any exploration should not cause significant damage to the fauna, and as there are no permanent structures the fauna will move back after exploration has finished.

5.3 HERITAGE

The Lake Newland Stone Arrangement is the only aboriginal site that has been recorded by the Heritage Unit, and this site will be avoided. There exists the possibility that other sites may be found during exploration work. Survey teams should be told of this possibility and in the event that a possible site is found it should be reported

immediately to the Heritage Unit.

5.4 THE COAST

The coastal system is very delicate and subject to major damage if care is not exercised. Dune backed beaches, such as the Lake Newland sea front are particularly susceptible.

Dunes are formed when sand is delivered to the beach and this is then blown into the area behind the beach by onshore winds. The dunes are stabilised when dune plants can trap this blown sand with their leaves and bind the sand with their roots. Where vegetation cover has been breached, hollows (blowouts) can occur.

In order to avoid beach and dune deterioration, it is recommended;

(1) Dunes should not be filled or levelled.
(2) Sand should not be removed from beaches or dunes.
(3) Native dune vegetation should not be damaged or moved.
(4) Access through dunes should be restricted.

Should any damage occur to the dune/beach area because of exploration it is strongly advised that restoration of the area should be undertaken. Any cleared areas should be replanted with high salt tolerant species. If erosion occurs steps will have to be taken to stabilise the dunes, possibly by erecting sand trap fencing.

Another sensitive area of the coastal system is the mangrove community on Germein Island (Venus Bay). Mangroves have several important roles in the environment:

(1) They act as barriers between the sea and land.
(2) They are important nursery grounds for various species of fish, prawn and crab.
(3) Mangroves can protect and cause sediment to be added to the coastal region, thus leading to an advancement of the shoreline.

Any interference in the mangrove community is likely to have an adverse effect which would be hard to justify.

5.5 THE GRANITE AND QUARTZITE FORMATIONS

There are many granite and quartzite outcrops throughout the central region of Eyre Peninsula, however, only two (Mt. Wedge and Darke Peak Range) occur within the lease. Any exploration conducted on these distinctive landmarks would probably leave visible scars, which would alter their beauty, and possibly affect their capacity as water-catchment zones.

5.6 RECOMMENDATIONS

There are several recommendations to be made.

(1) Vegetation clearing should be kept to a minimum and avoided wherever possible.

(2) Exploration should be excluded from the coastal zone.

(3) Efforts should be made to recognise aboriginal sites if they are found.

(4) Exploration should be kept away from Mt. Wedge and Darke Peak, so as not to ruin their natural beauty.

6. REFERENCES

A Field Guide to Australian Wildflowers, Volume 1 and 2.
- M. Hodgson and R. Paine.

A Regional Geography of South Australia.
- D.D. Harris and D.A.M. Lea.

Aboriginal Man in South Australia and Central Australia
- Edited by B.C. Cotton

Aboriginal Sites in South Australia, Mineral Information Series.
- South Australian Department of Mines & Energy, 1979.

Aboriginal Tribes of Australia.
- N.B. Tindale, 1974.

Australian Aboriginal Mythology.
- Edited by L.R. Hiatt.

Australian Native Orchids in Colour.
- L. Cady and E.R. Rotherham.

Coastline : Coastal Vegetation in South Australia, February 1979.
Beach Replenishment Issue, February 1979.
Beach/Dune, June 1981.
Geological Development of the Adelaide Metropolitan Coastline, June 1981.
Mangroves, June 1981.
Ocean Waves, June 1981.
- South Australian Coast Protection Board.

Conservation of Plant Communities in Australia and Papua New Guinea.
- R.L. Specht, E.M. Roe and V.H. Broughton, 1974.

Draft Enviromental Impact Statement - Stony Point.
- Santos.

Flora of South Australia, Volume I-IV.
- J.M. Black.

Hambridge Wildlife Reserve.
- A survey by the Nature Conservation of South Australia.

Handbook of South Australian Geology.
- Edited by L.W. Parkin.

Hincks National Park.
- The South Australian Naturalist, Volume 45, No. 2.

Scenic Wonders of Australia.
Reader's Digest.

Southern Heritage
- Focus on our Southern Heritage, 16th-22nd September 1978, in Adelaide.
Editors - D. Corbett and J. Sibly.

The Geography of South Australia.
- W. Honchin, F.G.S., & J.N. Gregory, D.Sc, F.R.S.

The Hundred Blesing.
- The South Australian Naturalist, Volume 43, No. 3.

The Mammals of South Australia.
- F.N. Jones.

The Natural Vegetation of Eyre Peninsula,1979.
- F.A. Mowling.

Trees of the Australian Bush.
- Worrell and Sourry.

The Vegetation of South Australia.
- R.L. Specht, 1974.

APPENDIX I

VEGETATION SPECIES LIST

This is a list of the flora which is likely to occur in the lease area

* Denotes introduced species

The rarity of species is indicated by (Specht et al,1974)

1. Probably extinct
2. Endangered - only small colonies remaining
3. Rare - population of adequate size
4. Depleted - originally widespread
5. Species known from original collection only
6. Species of geographical importance

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
FUNGI		
Trametes sanguinea		
LICHENS		
Caloplaca ferruginea		
Caloplaca aggregata		
Caloplaca calycantha		
Collema cocophorus		
Diploschistes scruposus		
Fulgensia bracteatum		
Heterodea muelleri		
Hypogyminia		
Lecanora atra		
Lecanora concriformis		
Lecidea contigna		
Lecidea decipiens		
Lecidea elegans		
Lecidea russala		
Lecidea sp.		
Parmelia borreri		
Parmelia conspersa		
Parmelia rutidota		
Parmelia sp.		
Physcia pulverulenta		
Ramalina inflata		
Teloschistes cryysophthalmus		
Teloschistes spinosus		
Thysanothecium hookeri		
Usnea sp.		
HEPATICAE		
Fimbriania conocephala		
Targeonia hypophlla		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
MUSCI		
Barbula psuedopulifera		
Barbula torquata		
Bryum capillare		
Bryum pachytheca		
Campylopus introflexus		
Funaria glabra		
Funeria hygrometrica		
Grimmia pulvinata		
Torleta calycina		
Torleta princeps		
Trinquetrilla papillata		
VASCULAR PLANTS		
AIZOACEAE		
Carpobrotus aequilaterus		
AMARANTHACEAE		
Ptilotus spanthulatus		
AMARYLLIOACEAE		
Hyponis pursilla		
APIACEAE		
Apium prostratum		
Bupleurum semicopositum		
Daucus glochidiatis		
Hydrocotyle callicanpa		
Hydrocotyle capillaris		
Hydrocotyle foveolata		
Hydrocotyle medicaginoides		
Hydrocotyle pilifera var. glabrata		
Hydrocotyle rugulosa		
Platysace heterophylla		
Trachymene cyanopetala		
Trachymene ornata		
Trachymene pilosa		
APOLYNALEAE		
Alyxia buxifolia		
ASTERACEAE		
Actinobole uliginosum		
Agianthus strictus		
Agianthus tomentosus		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
ASTERACEAE cont/...		
Arctotheca calendula		
Arthrixia athrixioides		
Brachyscome aliaris		
Brachyscome exilis		
Brachyscome goniocarpa		
Brachyscome leptocarpa		
Brachyscome linearilobα		
Brachyscome purpusilla		
Calocephalus brownii		
Calocephalus drummondii		
Calotis cymbacantha		
Calotis hispidula		
**Cardius tenuiflorus*		
Cassinia spectbilis		
**Centaurea melitensis*		
Centipeda cunninghamii		
Cirsium vulgare		
Chthonocephalus pseudevax		
Cotula australis		
Craspedia uniflora		
Elachanthus pursillus		3
Eriochlamys behrii		
Gnaphalium indutum		
Gnaphalium involucratum		
Gnaphalium leteoalbum		
**Hedypnois rhagadioloides*		
Helichrysum apiculatum		
Helichrysum baxteri		
Helichrysum bilobum		
Helichrysum bracteatum		
Helichrysum catacromum		
Helichrysum leucosidium		
Helichrysum obtusifolium		
Helichrysum semipaposum		
Helichrysum tepperi		
Helipterrnum demissum		
Helipterrnum hyalospermum		
Helipterrnum laeve		2
Helipterrnum moschatum		
Helitermum pygmaeum		
Helipterrnum sturtianum		
Humea cassiniaeformis		3
**Hypochoeris glabra*		
**Inula graveolens*		
Iseotopis graminifolia		
Lactuca seriala		
Leptorhynchos medius		
Leptorhynchos tetrachaetum		
Leptorhynchos waitzia		
Microseris scapigera		
Millotia myosotidifolia		
Millotia tenuifolia		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
ASTERACEAE cont/...		
Olearia axillaris	Coastal Daisy Bush	
Olearia ciliata		
Olearia floribimda		
Olearia lanuginosa		
Olearia lopidophylla		
Olearia muelleri		
Olearia picridifolia		
Olearia pimeleoides		
Olearia rudis		
Olearia tubiflora		
Podolepis canescens		
Podolepis capillaris		
Podolepis rugata		
Podotheca angustifolia		
Rutidosis multiflora		
Scypocoronis major		
Senicio glossanthus		
Senicio aff. lautus		
Senicio hispidulus		
Senicio pterophorus		
Senicio quadridentatus		
**Sonchus oleraceus*		
Stuartina muelleri		
Tonanthes muelleri		
Urospermum picroides		
Vittadinia tenuissima		
Vittadinia triloba		
Waitzia acuminata		
BORAGINACEAE		
**Buglossoides arvenue*		
**Echium lycopis*		
Halganca cycanea		
Halganca lavandulacea		
Myosotis australis		
Omphalolappula concava		
Plagiolotrup plurisepalus		
BRASSACEAE		
Alyssum linifolium		
Brassica tournefortii		
Capsella bursa-pastoris		
Diplotanis muralis		
Hymenolobus procumbens		
Sisymbruim orientale		
Stenopetalum lineare		
CAESALPINACEAE		
Cassia artemisioides		

SPECIES		
SCIENTIFIC NAME	COMMON NAME	RARITY
CAESALPINACEAE cont/...		
Cassia nemophila		
Cassia nemophila var. coriacea		
Cassia nemophila var. platypoda		
CAMPANULACEAE		
Wahlenbergia gracilenta		
Wahlenbergia sieberi		
CARYOPYLLACEAE		
**Cerastium diffusum*		
**Cerastium glomeratum*		
**Cerastium semidecandrum*		
Gypsophila australis		
**Minuarlia hybrida*		
**Sangina apetala sp. erecta*		
Sangina maritima		
**Silene conica*		
**Silene gallica*		
**Silene nocturna*		
**Spergularia diandra*		
**Stelleria media*		
**Stelleria palida*		
CASUARINACEAE		
Casuarina cristata		
Casuarina muelleriana		
Casuarina pursilla		
Casuarina stricta	She Oak	
CENTROLEPACEAE		
Centrolepis aristata		
Centrolepis murrayi		
Centrolepis polygyna		3
CHENOPODIACEAE		
Bassia obliquicuspis		
Bassia parviflora		
Bassia sclerolaenoides		
Chenopodium murale		
Chenopodium psuedomicrophyllum		
Enchylanena tomeentosa		
Kochia excavata		
Kochia radiata		
Kochia triptera		
Ragodia crassifolia		
Rhagodia nutans		
Rhagodia Preissii		
Salicornia sp.		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
CONVOLVULACEAE		
Convolvulus erubescens		
CRASSULACEAE		
Crassula colorata		
Crassula macrantha		
Crassula pedicellosa		
Crassula purpurata		
Crassula sieberiana		
CUPRESSALEA		
Callitris canescens		
Callitris preisii	Southern Cypress Pine	
Callitris verrucosa		
CYPERACEAE		
Bulbostylis sp.		
Cladium filum		
Gahnia deusta	Desert Sawedge	
Gahnia lanigera	Desert Sawedge	
Lepidosperma canescens		
Lepidosperma carphoides		
Lepidosperma congestum		
Lepidosperma viscidium	Black Rush	
Schoenus nanus		
Schoenus racemosus		3
Schoenus subphillus		
Scirpus antarticus		
Scirpus nodosus	Knobbly Club Rush	
DILLENIACEAE		
Hibbertia sericea	Guinea Flower	
Hibbertia stricta	Guinea Flower	
Hibbertia vigata		
DROSERACEAE		
Drosera glandulingera		
Drosera planchonii		
EPACRIDACEAE		
Acrotriche cordata		
Acrotriche patula		3,6
Astroloma conoslephioides		
Astroloma humifusum		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
EPACRIDACEAE cont/...		
Lecopogon condifolius		4
Lecopogon parviflorus	White Currant Bush	
EUPHORBIACEAE		
Adriana klotzochii		
Beyeria leschenaultii		
Beyeria leschenaultii var. ledifolia		
Poranthera microphylla		
Poranthera triandra		
FABACEAE		
Aotus ericoides		
Aotus villosus		
Daviesia brevifolia		
Davieinsia genistifolia		
Davensia nudula		
Daviensia pectinata		3
Daviensia polyphylla	Eggs and Bacon	2
Dillwynia hispiola		
Dillwynia uncinata		
Eutaxia microphylla	Small-leaved Eutaxia	
Gompholobium ecostatum		
Goodia lotifolia		
Glycine clandestina		
Hardnenbergia violacea		
Kennedia prostrata		
**Medicargo littoralis*		
**Medicargo minima*		
**Medicargo polymorpha*		
**Melulotus indica*		
Pultenaea acerosa	Native Broom	4
Pultenaea densifolia		
Pultenaea tenuifolia		
Swainsona lana		
Swainsona microphylla		
Templetonia retusa		
Templetonia sulcata		
**Trifolium arvense*		
**Trifolium compestne*		
Trifolium suffocatum		
**Trifolium tomentosum*		
GENTIANACEAE		
Sebia ovata		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
GERANIACEAE		
**Erodium botrys*		
**Erodium cicutarium*		
Erodium crinitum		
Erodium cygnorum		
**Erodium moschatum*		
**Geranium dissectum*		
Geranium retrorsum		
Geranium solanderi		
Pelargonium austral		
Pelargonium littorale		
GOODENIACEAE		
Dampiera lanceolata		
Dampiera rasmarinifolia		
Goodenia affinis		
Goodenia geniculata		
Goodenia pinnatifida		
Goodenia pursilliflora		
Goodenia robusta		
Goodenia varia		
Scaevola aemula		
Scaevola crassifolia		
Scaevola linearis		
Scaevola spinescens		
Velleia connata		
GYROSTEMONACEAE		
Gyrostermon australasicus		
HALORAGACEAE		
Haloragis heterophylla		
Haloragis teucriodes		
Loudonia behrii		
JUNCACEAE		
Juncus capitatus		
JUNCAGINACEAE		
Triglochin calcitrapa		
Triglochin centrocarpa		
Triglochin mucronata		
Triglochin trichophora		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
LAMIACEAE		
**Marrubium vulgare*		
Prostanthera aspalathoides		
Prostanthera calycina		3
Prostanthera crassifolia		
Prostanthera microphylla		
Teucruim sessiliflorum		4
Westringia grevillina		
Westringia rigida		
LAURACEAE		
Cassytha glabella		
Cassytha melantha		
Cassytha pubescens		
LILIACEAE		
Anguillaria dioica		
Anthropodium mirius		4
Anthropodium strictum		
Asphodelus fistulosis		
Bulbinopiis semibarbata		
Chamaesulla carymbosacory		
Dianella laevis		
Dianella revoluta		
Laxmannia sessiliflora		
Lomandra effusa		
Lomandra leucocephala		
Lomandra glauca		
Thysanotus patersonii		
Thysanotus tuberosus		3
Triconyne elatoir		
LINACEAE		
Linum marginale		
LONGANIACEAE		
Longania crassifolia		4
Longania linifolia		
Longania ovata		
Mitrasacme paradoxa		

SPECIES		
SCIENTIFIC NAME	COMMON NAME	RARITY
MALVACEAE		
Hibiscus huegelii		
Plagianthus berthae		
Plagianthus glomeratus		
**Melva nicaeensis*		
**Malva pauciflora*		
MIMONSACEAE		
Acacia acinacea		
Acacia anceps		
Acacia argyrophylla		
Acacia brachybotrya		
Acacia calamifolia	Wallowa Wattle	
Acacia colletiodes	Wait-A-While	
Acacia continua		
Acacia cf. euthycarpa		
Acacia cf. farinosa		
Acacia lingulata	Umbrella Wattle	
Acacia merralii		
Acacia microcarpa		
Acacia rigens		
Acacia rupicola		
Acacia sclerophylla	Hard Leaved Wattle	
Acacia sophorae	S.A. Coastal Wattle	
Acacia spinescens		
MYOPORACEAE		
Eremophila alternifolia		
Eremophila behriana		
Eremophila crassifolia		*3,6*
Eremophila glabra		
Eremophila rubfloccosasub		*3,6*
Eremophila weldii		
Myoporum parviflorum		
MYRTACAEA		
Baeckia behrii	Baeckea Broombrush	
Baeckia crassifolia	Baeckea Myrtle	
Callistemon macropunctatus	Scarlet Bottle Brush	
Calytrix involucrata	Fringed Myrtle	4
Calytrix tetragona		
Eucalyptus anceps		
Eucalyptus calycogona	Square Fruited Mallee	
Eucalyptus camaldulensis	River Red Gum	
Eucalyptus cooperana		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
MYRTACAEA cont/...		
Eucalyptus diversifolia	Coastal White Mallee	
Eucalyptus dumosa	White Mallee	
Eucalyptus flocktoniae		3
Eucalyptus foecunda	Slender-Leaved Mallee	
Eucalyptus gracilis	Yorrel	
Eucalyptus incrassata	Ridge Fruited Mallee	
Eucalyptus incrassata var. costata		
Eucalyptus odorata var. angustofolia		
Eucalyptus obesa var. angustifolia	Red Mallee	
Eucalyptus pileata		
Eucalyptus porosa	Mallee Box	
Eucalyptus rugosa		
Eucalyptus socialis	Red Mallees	
Eucalyptus transcontinentalis		
Leptospermum coriaceum		
Malaleuca acuminata	Mallee Honey Myrtle	
Melaleuca adnata		3
Melaleuca decussata		
Melaleuca halmaturorum		
Melaleuca lanceolata	Dryland Tea Tree	
Melaleuca neglecta		
Melaleuca oraria		3
Melaleuca pauperiflora		
Melaleuca uncinata	Broom Brush	
Thryptomene migueliana		
Verticordia wilhelmii		3
OPHIOGLOSSACEAE		
Ophioglossum lusitanicum sp. coriaceum		
ONAGRACEAE		
Denothera cf. biennis		
ORCHIDACEAE		
Acianthus exsert		
Acianthus reniformis		
Caladenia carnea		
Caladenia deformis		
Caladenia dilatata		
Caladenia filamentosa var. tentaculata		
Caladenia latifolia		
Caladenia tessellata		
Diuris maculata		
Eriochilus cucullatus		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
ORCHIDACEAE cont/...		
Leptoceras fimbriatum		
Lyperanthus nigricans		
Microtis paviflora		
Microtis unifolia		
Prasophyllum elatum		
Prasophyllum fitzgeraldii		
Prasaphyllum fuscoviride		
Prasaphyllum odoratum		
Prasaphyllum pallidum		
Pterostylis barbata		
Pterostylis cf. hamiltonii		4,6
Pterostylis mitchellii		
Pterostylis mutica		
Pterostylis nana		
Pterostylis pursilla		
Pterostylis rufa		
Pterostylis cf. squamata		
Pterostylis vittata		
Thelymitra antenifera		
Thelymitra aristata		
Thelymitra azurea		
Thelymitra luteocitium		
OXALIDACEAE		
Oxalis corniculata		
Oxalis pes-caprae		
PAPAVERACEAE		
Papaver aculeatum		
Papaver hybridium		
Paper setigerum		
PITTOSPORACEAE		
Billardiera sericophora		
Bussaria spinosa		
Cheiranthera cyanea		3
Cheiranthere linearis	Finger or Hand Flower	
Pittosporum phylliraeoides	Weeping Pittosporum	

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
PLANTAGINACEA		
Plantago coronopus		
Plantago varia		
POACEA (GRAMINEAE)		
Agrostis avenacea		
**Aira caryophylla*		
Aristida contorta		
**Avellinia michellii*		
**Avena barbata*		
**Briza minor*		
Bromus arenarius		
**Bromus diandrus*		
**Bromus rubens*		
**Catapodium rigiolum*		
Danthonia caespitosa		
**Hordeum lepovinum*		
**Lolium loliaceum*		
**Lolium rigidum*		
**Lophochloa phleoides*		
**Lophochloa rigidums*		
Neuranchne alopeviroidea		
**Parapholis incurva*		
**Pentaschistis airoides*		
Poa drummondiana	Tussock Grass	
Poa sp.	Tussock Grass	
**Schismus barbatus*		
Stipa acrociliata		
Stipa drummondisi		
Stipa elegantissima		
Stipa eremophila		
Stipa falcata		
Stipa indeprensa		3
Stipa cf. nitida		
Stipa plagiopogon		
Stipa sembibarbata		
Stipa tenuiglumis		
Stipa variabilis		
Triodia irritans	Porcupine Grass	
Triodia lanata	Porcupine Grass	3
Tristicum aestivcum		
**Vulpia bromdides*		
**Vulpia myruros*		
POLYGALACEAE		
Comesperma calymega		
Comesperma scoparium		
Comesperma volubile		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
POLYGONACEAE		
Muechlenbeckia adpressa		
Rumex brownii		
POLYPODIACEAE		
Cheiclanthes teniufolia		
Pleurosorus rutifolius		
PORTULACACEAE		
Calandrina calyptrata		
Calandrina corrigioloides		
Calandrina eromaea		
Calandrina neesiana		
PRIMULACEA		
Anagallis arvensis var. caerulea		
PROTEACEAE		
Adenanthos terminalis		
Conospermum patens		4
Grevillea aspera		
Grevillea huegelii		4
Grevillea ilicifolia	Holly Grevillia	
Grevillea pauciflora		3
Grevillea pterosperma		
Hakea cycloptera	Needle Bush	3
Hakea muellerana		
RANUNCULACEAE		
Adonis sp.		
Clematis microphylla		
Ranunculus sessiliflorus		
RESTIONACEAE		
Loxocarya fascuulata		3.6

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
RHAMNACEAE		
Cryptandra amara		
Cryptandra leucophracta		
Cryptandra tomentosa		
Pomanderris obcordata		
Pomanderris paniculosa		
Spyridium bifidum		
Spyridium leucopogon		3
Spyridium phylicoides		
Spyridium subochreatum		
Spyridium tridentatum		2
Spyridium vexilliferum		
ROSACEAE		
Aphanes arvensis		
RUBIACEAE		
Asperula scoparia		
**Galium murale*		
Opercularia scabrida		4
Opercularia varia		
RUTACEAE		
Boronia cocrulescens		
Boronia inorta		
Correa pulchella		4
Correa reflexa		
Correa reflexa var. coriacea		
Correa schlechtendalii		
Microcybe multiflora		4
Microcybe pauciflora		4
Phebalium bullatum		
Phebalium pungens		
SANTALACEAE		
Choretrum chrysanthum		
Choretrum glomeratum		3
Exocarpus aphyllus		
Exocarpus sparteus		
Santalum acuminatum	Native Peach	
Santalum murrayanum	Quandong etc.	

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
SAPINDACEAE		
Dodonaea attenuata		
Dodonaea baueri		
Dodonaea bursariifolia		
Dodonaea hexandra	Hop Bush	
Dodonaea humilis	Hop Bush	4
Dodonaea lobulata		
Dodonaea stenozyga		
Dodonaea viscosa		
SCROPHULARIACEAE		
**Panentucellia latifolia*		
Veronica distans		
**Zaluzanskyo divaricata*		
SOLANACEAE		
Anthocercis myosatidea		4
**Lycium ferocissimum*		
Nicrotiana goodspeedii		
Nicrotiana maritima		
Solanum capsiciforme		3
Solanum nigrum		
Solanum simile		
STACKHOUSIACEAE		
Stackhousia monogyna		
STERCULIACEAE		
Commersonia tateri		3
Lasiopetalum baueri		
Lasiopetalum behrii		
Lasiopetalum discolor		
STYLIDIACEA		
Levenhookia dubia		

SPECIES

SCIENTIFIC NAME	COMMON NAME	RARITY
THYMELAEACEAE		
Pimelea dichotoma		
Pimelea glauca		
Pimelea micrantha		
Pimelea octophylla		
Pimelea serphyllifolia	Thyme Rice Flower	
Pimelea simplex		
Pimelea stricta		
Pimelea villifera		
Pimelea williansonii		
URTICACEAE		
Parietaria debilis		
**Urtica urens*		
VIOLACEA		
Hybanthus floribundus		
ZYGOPHYLLACEAE		
Zygophyllum aff. ammophilum		
Zygophyllum apiculatum		
Zygophyllum aurantiacum		
Zygophyllum billardieri		
Zygophyllum glaucum		
Zygophyllum ovatum		

Appendix 2.

GLOSSARY OF BOTANICAL TERMS

ACUMINATE:	Tapering suddenly into a point.
ACUTE:	Sharp, gradually pointed.
APPRESSED:	Pressed closely against another organ; as leaves of a stem.
ANTHER:	Contains one or two pouches or cells which contain the minute pattern grains used for fertilization.
HRIL:	An expansion of the funicle into a membranous or fleshy appendage, sometimes covering a considerable part of the seed.
AXIL:	The angle formed by the leaf and the branch.
AXILLARY:	Arising from the anil of a leaf or bract.
BRACT:	A small leaf at the base of the penduncles of pedicels, and differing from the other leaves in size or shape. Bracts may also occur on the peduncles, scapes, or flowering branches without any pedicels in their anils.
CALYX:	Outer envelope of the flower, consisting of free of united petals.
CLAVATE:	Club-shaped.
CLAN:	The narrow lower part of a petal or involucral bract.
COLUMN:	Combination of stamens and style.
CORDATE:	Heart-shaped, with the notch below.
COROLLA:	Inner envelope of the flower, consisting of free or united petals.
FALCATE:	Curved like the blake of a sythe.
FILIFORM:	Threadlike slender
GALEATE:	Helmet-shaped
GLABROUS:	Devoid of hairs
GLANDULAR HAIRS:	Hairs tipped with a gland.
GLOBULAR:	Round like a globe or sphere.
LABELLUM:	The lowest petal of the orchid, usually different from the 2 lateral ones.
LAMINA:	The blade of a leaf, or the expanded upper part of a petal, sepal or bract.
LANCEOLATE:	Shaped like to head of a lance.
LINEAR:	Long and narrow, with parallel edges
MEDSCARP:	
OVATE:	When a flat surface, such as that of a leaf, is egg shaped, and broader below the middle.

PANICLE:	An inflorescence where the anis is divided into branches bearing several flowers.
PEDICEL:	Stalklet of a flower, when the peduncle bears 2 or more pedicellate flowers.
PEDICELLATE:	Growing on a pedicel.
PEDUNCLE:	Stalk of a solitary flower, or common stalk, of several pedicellate.
PERIANTH:	The floral envelope.
PETAL:	One of the divisions or leaves of the corolla, usually coloured.
PETIOLE:	Stalk of a leaf.
PUBESCENT:	Downy, covered with short soft hairs.
RACEME:	An individual anis or peoluncle bearing pedicellate flowers.
RADICAL:	Springing from the root.
SEPAL:	One of the divisions of the calyx.
SESSILE:	Without any stalk.
STAMEN:	Male organ of the flower, consisting of a short or long stalk which supports the anther.
SUBULATE:	Awl shaped.
TERETE:	Slender-cyclindrical, but not so slender as filiform.

APPENDIX III

BIRD SPECIES LIST

This is a list of recorded species and probable species for the lease

The symbol § indicates species which are casual visitors and are unlikely to nest.

SPECIES	
Scientific name	Common name
CASUARIIFORMES	
Dromaius novoehollandiae	Emu
SPHENISCIFORMES	
§Eudyptes chrysocome	Rockhopper Penguin
Eudyptula minor	Little Penguin
PROCELLARIIFORMES	
§Diomedia exulans	Wandering Albatross
§Diomedia melanophris	Black-browed Albatross
§Diomedia chlororhynchos	Yellow Nosed Albatross
§Macronectes giganteus	Giant Petrel
§Daption capense	Cape Petrel
§Pterodroma macroptera	Great-winged Petrel
§Pterodroma lessoni	White-headed Petrel
§Pachyptila salvini	Medium Billed Prion
§Pachyptila desolata	Dove Prion
§Pachyptila belcheri	Thin-billed Prion
§Puffinis carneipes	Fleshy-footed Shearwater
Puffinis tenuirostris	Short-tailed Shearwater
§Puffinis puffinis	Manx Shearwater
§Oceanites oceanicus	Wilson's Storm Petrel
Pelagodrama marina	White-faced Storm Petrel
PODICIPEDIFORMES	
§Podiceps novaehollandiae	Austalian Little Grebe
§Podiceps poliocepalus	Hoary Headed Grebe
PELECANIFORMES	
Pelecanus conspicillatus	Australian Pelican
Sula serrator	Australasian Gannet
Leucocarbo fuscescens	Black-faced Shag
Phalacrocorax varius	Pied Cormorant
Phalacrocorax melanoleucos	Little Pied Cormorant
Phalacrocorax carbo	Black Cormorant
Phalacrocorax sulcirostris	Little Black Cormorant
§Phaethon rubricauda	Red-tailed Tropicbird

SPECIES

Scientific name	Common name
ARDEIFORMES	
Ardea pacifica	White-necked Heron
Ardea novaehollandiae	White-faced Heron
Ardea ibis	Cattle Egret
Ardea sacra	Eastern Reef Egret
Eggretta alba	White Egret
Nycticorax caledonicus	Nankeen Night Heron
Threskiornis aethiopicus	Sacred Ibis
Threskiornis spinicollis	Straw-necked Ibis
Platatea regia	Royal Spoonbill
Platatea flavipes	Yellow-billed Spoonbill
ANSERIFORMES	
Cygnus atratus	Black Swan
Tadorna tadornoides	Mountain Duck
Anas superciliosa	Black Duck
Anas gibberifrons	Grey Teal
Anas castanea	Chestnut Teal
Anas rhynchotis	Blue-winged Shoveller
Malacorhynchus membranaceus	Pink-eared Duck
Aythya australis	White-eyed Duck
Chenonetta jubata	Wood Duck
Biziura lobata	Musk Duck
ACCIPITRIFORMES	
Pandion haliaetus	Osprey
Elanus notatus	Black-shouldered Kite
Elanus scriptus	Letter-winged Kite
Milvus migrans	Black Kite
Lophoictinia isura	Square-tailed Kite
Haliastur sphenurus	Whistling Kite
Accipiter novaehollandiae	Brown Goshawk
Accipiter cirrhocephalus	Collared Sparrowhawk
Haliaeetus leucogaster	White-breasted Sea-Eagle
Haliaeetus morphnoides	Little Eagle
Aquila audax	Wedge-tailed Eagle
Circus assimilis	Spotted Harrier
Falco subniger	Black Falcon
Falco peregrinus	Peregrine Falcon
Falco longipennis	Australian Hobby
Falco berigora	Brown Falcon
Falco cenchroides	Australian Kestrel
GALLIFORMES	
Leipoa ocellata	Mallee Fowl
Coturnix novaezelandiae	Stubble Quail

SPECIES

Scientific name	Common name
GRUIFORMES	
Turnix velox	Little Button-quail
Pedionomus torquatus	Plains Wanderer
Rallus pectoralis	Lewin Water Rail
Porzana fluminea	Australian Crake
Gallinula ventralis	Black-tailed Native-hen
Gallinula tenebrosa	Dusky Moor-hen
Porphyrio porphyrio	Swamp-hen
Fulicia atra	Coot
Ardeotis australis	Australian Bustard
CHARADRIIFORMES	
Burhinus magnirostris	Southern Stone Curlew
Haematopus longirostris	Pied Oystercatcher
Haematopus fuliginosis	Sooty Oystercatcher
Vanellus miles	Masked Lapwing
Vanellus tricolor	Banded Lapwing
Erythrogonys cinctus	Red-kneeded Plover
Charadrius rubricollis	Hooded Plover
Charadrius bicinctus	Double-banded Plover
Charadrius ruficapillus	Red-capped Plover
Charadrius melanops	Black-fronted Plover
Peltohyas australis	Inland Dotterel
Himantopushimantopus	Black-winged Stilt
Recurvirostra novaehollandiae	Red-necked Avocet
Cladorhynchus leucocephalus	Banded Stilt
Numenius madagascariensis	Eastern Curlew
Tringa nebularia	Greenshank
Calidris acuminata	Sharp-tailed Sandpiper
Calidris ruficollis	Red-necked Stint
Calidris ferruginea	Curlew Sandpiper
Larus novaehollandiae	Silver Gull
Larus pacificus	Pacific Gull
§*Catharacta lonnbergi*	Southern Skua
§*Catharacta maccormicki*	McCormack's Skua
§*Stercorarius parasiticus*	Artic Skua
§*Childonias hybridia*	Whiskered Tern
Hydroprogne caspia	Capsian Tern
Sterna nereis	Fairy Tern
Sterna bergii	Crested Tern
COLUMBIFORMES	
Columba livia	Domestic Pigeon
Streptopelia chinensis	Spotted Turtle Dove
Geopelia placida	Peaceful Dove
Phaps chalcoptera	Common Bronzewing
Phaps elegans	Brush Bronzewing
Ocyphaps lophotes	Crested Pigeon
Cacatua roseicapilla	Galah
Cacatua sanguinea	Little Corella

SPECIES	
Scientific name	Common name
COLUMBIFORMES contd/...	
Nymphicus hollandicus	Cockateil
Melopsittacus undulatus	Budgerigar
Barnadius zonarius	Port Lincoln Parrot
Psephotus varius	Mulga Parrot
Psephotus haeatogaster	Blue Bonnet
Neophema chrysostoma	Blue-winged Parrot
Neophema elegans	Elegant Parrot
Neophema petrophila	Rock Parrot
Neophema splendida	Scarlet-chested Parrot
Trichoglussus haematodus	Rainbow Lorikeet
Glossopsitta concinna	Musk Lorikeet
Glossopsitta porphyrocephala	Purple-crowned Lorikeet
Calyptorhynchus funerus funerus	Yellow-tailed Cockatoo
Calyptorhynchus lathami	Glossy Black Cockatoo
Cacatua leadbeateri	Major Mitchell's Cockatoo
CUCULIFORMES	
Cuculus pallidus	Pallid Cuckoo
Cacomantis pyrrhophanus	Fan-tailed Cuckoo
Chrysococcyx basalis	Horsefield's Bronze Cuckoo
Chrysococcyx osculans	Black-eared Cuckoo
Chrysococcyx lucidus plagosus	Golden Bronze Cuckoo
STRIGIFORMES	
Ninox novaeseelandiae	Southern Boobook
Tyto alba	Barn Owl
Tyto novaehollandiae	Masked Owl
Podargus strigoides	Tawny Frogmouth
Aegotheles cristatus	Australian Owlet-nightjar
Caprimulgus guttatus	Spotted Nightjar
APODIFORMES	
Hirundapus caudactus	Spine-tailed Swift
Apus pacificus	Fork-tailed Swift
CORACIIFORMES	
Dacelo gigans	Laughing Kookaburra
Halcyon pyrrhopygia	Red-backed Kingfisher
Halcyon sancta	Sacred Kingfisher
Merops ornatus	Rainbow Bee-eater
PASSERIFORMES	
Mirafra javinica	Singing Bushlark
Cheramoeca leucosternum	White-backed Swallow

SPECIES	
Scientific name	Common name
PASSERIFORMES contd/...	
Hirundo neoxena	Welcome Swallow
Cecropis nigricans	Tree Martin
Anthus novaeseelandiae	Richard's Pipit
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Coracina maxima	Ground Cuckoo-shrike
Lalage sueurii	White-winged Triller
Microeca leucophaea	Brown Flycatcher
Drymodes brunneopygia	Southern Scub-robin
Petroica multicolor	Scalet Robin
Petroica goodenovii	Red-capped Robin
Melanodryas cucllata	Hooded Robin
Eopsaltria griseogularis	Western Yellow Robin
Microeca leucophaea	Jacky Winter
Pachycephala inorta	Gilbert's Whistler
Pachycephala pectorialis	Golden Whistler
Pachycphala rufiventris	Rufous Whistler
Colluricincla harmonica	Grey Shrike-thrush
Oreoica gutturalis	Crested Bellbird
Myiagra inquieta	Restless Flycatcher
Psophodes nigrogularis	Western Whipbird
Rhipidura fuliginosa	Grey Fantail
Rhipidura leucophrys	Willie Wagtail
Cinclosoma castanotum	Chestnut Quail-thrush
Pomatostomus superciliosus	White-browed Babler
Cinclorhamphus mathewsi	Rufous Songlark
Cinclorhamphus cruralis	Brown Songlark
Corcorax melanorhamphus	White-winged Cough
Malurus cyaneus	Superb Blue Wren
Malurus asimmilis	Purple-backed Wren
Malurus pulcherrimus	Blue-breasted Wren
Malurus spendens callianus	Turquoise Fairy-wren
Malurus lamberti	Variegated Fairy-wren
Malurus leucopterus	White-winged Fairy-wren
Amytornis striatus	Striated Grasswren
Amytornis textilis	Thickbilled Grasswren
Sericornis frontalis	White-browed Scrub-wren
Sericornis brunneus	Redthroat
Sericornis fuliginosis	Calamanthus
Hylacola cauta	Shy Heath-wren
Smicrornis brevirostis	Weebill
Acanthiza apicalis	Inland Thornbill
Acanthiza uropygialis	Chestnut-rumped Thornbill
Acanthiza iredalei	Slender-billed Thornbill
Acanthiza chrysorrhoa	Yellow-rumped Thornbill
Aphelocephala leucopsis	Southern Whiteface
Climacteris rufa	Rufous Treecreeper
Anthochaera carunculata	Red Wattlebird
Acanthagenus rufogularis	Spiny-cheeked Honeyeater
Manorina flavigula	Yellow-throated Miner

SPECIES

Scientific name	Common name
PASSERIFORMES contd/...	
Lichenostomus virescens	Singing Honeyeater
Lichenostomus ornatus	Yellow-plumed Honeyeater
Melithreptus brevirostris	Brown-headed Honeyeater
Certhioyx variegatus	Pied Honeyeater
Meliphala leucotis	White-eared Honeyeater
Meliphala cratitia	Purple-gaped Honeyeater
Meliphala penicillata	White-plumed Honeyeater
Phylidonyris novaehollandiae	New Holland Honeyeater
Phylidonyris albifrons	White-fronted Honeyeater
Gliciphila melanops	Tawny-crowned Honeyeater
Certhionyx niger	Black Honeyeater
Acrocephalus australis	Reed-warbler
Megalurus gramineus	Little Grassbird
Acanthiza pusilla	Brown Thornbill
Ephthianura tricolor	Crimson Chat
Ephthianura albifrons	White-fronted Chat
Neositta pileata	Black-capped Sittella
Dicaeum hirundianceum	Mistletoebird
Pardalotus xanthopygus	Yellow-rumped Pardalote
Pardalotus striatus	Striated Pardalote
Zosterops lateralis	Silvereye
Passer domestius	House Sparrow
Carduelis carduelis	Gold Finch
Poephilia guttata	Zebra Finch
Sturnus vulgaris	Common Starling
Grallina cyanoleuca	Magpie-lark
Artamus personatus	Masked Woodswallow
Artamus superciliosis	White-browed Woodswallow
Artamus cinereus	Black-faced Woodswallow
Artamus cyanopterus	Dusky Woodswallow
Cracticus torquatus	Grey Butcherbird
Gymnorhina tibicen leuconota	White-backed Magpie
Strepera versicolor	Grey Currawong
Corvus mellori	Little Raven
Corvus coronoides	Australian Raven

APPENDIX IV

MAMMAL SPECIES LIST

This is a list of recorded and probable species for the lease.

SPECIES	
Scientific name	Common name
DASYURIDAE	
Sminthopsis murina	Slender-tailed Marsupial Mouse
Sminthopsis crassicaudata	Fat-tailed Marsupial Mouse
MACROPODIDAE	
Macropus fuliginosus	Western Grey Kangaroo
Macropus robustus	Euro
Bettongia penicillata	Brush-tailed Kangaroo
MURIDAE	
Rattus fucipes	Southern Bush Rat
Notomys mitchelli	Mitchell's Hopping Mouse
Mus musulus	House Mouse
PHALANGERINAE	
Cercartetus nanus	Pygmy Possum
Trichosurus vulpecula	Brush-tailed Possum
PERAMELIDAE	
Isoodon obesulus	Short-nosed Bandicoot
Perameles sp.	Long-nosed Bandicoot
ECHIDNA	
Tachyglossus aculeatus	Spiny Ant-eater
CANIDAE	
Canis familiaris	Dog
Vulpes vulpes	Fox
FELIDAE	
Felis catus	Cat
LEPORIDAE	
Oryctolagus cuniculus	Rabbit

APPENDIX V

REPTILE SPECIES LIST

List of recorded species and probable species for the lease

Scietific name	Common name
AGAMIDAE	DRAGON LIZARDS
Amphibolurus adelaidenis	
Amphibolurus barbatus	Bearded Dragon
Amphibolurus cristatus	Crested Dragon
Amphibolurus decresii	
Amphibolurus fionni	
Amphibolurus fordi	Mallee Dragon
Amphibolurus maculatus	Spotted Dragon
Amphibolurus muricatus	Jacky Lizard
Amphibolurus pictus	Painted Dragon
Moloch horrius	Thorny Devil
Tympanpcrytis lineata	
GEKKONIDAE	GECKOS
Diplodactylus elderi	Jewelled Gecko
Diplodactylus intermedius	Eastern Spiny-tailed Gecko
Diplodactylus vittatus	Wood Gecko
Gehyra variegata	Tree Dtella
Heteronotia binoei	Bynoe's Gecko
Lucasium damaneum	Bearded Gecko
Nephrurus laevissimus	
Nephrurus stellatus	
Phyllodactylus marmoratus	Marbled Gecko
Underwoodisauras milii	Fat-tailed Gecko
PYGOPODIDAE	SNAKE LIZARDS
Aprasia inaurita	
Aprasia striolata	
Delma australis	
Delma impar	
Delma molleri	
Delma nasuta	
Lialis burtonis	Burtons Snake Lizard
Pygopus lepidopodus	Commom Scaly Foot
SCINCIDAE	
Cryptoblepharus boutonii	
Ctenotus pantherinus	
Ctenotus regius	
Ctenotus robustus	
Ctenotus svhomburgkii	
Ctenotus uber	
Ergernia formosa	
Ergernia inorta	Desert Skink
Ergernia multiscutata	
Ergernia stokesii	Gidgee Skink

Scientific name	Commom name
-SCINCIDAE contd/...	
Ergernia whitii	White's Skink
Hermiergis peroni	
Leiolopisma delicta	
Leiolopisma entrecasteauxii	
Lerista bourgainvillii	
Lerista frosti	
Lerista microtis	
Lerista muelleri	
Lerista picturata	
Lerista terdigitata	
Menetia greyi	
Morethia adelaidensis	
Morethia boulengeri	
Morethia obscura	
Tiliqua branchialis	
Tiliqua occipitalis	Western Blue-tounged Lizard
Trachydosauras rugosus	Shingle-back
VARANIDAE	GOANNAS
Varanus gouldii	Sand Monitor
TYPHLOPIDAE	BLIND SNAKES
Typhlina australis	
Typhlina bituberculata	
BOIDAE	PYTHONS
Liasis childreni	Childrens Python
Morelia spilotes	Carpet Python
ELAPIDAE	FRONT FANGED SNAKES
Acanthopis artarcticus	Common Death Adder
Demansia psammophis	Yellow-faced Whipsnake
Drysdalia mastersi	Masters Snake
Echiopsis curta	Bardick
Notechis ater	Black Tiger Snake
Pseudechis australis	Mulga or King Brown Snake
Pseudonaja affinis	Dugite
Pseudonaja nuchalis	Western Brown Snake
Pseudonaja textilis	Eastern Brown Snake
Simoselaps bertholdi	Desert Banded Snake
Simoselaps semifasciatis	Half-girdled Snake
Suta suta	Myall or Curl Snake
Unechis brevicaudus	
Unechis gouldii	Black-headed Snake
Vermicella annulata	Bandy-bandy
ANURA	FROGS
Neobatrachus centralis	