SOUTH AUSTRALIA

DEPARTMENT OF MINES AND ENERGY

OPEN FILE ENVELOPE NO. 8173

EL 1555, WOORLO HILL

PROGRESS REPORTS FOR THE PERIOD 9/1/89 TO 9/7/89

Submitted by

Demis Pty Ltd and Mining Corporation of Australia Ltd

1989

ENVELOPE 8173

TENEMENT: EL 1555, Woorlo Hill

TENEMENT HOLDER: Demis Pty Ltd and Mining Corporation of Australia Ltd

CONTENTS

END OF CONTENTS

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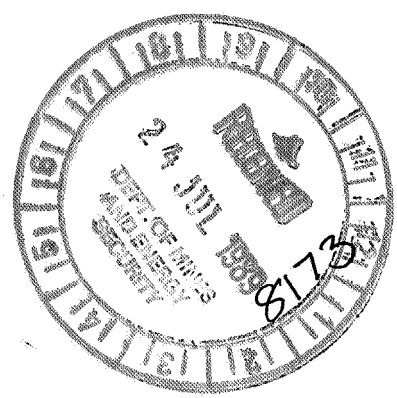
EXPLORATION LICENCE 1555
Woorlo Hill.

First Quarterly Report for the Period
9 January to 9 April, 1989.

Mining Corporation of Australia Limited
Demis Pty Ltd



CONTENTS.

FIGURES.

1 INTRODUCTION.

Three Exploration Licences were acquired over portions of the Padthaway Ridge following conceptual studies which identified the area as being prospective for the discovery of accumulations of heavy mineral sands. A reconnaissance drilling programme to examine the stratigraphy and heavy mineral content of the Pliocene and Pleistocene sand sequences within the tenements is scheduled to commence during the next quarter.

2 LOCATION, TENURE, PREVIOUS EXPLORATION.

Exploration Licence 1555 covering an area of 1428 square kilometres was granted on 9 January, 1989 for a period of six months to a Joint Venture consisting of Mining Corporation of Australia Limited and Demis Pty Ltd.

The tenement is located immediately west of Bordertown extending approximately 30 kilometres to the south and west towards Padthaway. The tenement was designed to cover a postulated Pliocene attachment structure developed behind the exposures of basement rocks about Willalooka.

Parts of the area were previously examined by the BMR as part of a regional reconnaissance of the Pliocene transgression and Pleistocene coastal dune system.

3 EXPLORATION OBJECTIVES.

The significant heavy mineral deposits reported to date in the Murray Basin have been contained within micaceous sands of the Pliocene Parilla Sands. While comprehensive data is not available the deposits appear to be either relatively linear accumulations associated with palaeobeaches, or more equidimensional and contained within laminar bedded sediments deposited in coastal "attachment" or "tombolo" structures. Such depositional environments can be expected to have occurred repeatedly during the Pliocene transgression and it was decided to attempt to outline areas where tombolo features may have formed and not been either obliterated or covered by subsequent events.

4 WORK COMPLETED.

An analysis of the distribution of the Pliocene sand sequence was carried out in conjunction with Mr. Belperio of the SADME. A series of reconstructions of the palaeocoastline were developed and prospective depositional environments identified. A review of the usage of the terms "Parilla Sand" and "Loxton Sand" for various sections of the Pliocene transgressive sands indicated that they were not sufficiently well defined, nor the stratigraphy sufficiently well understood, for them to be used as a criteria for the selection of exploration targets. Accordingly

the total Pliocene sand sequence was used in the analysis. The palaeoenvironmental reconstructions are presented in SADME Report Book /89.

5 FORWARD PROGRAMME.

A reconnaissance drilling programme is scheduled to commence in the area at the end of the reporting period. The programme will be designed to provide information on the stratigraphy of the Pliocene sand sequence, and the morphology and heavy mineral content of the sands within the postulated tombolo structure.

Results of the drilling and subsequent determinations of the heavy mineral mineralogy will determine the scope of further work.

6 EXPENDITURE.

Expenditures reported herein relate predominantly to the initial research and title acquisition phase. The work was carried out over the length of the Padthaway Ridge and the accumulated costs have been allocated equally to the three resulting Exploration Licences.

Geology and reporting	$ 4,108
Data acquisition	$ 54
Vehicle	$ 170
Drafting and printing	$ 186
Administration and overheads	$ 565
	$ 5,082

139°30'E

MURRAY BRIDGE

MARMON JABUK RANGE

MARMON JABUK RANGE E.L. 1554

Peake

LAKE ALEXANDRINA

Point Sturt

YOUNGHUSBAND PENINSULA

MT BOOTHBY E.L. 1557

Mt Boothby

36°00'S

WOORLOO HILL E.L. 1555

BORDERTOWN

Padthaway

Naracoorte

N

LEGEND

- Topographic contour (metres)
- Outcrop pattern of Parilla Sands
- Outcrop of litnified basement rocks
- E.L. Application
- Conservation Park

0 5 10 15 20 KILOMETRES

1:250000

DEMIS PTY LTD.

PADTHAWAY RIDGE

HEAVY MINERAL SANDS PROJECT

TOPOGRAPHY AND OUTCROPS

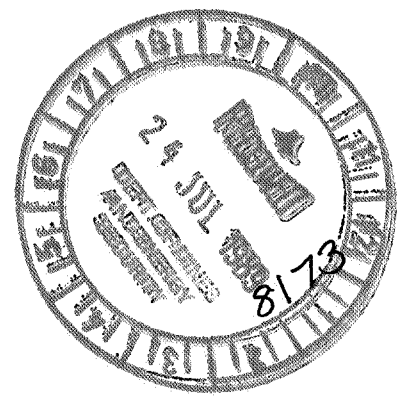
8173-1

000007

EXPLORATION LICENCE 1555
Woorlo Hill.

Second Quarterly Report for the
Period 9 April to 9 July, 1989.

Mining Corporation of Australia Limited
Demis Pty Ltd



CONTENTS.

FIGURES.

1 INTRODUCTION.

Three Exploration Licences were acquired over portions of the Padthaway Ridge following conceptual studies which identified the area as being prospective for the discovery of accumulations of heavy mineral sands. Within the Woorlo Hill tenement a possible Pliocene tombolo structure was recognised and reconnaissance drilling to examine the stratigraphy and heavy mineral content of the sand sequence was carried out. A relatively uniform sand blanket with visually significant traces of heavy minerals was intersected in most holes.

The drilling data is still being assessed.

2 LOCATION, TENURE, PREVIOUS EXPLORATION.

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The tenement is located immediately west of Bordertown extending approximately 30 kilometres to the south and west towards Padthaway. The tenement was designed to cover a postulated Pliocene attachment structure developed behind the exposures of basement rocks about Willalooka.

Parts of the area were previously examined by the BMR as part of a regional reconnaissance of the Pliocene transgression and Pleistocene coastal dune system.

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various sections of the Pliocene transgressive sands indicated that they were not sufficiently well defined, nor the stratigraphy sufficiently well understood, for them to be used as a criteria for the selection of exploration targets. Accordingly the total Pliocene sand sequence was used in the analysis. The palaeoenvironmental reconstructions are presented in SADME Report Book /89.

Within the tenement area the distribution of mapped outcrops of Pliocene sands (in fact of lateritised sandy sediments) and discernable geomorphic trends of both Pliocene and Pleistocene age were plotted (map attached). Between the limit of discernable Pliocene geomorphic trends about Bordertown and the basement outcrops about Willalooka the Pleistocene dunes appear to be developed on a relatively planar surface of Pliocene sands at an R.L. of approximately 60 metres above sea level. The curvilinear pattern of the Pleistocene dunes indicates that the prevailing swell during deposition was from the southwest with substantial refraction of the wave pattern about the Willalooka basement shoals.

The geomorphic trends in the Pliocene about Bordertown are presumed to reflect old dune systems which grade westward into a semi-emergent(?) tombolo structure developed in the lee of the Willalooka shoals. Late Pliocene lateritisation is assumed to have subdued the dune topography and levelled the tombolo to form the planar feature at R.L. 60 metres.

A reconnaissance pattern of fourteen drill holes was designed to test for the existence of the postulated Pliocene tombolo and to determine the overall heavy mineral content.

The drilling programme was commenced on 4 May and completed on 8 May, 1989. A total of 16 holes were drilled with an aggregate depth of 360 metres. A relatively consistent sand blanket of probable Pliocene age was intersected in the majority of the holes. Visually significant traces of heavy minerals were present in samples from several holes and selected intervals have been composited and submitted for determination of the mineral suite.

Compilation and analysis of the data is presently in progress.

5 FORWARD PROGRAMME.

Results of the compilation and analysis of the drilling data and determinations of the mineralogy of th heavy mineral sand fraction will determine the scope of further work.

6 EXPENDITURE.

Expenditures reported herein relate the reconnaissance drilling and initial sample compositing and dispatch. Laboratory analytical work and geological data compilation is still in progress and will need to be reported separately.

	First Quarter	Second Quarter
Geology	$ 4,108	$ 6,391
Wages	$ -	$ 2,856
Data acquisition	$ 54	$ -
Vehicle	$ 170	$ 2,018
Accommodation and meals	$ -	$ 1,979
Field supplies	$ -	$ 1,034
Drilling	$ -	$13,222
Drafting and printing	$ 186	$ -
Administration and overheads	$ 565	$ 1,785
	$ 5,082	$27,919
		$33,001

36° 10' S

36° 20' S

36° 30' S

36° 40' S

140° 10' E

140° 20' E

140° 30' E

140° 40' E

140° 50' E

20 m — CONTOUR INTERVAL

BASEMENT OUTCROP

PLEISTOCENE GEOMORPHIC TREND

PLIOCENE GEOMORPHIC TREND

MAPPED AND INFERRED WESTERN LIMIT OF PLIOCENE

PROPOSED DRILLHOLE AND SECTION LINE

OXFORD HOUSE ASSOC. P/L

MCA – DEMIS HMS J/V.

EL WOORLOO HILL

GEOLOGICAL–GEOMORPHIC ANALYSIS AND PROPOSED DRILL HOLES

GEO: R G Bluck	SCALE: 1:100000	DWG N°
DRN: INTO Drafting	DATE: Jan 1989	

8173-2

Appendix I

000012

ASSESSMENT OF THE HEAVY MINERAL SANDS POTENTIAL OF THE PLIOCENE SEDIMENTS OF THE PADTHAWAY RIDGE.

R. G. Bluck.
June, 1988.

CONTENTS.

TEXT FIGURES.

ATTACHED PLANS.

1 INTRODUCTION.

Significant discoveries of heavy mineral sands have been made in the Pliocene sequences of the Murray Basin by CRA and Aberfoyle. Major programmes have been established by these companies to explore for further deposits throughout the Murray Basin in Victoria, South Australia and New South Wales. To date exploration has concentrated on the area of the Pliocene Strand Plain identified by Brown (1985). Recently BHP have applied for title to explore the major strandline system identified by the South Australian Department of Mines and Energy in the Ooldea Range north of the Nullabour Plain.

Analysis of Pliocene sedimentation along the Padthaway Ridge on the southwestern margin of the Murray Basin has identified a major shoreline feature in the Marmon Jabuk Range, with associated but younger shorelines developed in the Padthaway area. Traversing and sampling has established the presence of a suitable heavy mineral suite. Models of known heavy mineral deposits together with palaeogeographic reconstructions are used to asses the potential of this region and to identify exploration targets.

This report presents a summary of the geology and exploration potential of the areas. More information is available and field visits into the areas can be arranged.

Applications for Exploration Licences have been lodged over exploration targets in the Marmon Jabuk Range and the Padthaway area by Demis Pty Ltd who are seeking joint venture partners for the exploration of the area.

2 EXPLORATION BACKGROUND.

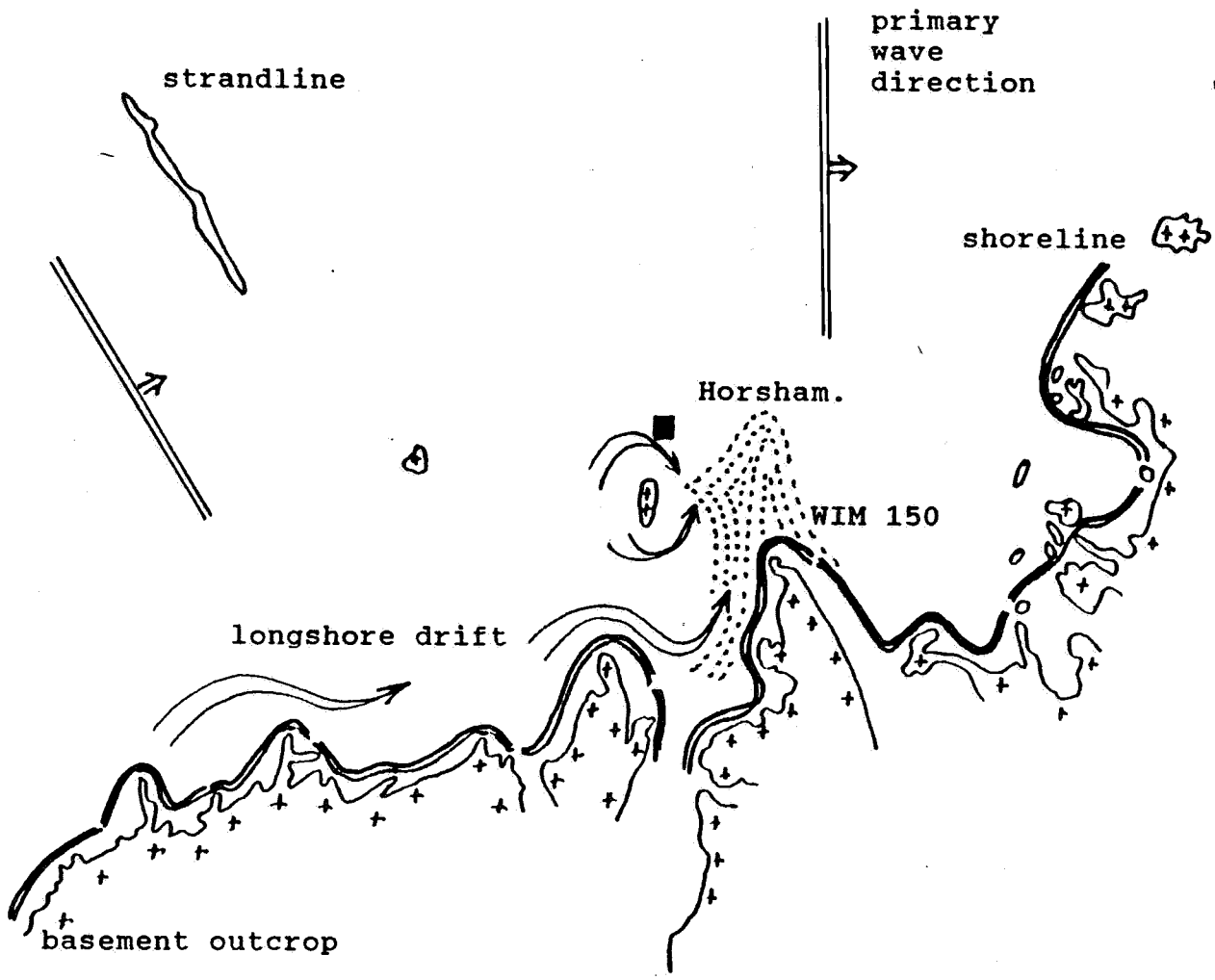
2.1 Known Murray Basin Deposits.

Exploration for heavy mineral sand deposits in the Victorian portion of the Murray Basin is dominated by a joint venture between Aberfoyle and Sandhurst Mining, and CRA.

The Aberfoyle-Sandhurst Mining JV has located a series of palaeostrandlines within the Pliocene Parilla Sands unit. In its Sea Lake (EL 1445) and Birchip (EL 1444) prospects the JV covers a 15 kilometre portion of the "Tyrrel Ridge" strandline and parallel dune system. Average heavy mineral content of some portions of the strand line is reported to be up to 11.6% total heavy mineral consisting of:

	THM	in-situ grade
rutile	13%	1.50%
zircon	14%	1.62%
monazite	1%	0.12%
ilmenite and others	71%	8.24%

CRA are evaluating the "WIM 150" deposit which is located several kilometres east of Horsham in Victoria adjacent to the margin of the Murray Basin. It is reported that the deposit contains in-situ reserves in excess of 1,000 million tonnes at over three



INTERPRETATION OF THE WIM 150 DEPOSIT.

Horsham, Victoria.

percent total heavy minerals at a two percent heavy mineral cut-off. The deposit consists of a heavy mineral bearing sand unit 10 to 15 metres thick overlain by approximately four metres of clay. Indicated in-situ grade of the reserve is;

rutile and anatase	0.34%
leucoxene	0.46%
ilmenite	1.25%
zircon	0.51%
monazite	0.06%
xenotime	0.02%

The CRA programmes commenced during 1984 and have advanced to the stage where detailed metallurgical studies are in progress and a feasibility study has been commissioned.

Little information on the geology of the WIM 150 deposit is available. However, an analysis of the prospect area from the available mapping suggests that the deposit may have formed as a composite spit and tombolo attaching to basement islands and shoals under the influence of longshore drift from the southwest. Such a mechanism could account for the apparent wide dispersion of moderate grade material.

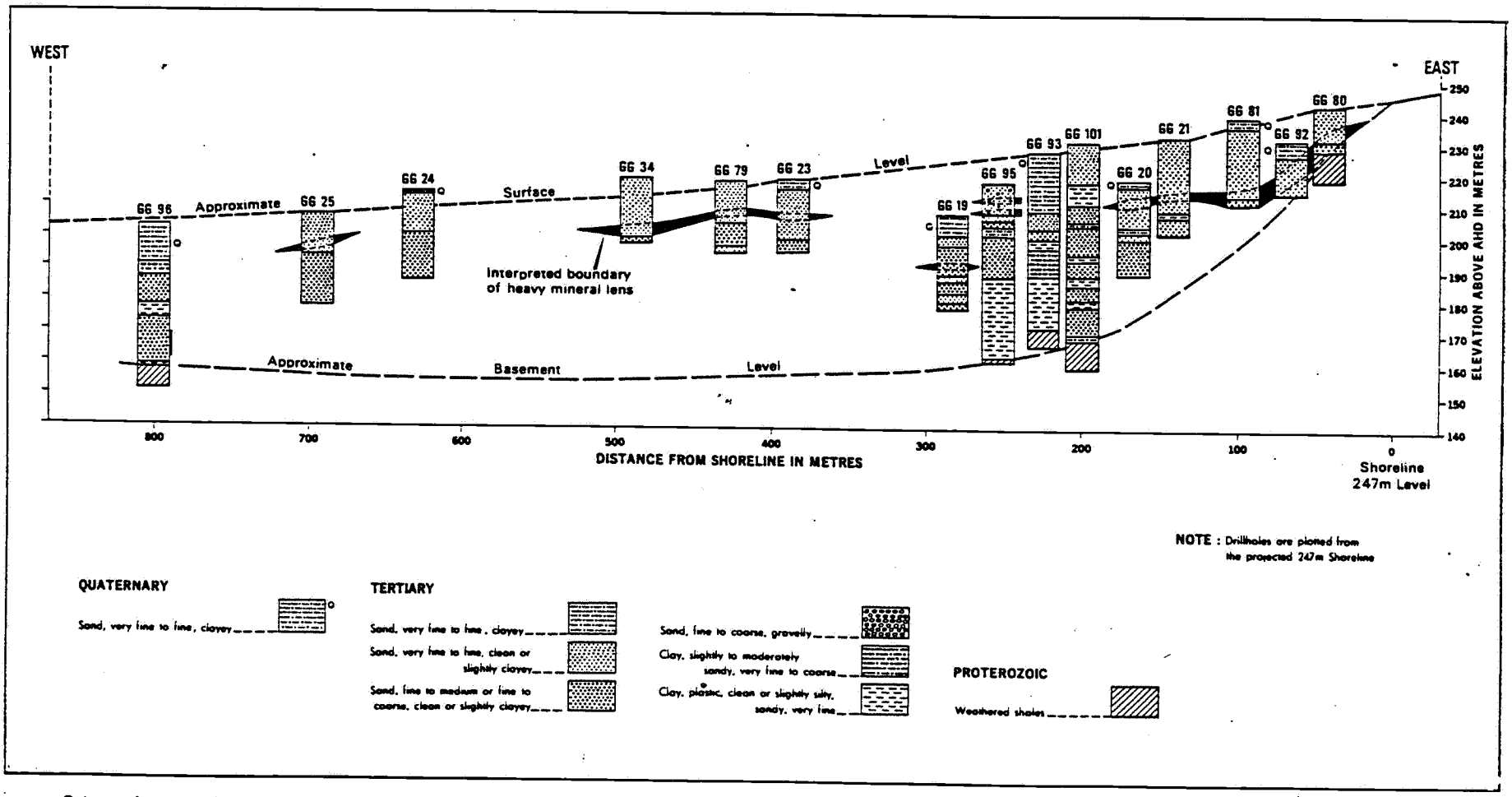
The largest explorer in the South Australian portion of the Murray Basin is Aberfoyle who have stated that the target minerals are rutile, leucoxene, ilmenite and zircon. While no results have been released, informal comment indicate that some potentially viable mineralisation has been located apparently associated with strandlines within the Upper Pliocene Parilla Sands.

The western margin of the Murray Basin north of Murray Bridge is now covered by ELA's of Aberfoyle, CSR, BHP and Peregrine Resources. The distribution of the applications suggests that the area of the Parilla Strand Plain identified by Brown (1985) has been accepted as containing the most prospective environments. Exploration is apparently based on broad spaced pattern drilling with only rudimentary geological controls.

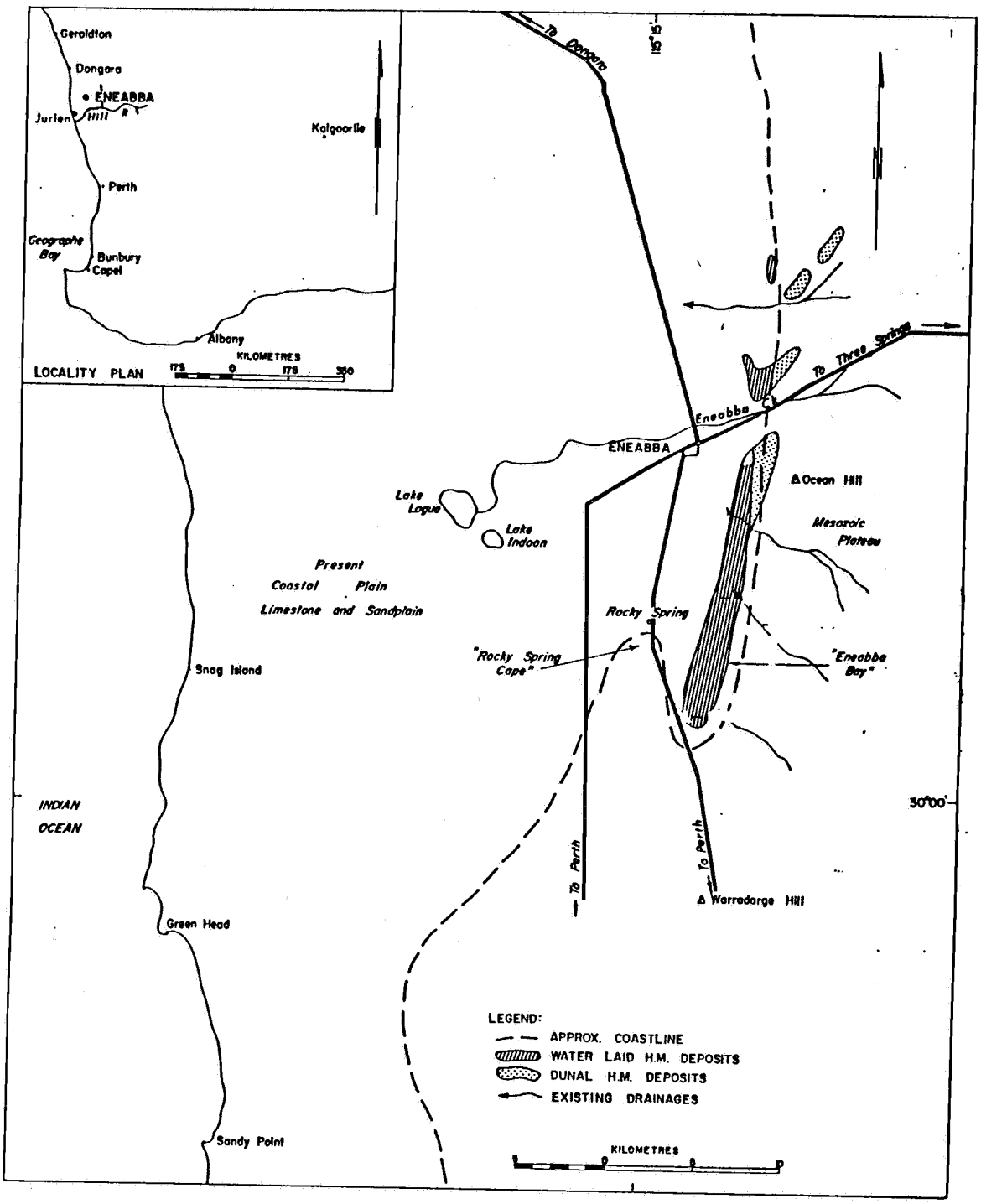
2.2 Other Deposits.

2.2.1 Golden Grove.

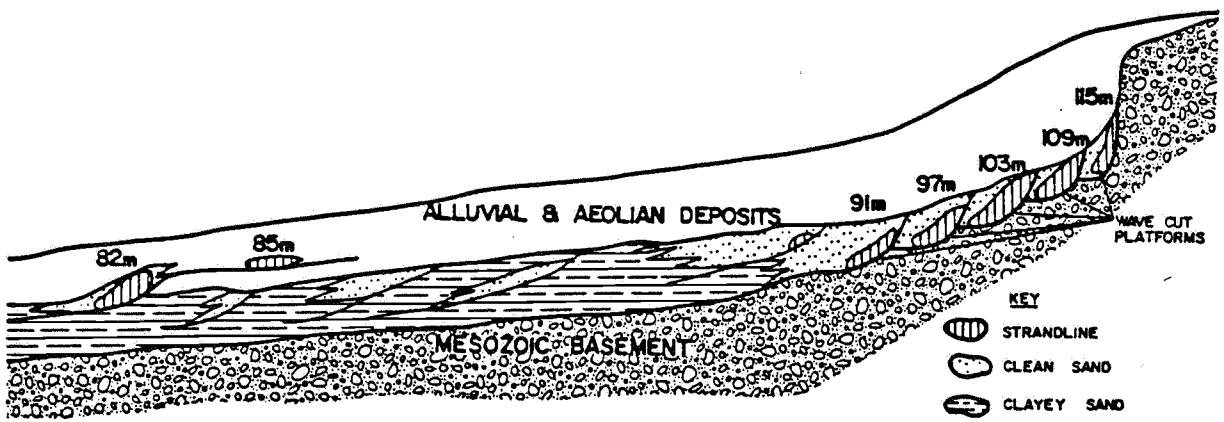
Tertiary marine and non-marine sequences with heavy mineral sands potential occur on the western side of the Mount Lofty Ranges in South Australia. The best known and documented is the Golden Grove heavy mineral accumulation which is located on the northeastern fringe of Adelaide on the western side of the Mount Lofty Ranges. The deposit consists mainly of ilmenite, rutile and zircon with lesser amounts of monazite, tourmaline, staurolite, sillimanite and kyanite. Heavy mineral content averages 7% comprising:



Schematic geological section, Golden Grove



Physiographic elements at the time of formation of the Eneabba deposit.



Diagrammatic geological section of the Eneabba deposit (after J. McDonald).

	HMS	in-situ grade
rutile	25.5%	1.79%
zircon	18.4%	1.29%
ilmenite etc	16.2%	1.13%
monazite	1.9%	0.13%
tourmaline	21.3%	1.49%
staurolite	8.5%	0.59%
sillimanite	3.3%	0.23%
kyanite	0.8%	0.06%

The deposit is localised immediately adjacent to a basement defined shoreline with heavies sourced from the Adelaidean hinterland. The data are summarised in the attached figures from McCallum amd Morris (1978).

2.2.2 Eneabba.

The Late Tertiary or Early Pleistocene Eneabba heavy mineral sands were sourced from local streams and concentrated and deposited in an open northwest facing bay exposed to the prevailing southwesterly wind and waves. Palaeostrandlines occupy wave platforms cut into Mesozoic sediments over a vertical interval of approximately 50 metres. The Mesozoic sediments contain up to 0.5% heavy minerals and are considered to be the immediate source.

The elements of the Eneabba deposits which are important in developing an exploration model are;

the deposits are localised in wave cut platforms in pre-existing sediments rather than crystalline basement.

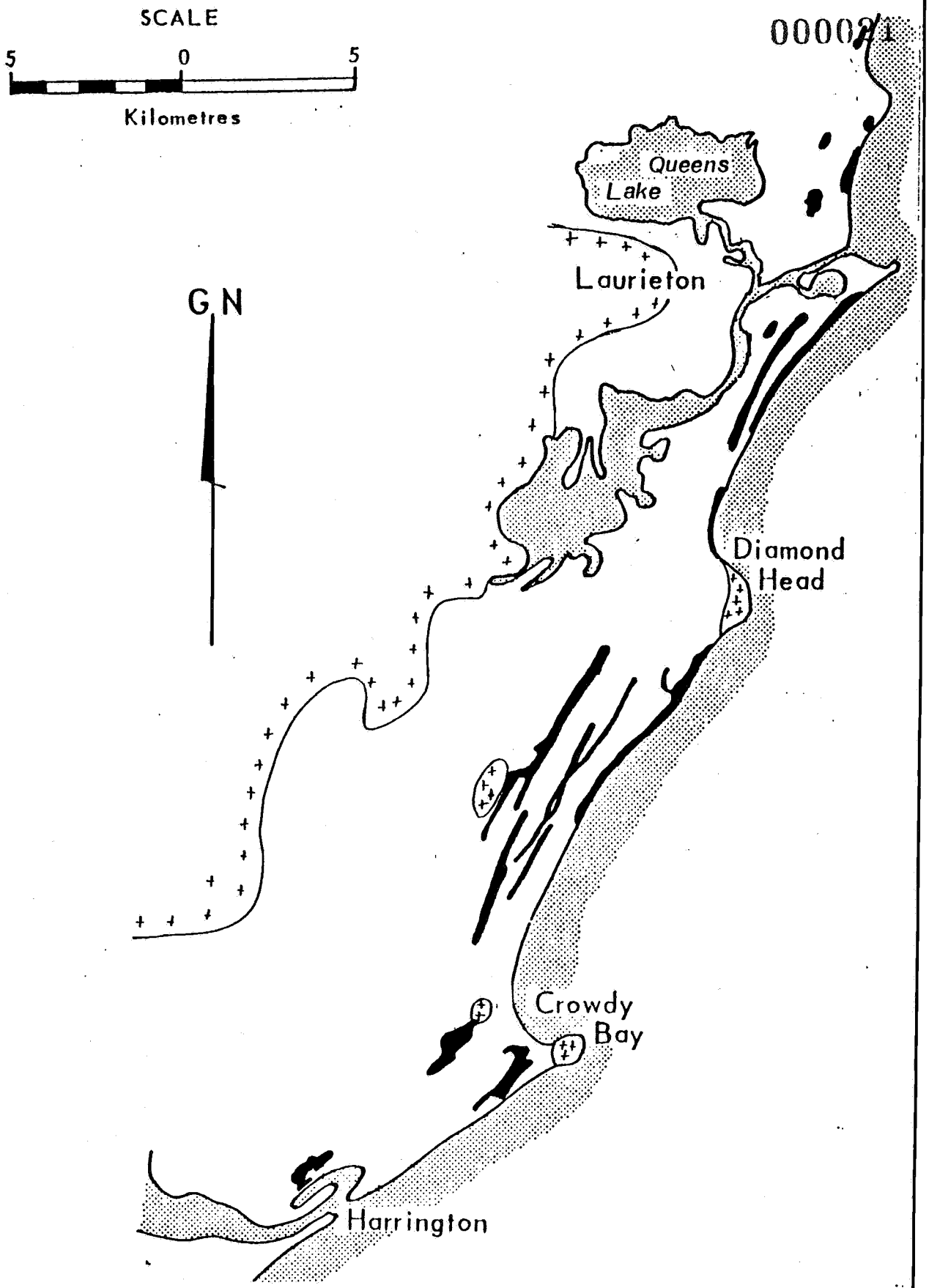
the deposits are down drift of, and partly behind, a major headland. The heavy minerals were presumably concentrated by a combination of longshore drift and flow separation behind the headland.

The data are summarised in the attached figures taken from Lissiman and Oxenford (1975).

2.2.3 East Australian Rutile Province.

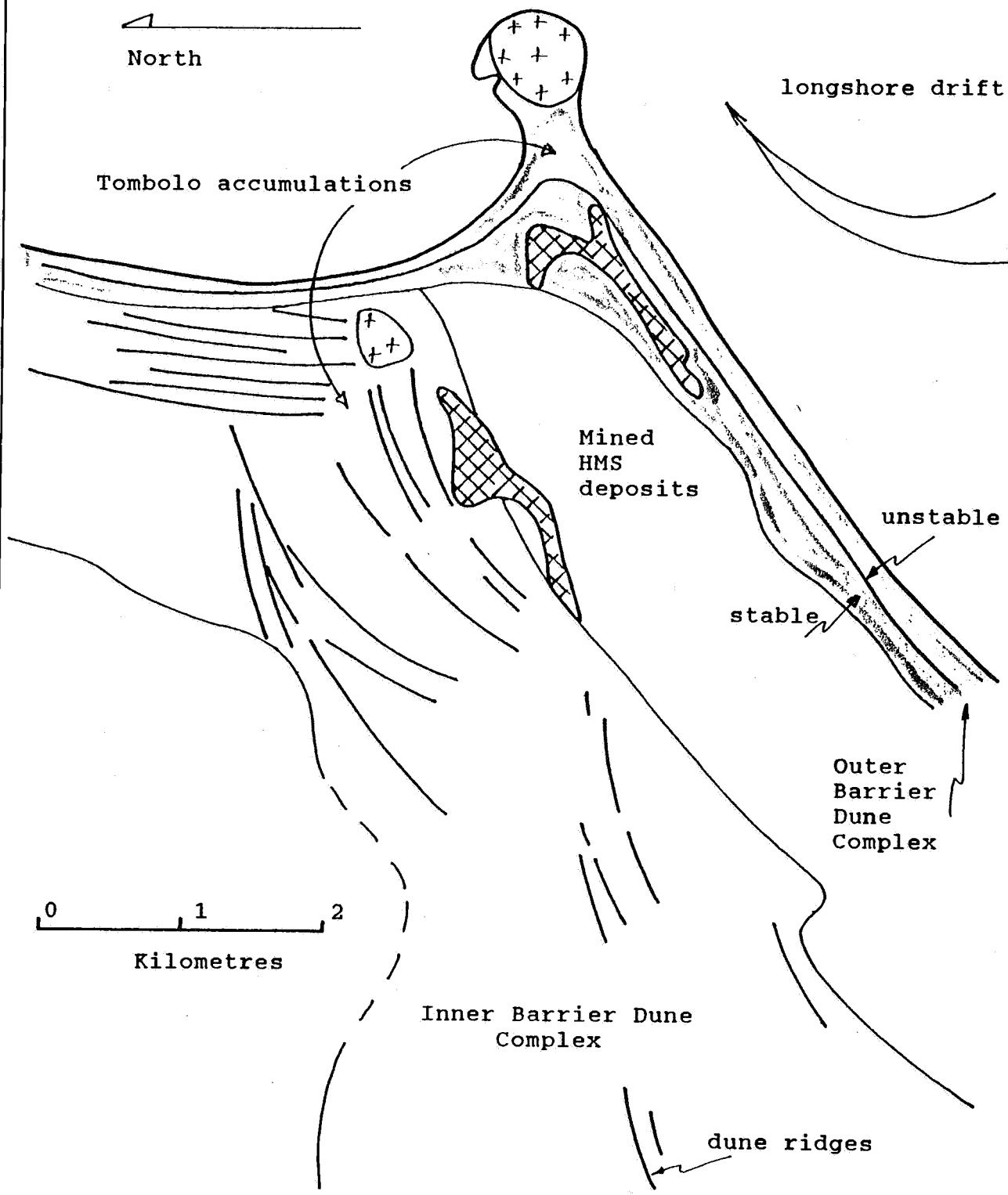
The Quaternary heavy mineral sand deposits of the east coast were deposited in a coastal environment dominated by a southeasterly swell and resultant strong northeasterly longshore drift. In the simplest case under these conditions mobile sediments constructed shore-parallel barriers and spits out from the lithic basement, with tombolos accumulating behind offshore islands and shoals. Continued progradation finally attached the spit and tombolo systems to the shoals, which then acted as headlands for the formation of zeta beach profiles down drift. In these situations heavy mineral deposits have formed most commonly along the linear portions of the zeta beach profiles, and on the updrift face of tombolo systems.

The above model is illustrated in the attached figures of the heavy mineral deposits of the Crowdy Bay - Diamond Head area in NSW. Data is taken from Winward (1974).



EAST AUSTRALIAN COAST.

Heavy Mineral Sand Deposits in the Crowdy Bay - Diamond Head Area. NSW.



EAST AUSTRALIAN COAST.

Heavy Mineral Sand Deposits in the Crowdy Bay Area. NSW.

Simplified Geology.

2.3 Depositional Models.

The components required to generate a significant concentration of heavy minerals are;

a supply of mobile sediments containing a measurable content of the significant heavy minerals (ilmenite, rutile, zircon, monazite etc) into an active, near shore, marine environment,

a marine environment with sufficient energy to periodically mobilise the sediment load,

a vectored current capable of generating a differential winnowing of the sediment.

Finally, the process must operate over a substantial area and for a protracted period.

On a detailed scale the most common setting for large deposits is within the swash zone of an open active beach profile where the accumulations are preserved by depositional progradation and frequently masked by aoelian dunes. Such strand line swash zones preferentially occur,

at "notch points" where a strand line is incised into either earlier sediments or lithic basement (e.g. Eneabba, Golden Grove),

along the most exposed portion of the strandline in the area of highest energy, commonly this is along the linear portion of a zeta shaped beach profile (e.g. Tyrrel Ridge, Diamond Head),

along the updrift face of tombolo accumulations between the coast and offshore islands or shoals (e.g. Crowdy Head, WIM 150),

against and behind irregularities in the beach profile (headland outcrops of lithic basement, river mouths etc) where complex current sets are generated (Eneabba, WIM 150).

The above points are discussed in the preceding text and summarised in the attached figures.

3 MURRAY BASIN SEDIMENTATION ABOUT THE PADTHAWAY RIDGE.

The following discussion is based on an assessment of that part of the Murray Basin covered by the Barker, Pinaroo and Naracoorte 1:250,000 geological map sheet areas. Various maps relating to the discussion are attached to the report. The area considered is bounded to the west by the Mount Lofty Ranges and runs parallel to the basement high of lithic to crystalline rocks of the Padthaway Ridge. Outcrops of basement rocks ("lithic basement") are exposed through younger cover about Murray Bridge and Lake Alexandrina, at Mount Boothby, and over a wide area at Padthaway. These areas of predominantly felsic igneous rock appear to have been either emergent islands or shallow-water shoals throughout Tertiary sedimentation.

Tertiary sedimentation in the area commenced in the Paleocene-Eocene with the deposition of lignitic sandstones, siltstones and claystones of the Buccleuch and Renmark Beds. They were succeeded in the Oligocene by calcareous clays and sandstones of the Compton Conglomerate Equivalents. These deposits form an irregular veneer over the lithic basement and effectively reduced the topographic relief.

The deposition of widespread Oligocene-Miocene bioclastic limestones (the Gambier, Pata, Morgan and Mannum Limestones and equivalents) occurred in an open marine environment. Banks of bioclastic debris accumulated in the lee of the basement shoals at the Murray Mouth and Mount Boothby, and along an inferred shoreline below the present position of the Marmon Jabuk Range. The morphology of the accumulations indicates that the primary wave direction was from the southwest.

Following the deposition of the bioclastic limestones and renewed transgression in the Pliocene, a sand sequence prograded over the area. In mapping and the literature both the Parilla and Loxton Sands are recognised as marginal marine assemblages of Pliocene age. The original differentiation between the units was geographic and the stratigraphic differentiation of the units, which is neither consistently applied nor supported by significant data, should be abandoned.

The Parilla Sands were deposited by depositional progradation and regression of the Pliocene sea from northeast to southwest, building a subparallel barrier complex which eventually attached to the basement shoals about the ancestoral Murray River mouth near Murray Bridge. At this time, refraction of the primary wave fronts about the Meningie and Mount Boothby offshore shoals resulted in an effective longshore drift to the southeast. This drift component generated a characteristic zeta shoreline, accompanied by winnowing of the immature fluvial load and the construction of a tombolo of lighter sands in the lee of the Mount Boothby shoals. The size and distinctiveness of the Marmon Jabuk Range strandline suggests that it represents a major stillstand during the Pliocene regression, and thence has the time potential to have generated significant heavy mineral accumulations.

At the eastern end of the Marmon Jabuk Range, the relict Pliocene coastal ridges have been breached and overprinted by blowouts downwind of a Pleistocene blowout complex at the north end of the Mount Boothby area. Extension of the blowout fabric through the Quaternary has destroyed the characteristic parallel morphology of the Pliocene ridges over a large area.

Similarly, in the Padthaway area progradation and tombolo construction from the Marmon Jabuk shoreline finally attached the shoreline to the basement shoals, and zeta shoreline profiles evolved downdrift.

A long period of exposure followed the Pliocene regression with weathering, soil development and a laterite profile variably developed over the area.

In the Pleistocene a series of marine transgressions were accompanied by deposition of calcarenites and calcareous aeolianites of the Bridgewater Formation. The aeolianites are composed predominantly of calcareous debris of marine origin, with a subordinate to minor siliclastic component. The most landward (Early Pleistocene) of these coastal complexes contain the greatest proportion of siliclastics with a significant heavy mineral component. Successive ridges to seawards become increasingly calcareous. The Quaternary coastal complexes of the Bridgewater Formation have been well documented and, in common with the Pliocene structures, are depositional rather than erosional features making it improbable that the Marmon Jabuk Range is an erosional escarpment as previously proposed.

The Pleistocene deposits and the previously lateritised Pliocene sequences were subsequently extensively calcreted.

Continuation of essentially similar coastal processes into the Holocene has formed the calcareous coastal barrier and lagoon of the Younghusband Peninsula and Coorong. Aeolian reworking of the surficial Pleistocene and Pliocene sediments is extensive and overprints and obliterates many of the primary morphologies.

4 EXPLORATION TARGETS.

The exploration parameters discussed previously have been used to assess the Pliocene depositional environments in that part of the Murray Basin covered by the Barker, Pinaroo and Naracoorte 1:250,000 map sheet areas. Reconnaissance sampling has confirmed that the immature, fluvially sourced sediments forming the Pliocene coastal complex of the Marmon Jabuk Range are part of a marginal marine assemblage, and that they contain a suite of the economically important heavy minerals. The Pliocene environmental reconstructions have been discussed previously and are shown on the attached maps.

A key consideration in assessing the potential of the strandlines identified is whether or not the available sediments could be winnowed to produce ore grade concentrations of heavy minerals. At Point Sturt, on the western shore of Lake Alexandrina, presently active sand bars and beaches contain heavy mineral concentrations of up to 46% garnet. These concentrations are forming by the erosion and subsequent longshore drift and winnowing of sands derived from an adjacent Pleistocene calcareous aeolinite body which contain much less than 0.5% garnet. The aeolinites are located immediately adjacent to the Mount Lofty Ranges and the garnets included into the dunes were derived from the metamorphics of the Kanmantoo Group.

The Point Sturt occurrence demonstrates conclusively that winnowing and/or longshore transport of immature sediments containing traces of heavy minerals can produce ore grade concentrations. Whether or not mineable tonnages develop will depend on the size of the concentrating environment, and the duration of the event.

4.1 Marmon Jabuk Range. ELA /88.

The Marmon Jabuk Range has a well developed ridge and swale morphology which reflects a former dune and interdune structure of the underlying Pliocene Parilla Sands. The Pliocene sequence prograded from the northeast, building seaward over Eocene marine sediments, with fluvial sediments being supplied from an ancestoral Murray River located at or west of Murray Bridge. The topography and outcrop patterns of the Range can be interpreted as reflecting a composite dune and interdune set to the northeast, with a slightly discordant major frontal dune to the southwest. The dunes have a pronounced arcuate hook at the northwestern end where they attach to the Murray Bridge basement shoals, straightening to linear southeast trends which can be traced for approximately 60 kilometres. This well developed distinctive zeta profile indicates a pronounced longshore drift to the southeast which is consistent with the inferred construction of a tombolo in the lee of the Mount Boothby shoals.

On the ground, the ridges of the Marmon Jabuk Range are capped by calcrete sheets which have obliterated the primary sediment fabric, while in the swales red clayey soils are developed on fine sands and clayey sands which are underlain at a depth of 2 to 3 metres by calcrete. Two exposures of the sands below the regolith were located - both are of aeolinites(?) developed high in the coastal complex and consist of red, fine to medium grained, unsorted, immature sands containing rare marine fossils and traces of heavy minerals. Pan concentrates contained rare mature quartz grains, marine fossils and traces of ilmenite, rutile, zircon.

Following the Late Pliocene regression and lateritic event a shallow marine environment was once again established in the Pleistocene up to the base of the Range. This environment would have been protected from the open sea by the aoelian dunes of the Bridgewater Formation which developed over the Mount Boothby shoals, and major erosion of the Pliocene sequence to form the present frontal escarpment is unlikely to have occurred.

The interpreted morphology and sediment transport processes of the Pliocene sediments of the Marmon Jabuk Range are analogous to those discussed earlier and the most probable concentration sites can be predicted. Heavy mineral concentrations are expected to be present within the swash zones located along the linear portion of the zeta beach profiles, within areas of complex current backwash behind the basement shoals, and along the connection between the beach and tombolo.

An application for an Exploration Licence has been lodged with the South Australian Department of Mines and Energy to cover the most obviously prospective portions of the Marmon Jabuk Range.

4.2 Padthaway. ELA /88.

In the Padthaway area Pliocene Parilla Sands form characteristic sets of zeta profiled dunes and interdunes downdrift of a complex set of basement shoals. Tombolo construction towards the shoals from the Marmon Jabuk Range shoreline produced a flat sand plain which gave way to dune complexes once the shoreline attached to

the shoals. The interaction of the primary wave fronts, longshore drift, and numerous basement shoals, undoubtedly produced complex current flows with associated opportunities for differential winnowing of the sediment load within the shoal area.

The interpreted morphology and sediment transport processes of the Padthaway area are complex, with similarities to the settings of the Eneabba and WIM 150 deposits. Heavy mineral concentrations can be expected to be present within the swash zones located along the linear portion of the zeta beach profiles, along beaches between shoals, and within areas of current backwash between and behind the shoals.

An application for an Exploration Licence has been lodged with the South Australian Department of Mines and Energy to cover the most obviously prospective portions of the Padthaway area.

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APPENDIX 2 ENV. 8173

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT: WOORLOO HILL CLIENT: OXFORD ASE ASS

PAGE No 027A 1/1

LOCATION: 2 km WNW of MUNDULLA RL = 80

HOLE No WH1/89

DATE COM. 4/5/89 FINISH. 4/5/89

TOTAL DEPTH 20.5m.

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH

TITLE EL1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Yellow brown silty clay with very fine sand, minor trace of black Hm, one carbonate. 70/70	WH1/2
2	4		Ditto 70/70	1/4
4	6		Ditto but with increased sand, above a ferric mot? gravel (up to 5mm) and greyish clays with pink/limonitic stain. 70/70	1/6
6	8		Fine white sands with up to 2% Hm, difficult to pan off. Black/Red [illegible] clear? Hm grains. 70/70	1/8
8	10		Ditto, then greyish clays, pink & limonitic staining as before. 70/70	1/10
10	12		Grey clay, above yellow brown fine & coarse "bi-modal sand" with trace Hm <1%, clayey. 70/70	1/12
12	14		Clayey; yellow brown calcareous sand, very fine grained weak Hm trace. 70/70	1/14
14	16		Ditto but with small fragments of shell grit and stronger Hm trace 70/70	1/16
16	18.		Calc arenite, very weak Hm trace. 70/70	1/18
18	20		Bryozoal limestone, porous highly fossiliferous 70/70	1/20
20	20.5		Ditto, pelecypods as well as bryozoans. EOH. 70/70	1/22.

RL LS = 62
RL CA = 64
ISO S = 4m or 10m (-2m day)
RL TS = 74

* Composite Samples WH 1/6-10, 12-16, Min Sample, WH 1/6-10.

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSV ASS

LOCATION 7 KM. WSW of MUMBULLAI RL=65.

PAGE No 1/1

DATE COM. 4/5/89 FINISH. 4/5/89

HOLE No WH2/89

LOGGED BY D.L.CURTIS. DRILLED BY INTERTECH.

TOTAL DEPTH 14.5m

TITLE EL1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Off white clay, calcareous gravels, and fine white clean sand.	WH2/2 C
2	4		Yellow brown clay, some white gravels (LST?), sand (trace to grey clay)	2/4 C
4	6	Hm	Yellow brown fine sand, trace Hm BLM. Rather with grey clay pit e yellow Fe ox stains, above a semi ... gravel, Hm as above.	2/6 F
6	8	Hm	Grey clay, then fine white sand with strong Hm trace.	2/8 F
8	10		Grey/limonitic yellow clays, minor sand, with Hm trace	2/10 F
10	12.	CA	Yellow brown, limonite stained massive chunks of limestone and clays, minor sand:- calcarenite	2/12 C
12	14		Rather, then coarse grained porous bryozoal limestone.	2/14 C
14	16		Lst as above. EOA 14.5m.	

(Samples 2/6 F – 2/10 F bracketed: *)

RL LS = 52
RL CA = 55
Iso S = 4 m (5m)?
RL TS = 59

* Composite Mineralogical Sample WH 2/6-10

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSE ASS.

PAGE No 1/1

LOCATION W 1km. WSW OF MUNDIJONG RL = 63

HOLE No WH3/89

DATE COM. 4/5/89 FINISH. 4/5/89

TOTAL DEPTH 20.5m

LOGGED BY J.L.CURTIS DRILLED BY INTERTECH

TITLE EL 1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Yellow brown clay and fine sand, some clasts of ferruginised min blobs by Hm. 60/60	WH3/2 C
2	4		Grey clay with pink and yellow brown laterite clay, with fine yellow brown sand, Trace Hm, Blk & Red? 60/60	3/4 C
4	6	Hm	Yellow brown clay and fine yellow brown sand 60/60 Trace of Blak Hm. above yellow brown ferruginised, massive lst	3/6 F
6	8		Grey clays, massive bands of thin white limestone, fine white sand with upto 1%? Hm. Blk & Red grains. 60/6	3/8 F
8	10	Hm	White fine grained sand as above, very little clay or lst, Hm as above, suspect white zircon as well? 60/60	3/10 F
10	12		Bulk, thin grey clays 60/60	3/12 F
12	14	CA	Yellow brown, calcareonite no q/z, no Hm. 60/60	3/14 F
14	16	CA.	Bulk, faint trace of Hm, competent, cemented. 60/60	3/16 C
16	18	Hm CA	Bulk, buff off white in color, competent, cemented. Little gritty sand, trace Hm to 1%? 60/60	3/18 C
18	20		Bulk thin graded to off white - buff, med - coarse grained, porous bryozoal lst. 60/60	3/20 C
20	20.5		Bulk EOH 20.5	

RL LS = 43
RL CA = 51.
ISO S. = 6m.
RL TS = 57

* Composite Sample WH3/8-12

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT ONROAD HSE ASS

PAGE No 1/1

LOCATION 15 km WSW* OF MUNDULLA RL ≈ 59

HOLE No WH4/89

DATE COM. 4/5/89 FINISH. 4/5/89

TOTAL DEPTH 17.50m

LOGGED BY J.L.CURTIS DRILLED BY INTER TECH

TITLE EZ 1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Yellow brown clay with kaolinitic patches, and fine grained yellow brown sand with minor trace black Hm. 60/60	WH 4/2 C
2	4	HEm	Ditto, but largely of grey colour, minor carbonate 60/60	4/4 C
4	6		Grey, oily clay with kaolinitic staining, min Leafy mineral trace (as previously), minor carbonate 60/60	4/6 F
6	8		Ditto, then very fine grained white sand and clay, trace Hm., some small percentage of coarse sand. 60/60	4/8 F *
8	10		Ditto as for sand above. 60/60	4/10 F *
10	12	CA	Ditto then massive carbonate rock overall, trace Hm as previously (yellow brown) 60/60	4/12 F
12	14	CA	Ditto buff Buff coloured, Hm trace, weak. 60/60	4/14 C
14	16	CA	Ditto. 60/60	4/16 C
16	17.50		Ditto, then hard drilling in massive carbonate rock overall? limonite 60/60	4/18 C
			EOH 17.50 m.	
			RL LS = 43	
			RL CA = 48.	
			ISO S = 4m.-	
			RL TS = 52	

* Composite Sample WH4/8-10

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD IISE ASS

PAGE No 1/1

LOCATION 19 KM. WSW of MUNDARING RL ≈ 55

HOLE. No WHS/89

DATE COM. 4/5/89 FINISH. 4/5/89

TOTAL DEPTH 22 m.

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH.

TITLE EL 1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No	
0	2		Yellow brn sandy clay, clean sand, very fine grained, minor trace Hm. 70/70	WHS/2 C	
2	4		Grey clay with yellow brown limonite stains, silty & fine grained white sand with >1% Hm, Blk/Red/(Multi.?) 70/70	5/4 F	
4	6		Grey clay with sand at Hm as above 70/70	5/6 F	
6	8		Ditto 70/70	5/8 F	
8	10	Hm	White sand, with suspended clay, up to 1% Hm. Blk/Red., very fine grained sand at Hm. 70/70	5/10 F	*
10	12	Hm	Ditto 70/70	5/12 F	*
12	14	Hm	Ditto 70/70	5/14 F	*
14	16	Hm	Ditto 70/70	5/16 F	*
16	18	Hm	Ditto, but substantially less Hm, trace. 70/70	5/18 F	*
18	20		Ditto as above 70/70	5/20 F	
20	22		Ditto as above, yellow clay < 2 m above bryozoan lst. EOH 22. 70/70.	5/22 F	
22	24				

RL LS = 34.
RL CA = 34
RBO S = 7.10 m.
RL TS = 47.

* "Composite Samples": WHS/10, ..., 18; Mineralogical WHS/10-18

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOODLOD HILL CLIENT OXFORD HSF ASS

PAGE No 1/1

LOCATION 24 km WSW of MILDURA. RL ≈ 69

HOLE No WH6/89

DATE COM. 5/5/89 FINISH. 5/5/89

TOTAL DEPTH 29.5m.

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH

TITLE EL 1555.

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Chocolate brown veneer over yellow brown clays with trace of sand, very very minor Hm trace 80/80	WH 6/2 C
2	4		Medium grey clays with some ferruginised staining and minor fine sand, no Hm. 80/80	6/4 C
4	6	O O	Ditto but with minor dolomite grains and nodules., no sand. 80/80	6/6 C
6	8		Stiff lt grey clay with ferruginised stains, no sand. 80/80	6/8 C
8	10		Ditto but with pink and yellow Fe ox stain. 80/80	6/10 C
10	12		Blue - (radioactive) green clays with yellow, orange pink Fe ox stains - (cliff), similar to above 80/80	6/12 F
12	14	Hm	White fine grained sand, strong trace of Blue Red Hm. fine Hm, lesser panning 80/80	6/14 F
14	16	Hm	White fine grained sand as above with large fresh grey clays as above, strong high Hm ≥ 1% Ilm Blk 95/80	6/16 F
16	18	Hm	Ditto 95/80	6/18 F
18	20	Hm	Ditto, yellow brown ferruginised stain some arenaceous — Hm ≥ 1% as above 95/80	6/20 F
20	22		Massive yellow brown & grey vesicular clays with (minor sand, seed, white/yellow bn, fine qz, abund Hm > 1%.) 80/80	6/22 F
22	24		Ditto, with yellow brown clayey fine sand and trace, Hm, very weak. 80/80	6/24 F
24	26	CA	fine sand as above, then yellow brown sandy calc arenite. 80/80	6/26 C
26	28.	CA	Calc arenite - 100% bryozoal fragments, re-worked basal lst., trace Hm. 80/80	6/28 C
28	29.5.	CA	Calc arenite with shell fragments, 90% sand massive, compact. strong trace Hm. 80/80	6/30 C

RL LS = 39
RL CA = 45
ISO S = 8m.
RL TS = 59

* Composite Sample WH6/14-20

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSE. ASS.

PAGE No 1/1

LOCATION 18.5 km W of MUMDULLA RL = 54 HOLE. No WH7/89

DATE COM. 5/5/89 FINISH. 5/5/89 TOTAL DEPTH 16 m.

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH TITLE EL 1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Thin veneer of grey sand above chocolate brown clays, silty. — acid, trace of Hm., Dolomite chips ? 70/70	WH7/2C
2	4		Grey silty clays, some yellow limonite staining, with lumps & chips of dolomite?, fine sand (min) trace Hm? 70/70	7/4C
4	6		Both as above, but with fine white sand (late) containing perhaps 2% Hm. 70/70	7/6F *
6	8	Hm	Fine white sand, clayey, milk ~2% Hm, very fine Blue Red, loss on panning substantial. 70/70	7/8F *
8	10	Hm	Both, ultrafine Hm very evident, can't be panned successfully, grey/blue grey clay & limonite stain 70/70	7/10F
10	12		Both thin yellow brown clay milk dolomite? clays. 70/70	7/12F
12	14	CA	Yellow brown clay, abun calcarenite 70/70	7/14F
14	16		Yellow brown calcarenite above white bryozoan pelecypods, and crinoidal? Limestone. 70/70	7/16C
			EOH 16m.	
			RL LS = 41	
			RL CA = 43	
			ISO S = 7m.	
			RL TS = 49	

* Composite Sample WH7/6-8

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSE ASS

PAGE No 1/1

LOCATION 10KM. WNW of MUNDARING RL = 6xx HOLE No WH8/89.

DATE COM. 5/5/89 FINISH. 5/5/89 TOTAL DEPTH 17.50m.

LOGGED BY T.L. Curtis DRILLED BY INTERTECH TITLE EL 1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		chocolate brown sandy loam, ltn clay, above buff clay and calcrete, magnesian Hm in fine sand. 70/20	WH8/2 C
2	4		Yellow brown clay with silty, mica fine yellow brown sand, calcrete lumps at fine pisolitic ferricrete 70/20	8/4 F
4	6		Red/yellow brown fine clayey, sand, cemented weakly by iron oxides, faint trace Hm-S., mica carbonate 70/20	8/6 F
6	8		Yellow brown clayey sand, fine g with va very weak Hm trace - mica carbonate grains 70/70	8/8 F
8	10		Ditto 70/70	8/10 F
10	12		Yellow brown, fine sand with a trace of Hm. At the base of white massive carbonate cemented sand. 70/70	8/12 F
12	14		Ditto, bands of cemetation as above, Trace Hm v weak above clay, yellow brown/grey, silty. 70/70	8/14 F
14	16		Yellow brown/grey silty clay with mica fine g yellow sand, faint trace Hm-, few fossil chips 70/70	8/16 C
16	18		Ditto, ltn calc cemented, massive cemented bioclastic & indurated massive carbonate above bryozoal hsk. 70/70	8/18 C
			EOH 17.50	
			RL LS = 44	
			RL CA = 45	
			ISO S = 7m?	
			RL TS = 57.	

* Composite Sample WH8/6-12

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSE ASS.

PAGE No 1/1

LOCATION 7 Km NNW of MUNDULLA RL = 80

HOLE No WH9/89

DATE COM. 5/5/89 FINISH. 5/5/89

TOTAL DEPTH 12 m.

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH.

TITLE EL 1555.

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Thin veneer of chocolate brown sandy soil covering calc- passes to greyish green clays with limonite staining, (pressed, tacky)	WH 9/2c
2	4		~~Ditto~~ Abundant calcrete / Ditto, clay silty as above with red brown ferruginous pisolite at the end of interval 50/80	9/4P
4	6	THm	Minor pisolites above white clayey fine sand with strong Hm trace, v.f.g <1%. 50/80	9/6P *
6	8	T.Hm	White fine grained sand/clay with Hm trace as above 50/80	9/8F *
8	10	TH	Ditto, but transitional to yellow brown sandy clay with high muscovite and calc arenite cobbles, Hm trace 50/80	9/10F *
10	12	CA	Calc arenite, weakly cemented, transitional to yellow brown/buff bryozoal/shell grit, Lot, Hm trace 50/50	9/12P

EOH 12.0 m.

RL LS = 69
RL CA = 70
ISO S = 6m.
RL TS = 76

* Composite Sample WH9/ 6-10

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL. CLIENT OXFORD HSE ASSO

PAGE No 1/1

LOCATION 21 km SW of MUNDIJONG. RL ≈ 65

HOLE No WH10/89

DATE COM. 6/5/89 FINISH. 6/5/89

TOTAL DEPTH 32.5m

LOGGED BY J.L. CURTIS. DRILLED BY INTERTECH.

TITLE EL 1555.

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Dark brown to slightly bahia clays, very minor sand with faint Hm trace (could be roadway runoff) 80/80	WH10/2C
2	4		Yellow brown, limonitic clays, translucent to grey clays.. 80/80	10/4C
4	6		Grey clay with limonite + lats 80/80	10/6C
6	8		Delta but with some pink shells as well. 80/80	10/8F
8	10	Hm	Yellow brown clayey calcareous/quartz, fine sand, trace Hm 80/80	10/10F
10	12	CA?	Delta, but with some pellets of cemented, trace Hm as above. 80/80	10/12F *
12	14	Hm	Delta but with abund Hm, Blk, Red, ad white? ≤1%? 80/80	10/14F
14	16	CA	Delta but transition to well sorted quartz/calc arenite sand, fine grained, abund Hm. trace, yellow bn 80/80	10/16F
16	18		Yellow brown to buff calcarenite, quartz content decreasing. Hm trace. 80/80	10/18C
18	20	Hm	Delta but with gastropod casts; abund Hm trace 80/80	10/20C
20	22	CA CA CA	Delta, med less well sorted in bands only, higher quartz, sorted, modern Hm trace, micaceous. 80/80	10/22C
22	24	CA	Delta as above 80/80	10/24C
24	26		Delta, becoming coarser grained in intervals, some gastropod shells. no Hm at all! 80/80	10/26C
26	28.		Delta, but, pelecypoda, dominat fossil, less quartz, no Hm trace (shell grit?) 80/80	10/28C
28	30.	CA	Delta, med fine grained, muscovite flakes coarse (discarded). 80/80	10/30C
30	32.	CA	Delta, Hm massive intervales fine grained limonite cleaned carbonate rock above buff bryozoal Lst. 80/80	10/32C
32	32.5		Buff bryozoal Lst with limonite slats. Hm trace 80/80.	10/34C
			RL LS = 33	
			RL CA = 50	
			180 s ≈ 7	
			RLS = 57	

* Composite Sample WH10/10-14.

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSE ASS.

PAGE No 1/1

LOCATION 12 km S OF MUMBULLA RL 65 HOLE No WH11/89

DATE COM. 7/5/89 FINISH. 7/5/89 TOTAL DEPTH 33m

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH TITLE EL1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Yellow brown to pink silty clay. Trace Hm (mica fine sand) 60/60	WH11/2c
2	4		Pale buff with nodular calcrete, a trace Hm. 60/60	11/4c
4	6	CA THm	Yellow brown calc arenite, mica quartz & trace Hm as above with fine sand component, nodules calcrete 60/60	11/6c
6	8	CA	Pale, weaker Hm trace, weakly cemented 60/60	11/8c
8	10	Hm	Pale, about 85% calc/15% Qtz. 60/60	11/10c
10	12	CA THm	Pale, very weakly cemented/free running? 60/60	11/12c
12	14	CA	Pale 60/60	11/14c
14	16	CA THm	Pale, finely layered. 60/60	11/16c
16	18	CA	Pale becoming more indurated with depth. 60/60 trace Hm persists.	11/18c
18	20	CA	Pale as above, a few coarse quartz grains, 60/60 becoming micaceous	11/20c
20	22	CA	Pale but becoming much fine grained, higher quartz content 60/60	11/22c
22	24	CA	Pale, as above. 60/60	11/24c
24	26		Pale, as above 60/60	11/26c
26	28	CA	Pale, slightly higher Hm trace. 60/60	11/28c
28	30	CA	Pale. 60/60	11/30c
30	32	CA	Pale, but transitions to buff limonite with brown 60/60 fossils, last - weakly calc arenite	11/32c
32	33		Limonite as above 60/60.	11/34c
			RL LS = 34	
			RL CA = 61	
			$\delta^{18}O$ S = 0?	
			RL TS = 61 = subsoil.	

* Composite Sample - None

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOOMALOO HILL CLIENT OXFORD HSE ASS. PAGE No 1/1

LOCATION 7 Km. S of MUNDIJULLA RL=80 HOLE. No WH12/89

DATE COM. 7/5/89 FINISH. 7/5/89 TOTAL DEPTH 16.5m

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH. TITLE EL 1555.

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		Yellow brown, silty to slightly sandy clay with ferruginous lumps and minor calcrete, weak Hm trace. 50/50	WH12/2
2	4		Ditto, becoming "orange brown" - grey clay & lemonite and pink Fe oxide staining, trace Hm. 50/50	12/4
4	6		Ditto, stiff clays. 50/50	12/6
6	8		Ditto, but dominantly silt with clay and some fine sand, trace Hm as before (Hydrite - yellow) 50/50	12/8
8	10	Hm	~~Ditto~~ Fine to ultrafine sand with clay, strong Hm trace, very fine grained, hard & powdery 50/50	12/10 *
10	12		Ditto but with up to ·5%? Hm trace. 50/50	12/12 *
12	14	Hm	Ditto, white sand, perhaps up to ≤1% Hm. very fine 50/50	12/14 *
14	16		Ditto, then yellow/grey silty clays. weaker Hm trace 50/50	12/16
16	18		Bryozoal bed down to 16.5m. —	
			RL LS = 62	
			RL CA = 65 (CA absent ≈ LS)	
			RL 100 = 7m.	
			RL TS = 72m.	

* Composite Sample WH12/10–14

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOOI HILL CLIENT OXFORD HSG ASC

PAGE No 1/1

LOCATION 2½ km S of MUMDULLA. RL ≈ 80m HOLE. No WH13/89

DATE COM. 8/5/89 FINISH. 8/5/89 TOTAL DEPTH 32.5m.

LOGGED BY J.L. CURTIS DRILLED BY INTER TECH TITLE EL1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2	Hm	Light grey sand veneer above yellow brown sand, minor clay, abound 5% fossil chips, subsb. Hm trace 40/40	WH13/2C
2	4	Hm	Yellow brown sand, fine gravel, few coarse grains, subsb Hm trace, few lumps of clay. 40/40	13/4C
4	6	Hm	Yellow brown medium sand with subsb to abund Hm, very fine, "dust" size / clayey 40/40	13/6C
6	8	Hm	Yellow brown sand, but with much less and much coarser Hm (still v fine g), clayey 40/40	13/8C
8	10	Hm	Yellow brown/grey variegated silty clayey sand, similar to above / semi-dry sample. 40/40	13/10C
10	12	Hm	Ditto but Hm subsb fine, Tr. in Pm. 40/40	13/12C
12	14	Hm	Ditto 40/40	13/14C
14	16	Hm	yellow brown fine sand with 5% of calc arenite clayey. Hm as above, mica coarse 40/40	13/16C
16	18		Ditto. 40/40	13/18C
18	20	Hm	Ditto, no calc arenite arenite compact Hm as above. 40/40	13/20C
20	22		Ditto, no calc arenite as before, less? Hm. 40/40	13/22C
22	24	Hm CA	Ditto, weakly cemented, Trace fine Hm as above, calc arenite compact rare lab 40/40	13/24C
24	26	CA Hm	Ditto as above. 40/40	13/26C
26	28	CA	Ditto, more indurated 40/40	13/28C
28	30		Ditto, 40/40	13/30C
30	32		Ditto) thin bryozoal limestone	13/32C
32	32.5		Bryozoal Ls. EOH 32.5m	13/34C
			* Fg. Hm, 4-6m is wathy Fe oxide stain accts for brown tinge to it - suspect similar in lower part of hole as well.	
			RL LS = 50m.	
			RL CA = 64? a 58m.	
			ISO S = 12m.	
			RL TS = 78m.	

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOOLOO HILL CLIENT OXFORD HSE ASS.

PAGE No 1/-8

LOCATION 37 Hm S of MUM BUILD. RL = 60

HOLE. No WH14/89.

DATE COM. 8/5/89 FINISH. 8/5/89

TOTAL DEPTH 24

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH.

TITLE EL 1555.

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2	Hm	Yellow limonite stained silty grey clay, Hm Tr beneath a veneer of chocolate brown clayey sandy soil	WH14/2c
2	4		Relict bed with some sandy zones with Hm lags 40/40	14/4c
4	6		Relict, but becoming coarser, Hm Trace as above 40/40	14/6c
6	8		Relict bed brecciated & white sand, Hm Trace as above 40/40	14/8F
8	10	Hm	Off white, fine grained clayey sand with Hm trace, strongly micaceous 40/40	14/10F
10	12	Hm	Relict, but with some coarser grains of Hm 40/40	14/12F
12	14	Hm	Relict, thin Hm trace with Pumice gravel 40/40	14/14F
14	16	Hm	Relict, but with many fossil fragments and chips of obsidian? 40/40	14/16F
16	18		Relict, as above. 40/40	14/18c
18	20		Relict, thin bryozoal limestone chips with sand and a Hm trace. 40/40	14/20c
20	22		Bryozoal limestone chips and fine sand with trace Hm, Volcanic glass chips also 40/40	14/22c
22	24.		Relict, but solid core of rock 40/40	14/24c

16 – 22 m → ?? volcanic ejecta "reliable" of obsidian fragments and ML contains rock. ??

RL, GIS = 39
RL CA = ? poss ≥ 46m
ISO S = 8
TS = 52m

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT: WOORNOO HILL CLIENT: OXFORD ASC ASS

PAGE No 1/1

LOCATION: 27 km SSW of MUNDULLA R272

HOLE No: WH15/89

DATE COM. 8/5/89 FINISH. 8/5/89

TOTAL DEPTH 20.5m

LOGGED BY: J.L.CURTIS DRILLED BY: INTERTECH

TITLE: EL1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2		White, fine grained clayey sand, trace Hm 40/40	WH15/2F
2	4	THm	Ditto, stronger Hm trace 40/40	15/4F
4	6	THm	Ditto as above 40/40	15/6F
6	8	TH	Ditto 40/40	15/8F
8	10	TH	Ditto 40/40	15/10F
10	12	TH	Ditto 40/40	15/12F
12	14	H	Yellowish - off white clay and fine sand as above but also with small granular chips of Fe Ox Hm staining 40/40	15/14F
14	16	CA	Yellow brown sandy calc arenite with chips of FeOx; dk brown laminated mud fine Hm (FeOx ?) 40/40	15/16C
16	18	CA	Ditto but with quartz up to granule size, much less FeOx Hm, partially cemented 40/40	15/18C
18	20		Ditto but with well rounded pebbles of silicified limestone? containing fossils (up to 2cm in diam. TH 40/40	15/20C
20	22		Conglomerate as above down to 20.5m then TD, bryozoa just in sample at 20.5m. 40/40	15/22C

RL GL ≈ 51 m
CA = 57
150 S = 13
TS = 72 m

GEOLOGICAL DRILLING LOG

JLC EXPLORATION SERVICES

PROJECT WOORLOO HILL CLIENT OXFORD HSE ASS

PAGE No 1/1

LOCATION 21 km SW of MUNDULLA RL = 80m

HOLE No WH 16/89

DATE COM. 8/5/89 FINISH. 8/5/89

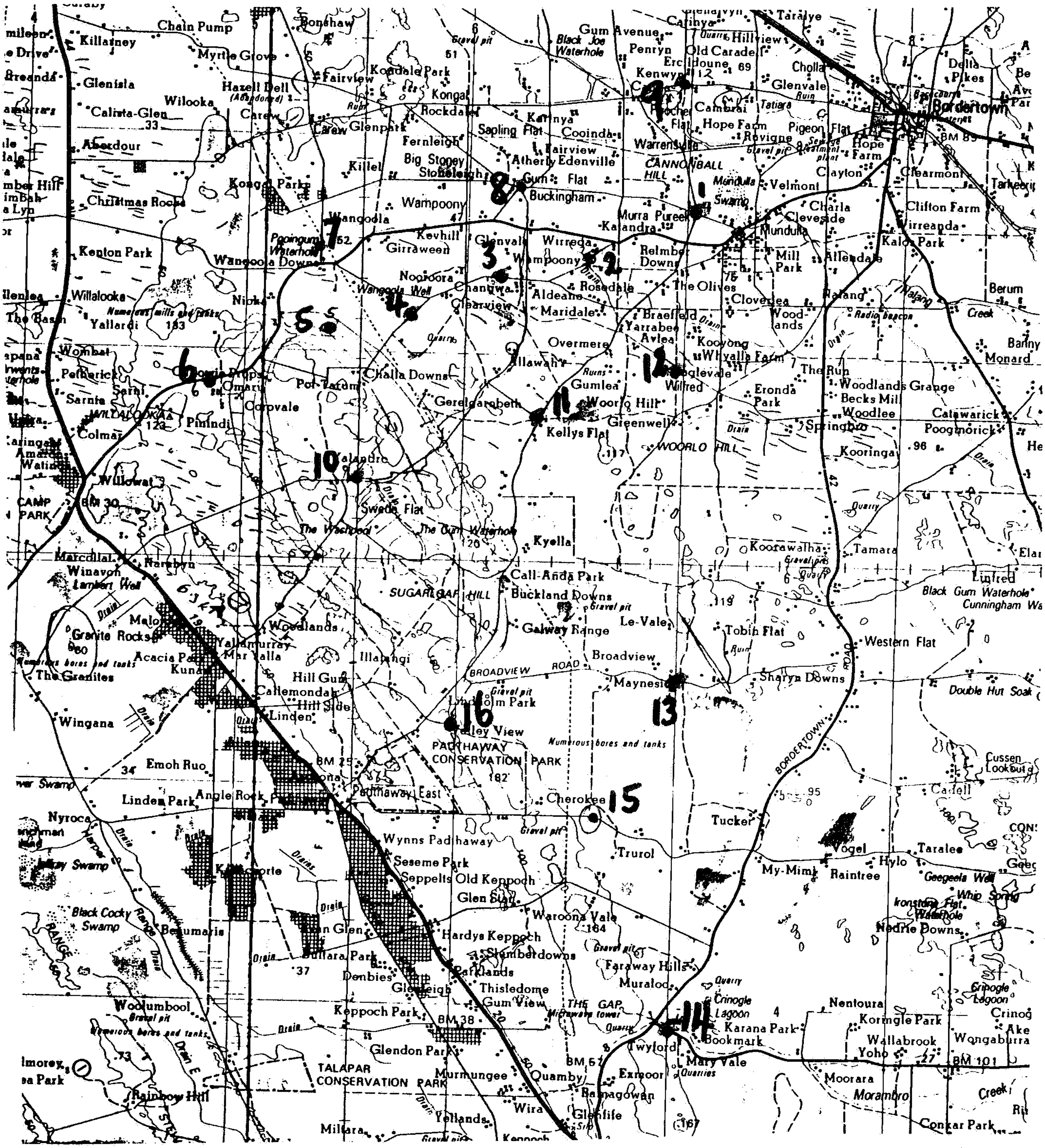
TOTAL DEPTH 31.0m

LOGGED BY J.L. CURTIS DRILLED BY INTERTECH

TITLE EL 1555

DEPTH FROM	DEPTH TO	GRAPHIC LOG	GEOLOGICAL DESCRIPTION	SAMPLE No
0	2	THm	Light grey veneer of sand above red-orange brown calcareous sand, minor Hm trace 30/10	WH16/2c
2	4	THm	Ditto 30/30	16/4c
4	6		Medium to coarse grained, yellow brown clayey sand with trace Hm. 30/40	16/6c
6	8		Red brown clayey sand and sandy clay with calcarenite lumps. trace Hm 30/30	16/8c
8	10	CA	Yellow brown, sandy calc arenite, well cemented Hm trace 30/40	16/10c
10	12	THm CA	Ditto 30/40	16/12c
12	14	THm CA	Ditto 30/40	16/14c
14	16	THm CA	Ditto 30/30	16/16c
16	18	THm CA	Ditto 30/40	16/18c
18	20	THm	Ditto, fossil root casts., Hm 30/30	16/20c
20	22		Off white/yellow coarse grained quartz sand, minor carbonate grains, uncemented Trace Hm 30/40	16/22c
22	24		Ditto, but with fossil (roots?), very weakly cemented 30/40	16/24c
24	26		Ditto as above 30/40	16/26c
26	28		Ditto. 30/40	16/28c
28	30	CA	Ditto, hard, cemented calcarenite Holes 30/40	16/30c
30	32.		Hole abandoned @ c. 31 m.	16/31c

RL LS < 49m.
CA = 23
1805 = 0?
TS = 74?



Chain Pump
Killarney
Myrtle Grove
Bonshaw
Glenisla
Hazell Dell
Wilooka
Calista-Glen
Carew
Aberdour
Kongal Park
Christmas Rocks
Kenton Park
Wangoola Downs
Willalooke
Yallardi
Nick
Wombat
Sarnia
Colmar
Willowat
Camp Park
Marcollat
Winavon
Lambert Well
Naraby
Malo
Granite Rocks
Acacia Park
Kunat
Yallamurray
Mar Valla
The Granites
Wingana
Callemondah
Hill Side
Linden
Emoh Ruo
Linden Park
Angle Rock
Nyroca
Black Cocky Swamp
Beaumaris
Woolumbool
Rainbow Hill
Fairview
Koondale Park
Kongal
Rockdale
Carew Glenpark
Fernleigh
Big Stoney
Stoneleigh
Killel
Wampoony
Wangoola
Girraween
Kevhill
Noorora
Wangoola Well
Chantiwa
Clearview
Challa Downs
Gereldarobeth
Corovale
Pinindi
Omaru
Swede Flat
The Washpool
The Gum Waterhole
Kyella
Sugarloaf Hill
Woodlands
Illawangi
Hill Gum
Padthaway Conservation Park
Padthaway East
Wynns Padthaway
Sesame Park
Seppelts Old Keppoch
Glen Sura
Hardys Keppoch
Slumberdowns
Parklands
Thisledome
Gum View
Denbies
Glenleigh
Keppoch Park
Glendon Park
Talapar Conservation Park
Murmungee
Quamby
Wira
Yellands
Glenfife
Millara
Sapling Flat
Karinya
Cooinda
Fairview
Atherly
Edenville
Gum Flat
Buckingham
Glenvale
Wirreda
Wampoony
Aldeane
Maridale
Rosedale
Overmere
Allawah
Gumlea
Woorlo Hill
Kellys Flat
Greenwell
Call-Anda Park
Buckland Downs
Galway Range
Le-Vale
Broadview
Broadview Road
Maynesio
Cherokee
Trurol
Waroona Vale
Faraway Hills
Muraloo
The Gap
Twyford
Exmoor
Bamagowan
Mary Vale
Bookmark
Karana Park
Crinogle Lagoon
Gum Avenue
Black Joe Waterhole
Penryn
Old Caradel
Hillview
Kenwyn
Ercildoune
Camerai
Hope Farm
Warrensville
Cannonball Hill
Mundulla Swamp
Murra Pureel
Kalandra
Belmbe Downs
The Olives
Braefield
Yarrabee
Avlea
Kooyong
Whyalla Farm
Wilfred
Woorlo Hill
Koorawalha
Tobin Flat
Sharyn Downs
Tucker
My-Mimi
Raintree
Vogel
Taralee
Hylo
Tarratye
Cholla
Glenvale
Pigeon Flat
Bordertown
Hope Farm
Clayton
Velmont
Charla
Cleveside
Mundulla
Mill Park
Allendale
Clearmont
Clifton Farm
Yirreanda
Kalo Park
Cloverlea
Woodlands
Radio beacon
The Run
Woodlands Grange
Becks Mill
Woodlee
Springbro
Kooringa
Catawarick
Poogmorick
Berum
Barny
Monard
Tamara
Linfred
Black Gum Waterhole
Cunningham
Western Flat
Double Hut Soak
Bordertown Road
Cussen Lookout
Cadell
Geegeela Well
Whip Spring
Nedrie Downs
Nentoura
Koringle Park
Wallabrook
Yoho
Wongaburra
Moorara
Morambro
Conkar Park
Creek
BM 101
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APPENDIX 3

044

amdel
technology and enterprise

Amdel Limited
(Incorporated in S.A.)
31 Flemington Street,
Frewville, S.A. 5063

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Telex: AA82520
Facsimile: (08) 79 6623

5 July 1989

Oxford House Associates Pty Ltd
Suite 8
3 Mount Barker Road
STIRLING SA 5152

ATT: MR J L CURTIS

REPORT G 8092/89 - PART I

YOUR REFERENCE:	Letter dated June 1989
IDENTIFICATION:	MTR and WH series
MATERIAL:	21 slurry samples
DATE RECEIVED:	8 June 1989
WORK REQUIRED:	Determination of heavy mineral content.

Investigation and Report by: Michael Till

Keith Henley

Dr Keith J Henley
Manager
Geological Services Section

bp

amdel

HEAVY MINERAL CONTENT OF 21 SAMPLES

1. INTRODUCTION

Twenty one samples were received from Mr. J.L. Curtis of Oxford House Associates Pty. Ltd. with a request for determination of heavy mineral content.

2. PROCEDURE

The procedure is as follows :

a) Dry and crush and riffle ~125g.

b) Prepare a slurry of the ~125 g and stir mechanically.

c) Wet sieve at 1 mm and 38 μm with a lower 38 μm check sieve to ensure full retention of +38 μm material.

d) Weigh +1 mm and -1 mm+38 μm fractions.

e) Separate the -1 mm+38 μm fraction centrifugally in tetrabromoethane (TBE, 2.96 sp. gr.).

f) Remove <2.96 sp. gr. lights and discard.

g) Top up tube with TBE and recentrifuge in order to remove any lights in the >2.96 sp. gr. heavies.

h) Remove second <2.96 sp. gr. lights and discard.

i) Wash, dry and weigh the >2.96 sp. gr. product.

3. RESULTS

The results are given in Table 1 which gives the -1 mm+38 μm >2.96 sp. gr. product as a percentage of the -1 mm+38 μm fraction and of the total sample.

Table 1 : SIZE AND SPECIFIC GRAVITY DISTRIBUTION OF SAND SAMPLES

Sample no	SIZE DISTRIBUTION +1mm wt%	-1mm+38um wt%	-38um wt%	-1mm+38um >2.96 sp.gr as a % of -1mm+38um size fr.	total sample
MJR 8/28-34	6.6	90.8	2.6	0.82	0.74
MJR 9/18-26	27.9	62.8	9.3	0.19	0.12
MJR 10/8-16	1.1	91.4	7.5	0.25	0.22
MJR 10/18-24	1.1	94.3	4.5	0.40	0.37
MJR 11/10-14	12.0	85.7	2.4	0.51	0.44
WH 1/6-10	0.0	74.8	25.2	0.33	0.25
WH 1/12-16	2.9	80.6	16.5	0.15	0.12
WH 2/6-10	9.4	58.0	32.6	1.91	1.11
WH 3/8-12	11.3	68.1	20.6	0.22	0.15
WH 4/8-10	7.6	72.0	20.4	0.22	0.16
WH 5/10	0.7	83.8	15.5	0.16	0.14
WH 5/12	0.1	81.1	18.9	0.28	0.22
WH 5/14	0.1	81.2	18.7	0.26	0.21
WH 5/16	0.1	81.6	18.3	0.23	0.18
WH 5/18	0.1	78.8	21.2	0.20	0.16
WH 6/14-20	0.1	67.5	32.4	0.24	0.16
WH 7/6-8	16.7	55.8	27.6	0.37	0.21
WH 8/6-12	14.3	71.6	14.0	0.22	0.16
WH 9/6-10	16.6	58.4	25.0	0.19	0.11
WH 10/10-14	14.0	73.6	12.4	0.14	0.10
WH 12/10-14	0.6	85.4	13.9	0.27	0.23

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18 August 1989

Oxford House Associates Pty Ltd
20 Oxford Road
ALDGATE SA 5154

ATT: MR J L CURTIS

REPORT G 8180/90

YOUR REFERENCE:	Letter dated 8/8/89
IDENTIFICATION:	MJR8, WH1, WH2, WH5
MATERIAL:	Mineral concentrates
DATE RECEIVED:	10 August 1989
WORK REQUIRED:	Determination of mineralogy.

Investigation and Report by: Michael Till and Michael J W Larrett

Keith Henley

Dr Keith J Henley
Manager
Geological Services Section

bp

MINERALOGY OF FOUR MINERAL CONCENTRATES

1. INTRODUCTION

A request was received from Mr. L. Curtis of Oxford House Associates Pty. Ltd. for determination of mineralogy of samples previously reported in Amdel report G 8092/89.

2. PROCEDURE

The -1 mm+38 μm >2.96 sp. gr. products were examined in a loose grain oil mount and in polished section (PS48723, 4) and the mineral contents estimated visually.

3. RESULTS

The results are given in Table 1.

TABLE 1: MINERALOGY (EST. VOL. %) OF >2.96 SP. GR. PRODUCT OF FOUR SAMPLES

	MJR8 28-34	WH1 6-10	WH2 6-10	WH5 10-18
Altered ilmenite	17	15	3	Tr
Leucoxene	4	19	Tr	48
Zircon	5	15	3	8
Rutile	4	1	<1	2
Monazite	Tr	-	-	-
Anatase/brookite	1	1	-	<1
Porous iron oxide	10	20	83	1
Tourmaline	5	20	5	25
Andalusite	Tr	4	-	3
Sillimanite	2	3	-	3
Kyanite	Tr	-	<1	-
Garnet	47	-	Tr	1
Epidote	Tr	-	-	-
Barite	-	<1	<1	<1
Staurolite	5	-	<1	<1
Quartz (Fe-stained)	Tr	-	4	5
Pyrite	Tr	-	-	-
Others	-	1	1	1

N.B. Results are ±30-50% relative.