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CRA EXPLORATION PTY.LIMITED

RAILTON E.L. 4/74 INTERIM REPORT ON

1981 DRILLING

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CONTENTS

1. SUMMARY

CRA Exploration have completed a total of 2345 metres of open hole and diamond drilling to assess the Tasmanite oil shale resources of EL 4/74. This drilling programme was the first part of the exploration commitment agreed to in the joint venture agreement between CRA Exploration and Endeavour Resources, holders of EL 4/74.

Results to date have indicated that the Tasmanite oil shale resource in the Railton Latrobe district may exceed 40 million tonnes, and that there is scope to increase the resource significantly by further exploration. Only a small proportion of the indicated resource, probably less than 5 million tonnes, is ameniable to open-cut mining (i.e. is at less than 20m depth). The most extensive areas of Tasmanite at depth are Areas II and III in the north of the district. Saggers Hill (Area I) may have potential for a limited open cut operation plus adjacent deeper Tasmanite reserves.

Further drilling is recommended to fully delineate known Tasmanite occurrences and to explore new target areas. Research into the techniques and economic feasability of bitumen production from Tasmanite oil shale is also recommended.

2. INTRODUCTION

EL 4/74 (Railton), for coal and oil shale, has been held by Endeavour Resources since 1974. The EL hosts most of the known Tasmanite oil shale occurrences.

Originally discovered in the late 19th century, and worked until the 1920's for its oil producing capability, the Tasmanite oil shale has recently attracted interest because of the potential of producing bitumens suitable for road construction.

Endeavour Resources, who have carried out some exploration and commissioned some research into the Tasmanite of EL 4/74, approached CRA Exploration with a joint venture proposal on the oil shale of this EL.

In September 1981, CRA Exploration entered into an agreement with Endeavour whereby CRA Exploration could earn a major interest in the project by carrying out 5000 metres of exploration drilling plus technical research into the Tasmanite oil shales bitumen producing potential.

This report details the results of the first part of the drilling programme which was conducted during September - October 1981 and makes recommendations for further drilling.

3. CONCLUSIONS

1. Drilling carried out by CRAE has indicated that the Tasmanite horizon is considerably more extensive than previously thought.
2. The preliminary indicated resource is in the order of 40 million tonnes. The resource is located in several seperate blocks. No block has yet been fully delineated and future drilling could still further increase the Tasmanite resource.
3. The most extensive, relatively continuous area of Tasmanite is in the north of the district, where Areas II and III may have a combined resource of around 20 million tonnes.
4. On present indications the potential open cut reserve (to depths of 20 metres) is in the order of 5 million tonnes. This occurs in a number of seperate areas which need to be better defined by further drilling.
5. The Saggers Hill area (Area I) (approximately 6 million tonnes) would appear to have the most promise for a limited open cut operation leading to future underground development.
6. The limited open cut potential will require that future development of the Tasmanite oil shale will be by underground mining. Because of the relatively high costs factors involved, it is essential that the economics of the benification of bitumen production processes be established to determine if underground mining is a feasable proposition.

4. RECOMMENDATIONS

1. Area I (Saggers Hill) should be drilled as proposed by C.Gloe (1981) plus additional drilling in the north and east of that area (up to 800 metres).

2. Extensive drilling is required to delineate the Tasmanite in Areas II and III (up to 1200 metres).

3. Up to six holes should be drilled south of Area V to follow-up the Tasmanite intersections in RD81 MR17 and RD81 MR37. (Approximately 400 metres).

4. Three exploration holes are required in Area VI (Approximately 180 metres).

5. Three holes are required to test the previously unexplored area south of Railton mapped as basal and undifferentiated Permian.(Approximately 380 metres).

6. Shallow drilling or trenching of potential bulk sample sites at South China Flat or Saggers Hill.

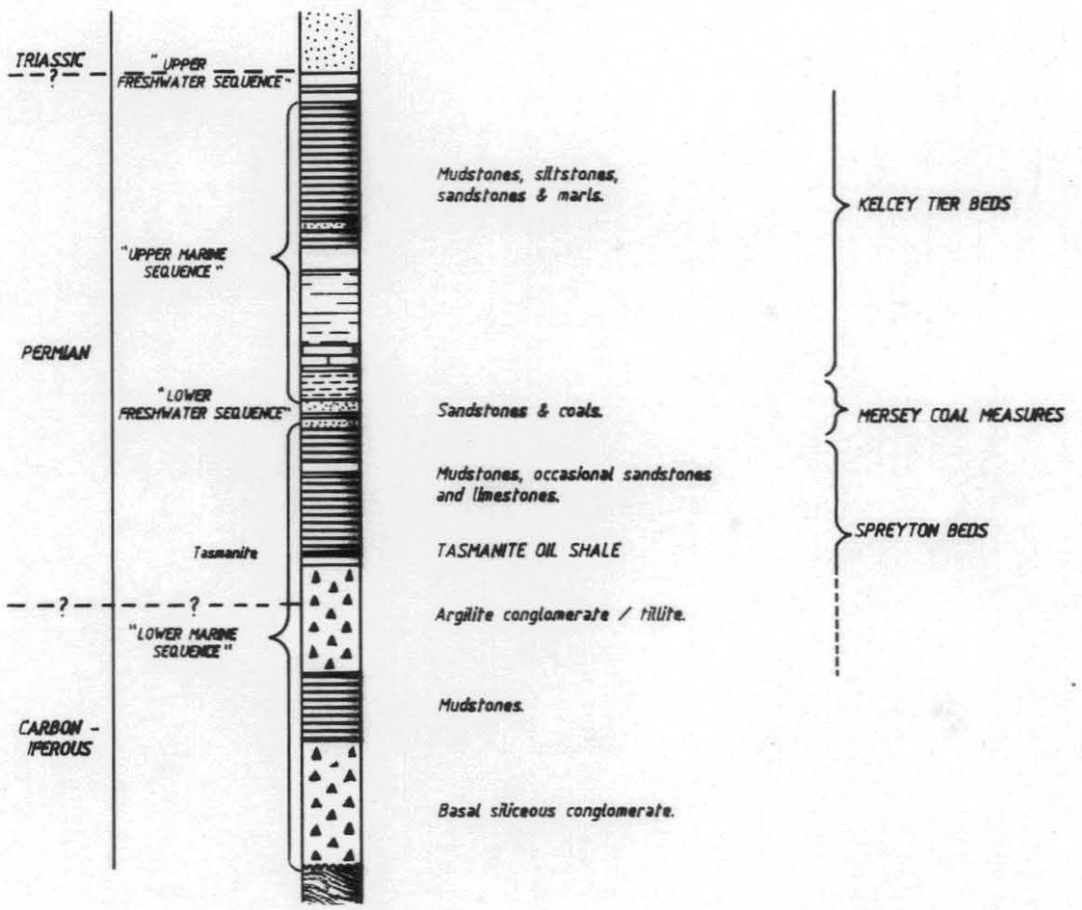
7. Open hole drilling with wire line geophysical logging to be used in preference to diamond drilling.

8. A major research programme needs to be initiated to determine the best methods of bitumen production, the economics of production and to provide material for determination of road use specification. This research to be carried out by the CRA Research and Technology Division.

5. GEOLOGY OF THE TASMANITE OIL SHALE

5.1 Stratigraphy

The Carbo-Permian stratigraphy within which the Tasmanite oil shale occurs, is summarised below:



The Tasmanite is of lower Permain age and occurs within the upper part of the marine Spreyton Beds. The lower part of the Spreyton Beds is a basal siliceous conglomerate, which because of the transgressive nature of the unit is not always present. This is followed by a thin mudstone unit then a succession of "argillitic conglomerates" which are believed to be quiet water marine mudstones and siltstones into which floating tree roots and/or icebergs dropped their load of debris. Overlying the "tillites" is a thick succession (up to 150 metres) of mudstones and siltstones, also with occassional dropstone (?) clasts. The Tasmanite bed occurs near the base of this unit which is in turn overlain by the Mersey Coal Measures and the Kelcey Tier Beds.

5.2 Distribution

The primary distribution of the Tasmanite is not well understood. It is knwon to occur in several parts of northern Tasmania near Oonah, Dulverton, Latrobe, Kimberley, Beulah, Chudleigh and Quamby Brook but the original degree of continuity of the horizon between these areas is not known. Both Twelvetrees (1911) and Reid (1924) considered that the Tasmanite horizon was deposited in relatively shallow water adjacent to basement highs on the Permo-Carboniferous shoreline away from the coal forming swamps. This is still the generally accepted theory but the Tasmanite has now been shown to be older than the Mersey Coal Measures and not a facies variant of the coals. Coal and Tasmanite are therefore not mutually exclusive and several instances can be shown where Tasmanite occurs beneath the Coal Measures (e.g. RD81 MR35 - CRAE 1981 Drilling). This is significant in that Tasmanite oil shale could occur below many areas of younger Permian coals which had previously been neglected.

The present near surface distribution of the Tasmanite is largely the result of post depostional events. Faulting and igneous intrusion have broken up theoriginally continuous bed into a series of fault, basement, dolerite and basalt seperate blocks. The majority of these blocks occur within the Railton-Latrobe district, but the sub-surface distribution could be very much more extensive.

5.3 Properties of Tasmanite Oil Shale

The Tasmanite oil shale is a siltstone rich in the fossil Tasmanities punctatus. This fossil is a discoidal spore case up to 0.5 millimetres in diameter, amber to red in colour and composed of "kerogen" which yields a variety of oils when heated.

The Tasmanite horizon is up to 2 metres in thickness but averages around 1.5 metres and is generally subdivided by one, occassionally two thin (10-20 centimetres) bands of kerogen (Tasmanities spores) poor horizons.

These low grade partings generally have sharp lower contacts and gradational upper contacts. Taken as a whole, the Tasmanite horizon generally has gradational contact with the enveloping mudstones. Pyrite is present in both the high and low"grade" portions of the horizon, often concentrated in and around the small (± 1 centimetre) arenite and argillite clasts which occur commonly (± 5 percent) within the Tasmanite. The discoidal nature Tasmanities sp. gives a pronounced foliation to the rock, making it very fissile yet tough to fracture across this foliation.

The kerogen (spore) content of the richer parts of the seam can be 45 percent whilst that of the low grade partings is around 5 percent. Oil yields vary greatly but rich (45 percent kerogen) shale might yield 264 litres/tonne and poor (7 percent kerogen) shale might yield 20 litres/tonne. Overall average for oil yield for the total Tasmanite horizon appears to be between 90-120 litres/tonne. Exposure to weathering is reported to have negligable effect on the oil yield of the oil shale. The specific gravity of the shale, as a result of the kerogen content is low, the average for the entire Tasmanite horizon is about 2.1 gm/cc. The Tasmanities spores can be readily seperated from the shale by crushing and simple floatation.

6. PREVIOUS WORK

The Tasmanite oil shale has been known since the late 19th century and was worked from, approximately, 1910 to 1932 in the Railton-Latrobe areas. During that time extensive exploration was conducted by the operating mines, lease holders and the Tasmanian Mines Department; the latter producing three reports on the potential of the oil shale industry (Bull 11, 1911; Min Res. 8 Vol.1, 1924; Min Res 8 Vol.2, 1934).

Total oil production from the various operations was small, approximately 250,000 gallons (1.13 million litres) equivalent to about 10,000 tonnes of Tasmanite, and has not significantly reduced the reserves of the field.

The Mines Department resumed exploration in 1940/41 with a drilling programme close to one of the old mines. Between that time and 1974 interest lapsed until Endeavour Resources took over the area and, in 1975, conducted a drilling programme to assess the potential for open cut exploitation. Endeavour also commissioned a certain amount of technical research by the CSIRO and other agencies into the Tasmanite bitumen producing potential.

Appendix 5 and Plan TASh 581 summarise the known drilling results from the Railton-Latrobe Tasmanite fields.

7. CRAE DRILLING - 1981

7.1 General

A total of 2269 metres of open hole drilling and 76 metres of diamond drilling was completed in 66 drill holes at 51 sites within the Railton-Latrobe Tasmanite oil shale fields. Tasmanite was intersected at 27 of the sites drilled.

The drilling followed the proposals made by C.Gloe (1981), but some modifications to that programme were forced by access problems and expenditure. Plan TASh 580 shows the location of the holes drilled; a summary of the drilling and the drill logs are given in Appendices 2 and 3 respectively.

Drilling was conducted by Exploration Drilling using an Ingersol Rand Cyclone TH60 rig. Open hole drilling was by rotary air, rotary mud or percussion hammer techniques depending on the ground conditions. Coring was accomplished using a HQ triple tube core barrel. The rig proved to be highly efficient throughout the drilling problem, the only drawbacks being it's large size which restricted access in some areas.

Eighteen of the holes were geophysically logged by a Century Geophysics wireline logging system.

7.2 Results

7.2.1. Area I

This area was not drilled as planned because of access problems which arose despite having prepared bulldozed tracks to the proposed drill sites.

Examination of previous drilling results shows that the area has a fairly large potential; Tasmanite at shallow depth was proven by the 1975 Endeavour drilling to the west of Saggers Hill. The same programme also showed that Tasmanite was likely to continue at depth into an area to the north of Saggers Hill. The potential indicated by this drilling is in the order of 6 million tonnes of which up to 2 million tonnes may be at less than 20 metres depth.

The northern and western limits of this Tasmanite field are totally untested; the southern extent is limited, by a topographic high from which the Tasmanite has been eroded, whilst the western limit is defined by a basement ridge.

7.2.2. Area II

The potential of Area II, as indicated by the 11 CRAE holes (RD81 MR25-33 and RD81 MR60-61) and extensive previous exploration, may be as great as 14 million tonnes of Tasmanite. All of this is at depths in excess of 20 metres, with much of it being over 75 metres deep.

Area II is divided in two, probably seperate, fields by a major NE-SW fault through the Permian. Previous drilling and mining has clearly defined the Tasmanite south of the fault. Here the Tasmanite is bounded by pre-Cambrian inliers to the east and west, between which it is fairly continuous with only minor faults causing some structural complication. RD81 MR 26-28 were drilled in this area to obtain samples of Tasmanite for analysis. About 3 million tonnes of Tasmanite are indicated in this southern part of AreaII.

In the northern part of Area II, the Tasmanite has been shown to extend as far as RD81 MR33 with no indication that it does not extend further north and north-east at depth. As the structure within this area appears to be simple, a general north-easterly dip at ± 5 degrees, it is probable that the Tasmanite extends east of RD81 MR30/MR60 all the way to the pre-Cambrian inlier which trancates the Permian in that direction. If this is the case, then this area has a potential resource of around 11 million tonnes of Tasmanite, with the possibility of reserves to the north of RD81 MR33.

7.2.3. Area III

The indicated potential of Area III is around 11 million tonnes of Tasmanite of which less than 2 million tonnes could be at depths of less than 20 metres. There is considerable potential for increasing the total reserve if possible extensions to the west and north of the known Tasmanite field are proven.

In the south of Area III, only one hole RD81 MR36, was drilled. This proved to be collared stratigraphically below the Tasmanite horizon, thereby showing that the Tasmanite does not extend quite as far south as anticipated.

Holes RD81 MR35 and RD81 MR62-65, testing the western side of Area III, indicated that the Tasmanite does persist that far west. RD81 MR35 also showed that Tasmanite can be present beneath the Mersey Coal Measures and therefore indicates that Area III is still open to the west beneath this younger Permian cover.

The northern limit of Area III was inconclusively tested by holes RD81 MR21 and RD81 MR34. Both of these holes intersected, but failed to penetrate, dolerite sills (?) within the Permian above the anticipated depth of the Tasmanite horizon. Whether the dolerites have destroyed the Tasmanite horizon, or are above and have not affected the Tasmanite, is not known.

Tasmanite was intersected in all of the holes in the central part of Area III(RD81 MR18-20, RD81 MR55-56 and RD81 MR58-59),but at depths which indicate the presence of faults, some of which appear to have caused significant vertical displacement of the Tasmanite horizon.

Faulting probably seperates Areas II and III where they abut along a section of the Mersey River. Differences in the elevation of Tasmanite intersections from both sides of the river suggest a downthrow of over 50 metres on the west side of the postulated fault. Further north, where no information is available, there is the possibility that the displacement on this fault decreases and that the Tasmanite of Area II and III is adjacent.

7.2.4. Area IV

Access problems restricted drilling in this area to one hole, RD81 MR24, which failed to penetrate through the Tertiary basalt in which it was collared.

Examining the previous work in this area it would appear that Area IV does not have the potential for significant Tasmanite reserves.

7.2.5. Area V

Holes RD81 MR1 - RD81 MR16 indicated the potential of the North China Flat area is much smaller than previously estimated. The topography exposes and delimits the Tasmanite to the east, south and west, whilst to the north the Tasmanite is lost by faulting and possibly by dolerite intrusions. Depth of the Tasmanite, where present, averages 14 metres. Indicated reserves are around 2.2 million tonnes.

The South China Flat area, tested by RD81 MR38-RD81 MR54, is also smaller than expected. The Tasmanite area here is confined, by its dip and the topography, to a spur and low hill between valleys in which the Tasmanite must outcrop. Depth to the Tasmanite in this area averages 6 metres, and indicated reserves amount to around 0.7 million tonnes.

To the south of Area V, RD81 MR17 and RD81 MR37 intersected Tasmanite at depth. These results, plus the indications of Endeavours drilling in this area suggest the possibility of a significant Tasmanite occurrence at depths up to 100 metres below surface. This area would be restricted in the east and west by basement outcrops, but could persist south east for a considerable distance beneath Quaternary cover. If this is the case, a Tasmanite resource in the order of 3-4 million tonnes is feasable but would require extensive drilling to prove.

7.2.6. Area VI

Two exploration holes were drilled in this area. RD81 MR22 intersected Tasmanite whilst RD81 MR23 proved to be collared stratigraphically below the Tasmanite horizon.

Assuming a regional dip of 5 degrees to the north east, the intersection in RD81 MR22 could indicate a Tasmanite area extending north from this hole. If this is the case then the potential resource of Area VI could be in the order of 5 million tonnes of Tasmanite, most of which would be at depth.

7.3 Geophysical Logging

The low density, high hydrogen content and probable high resistance and resistivity of the Tasmanite was expected to be easily discernable by wireline geophysical logging. To test this, a number of holes were logged by Century Geophysics. Plans TASh 583 and TASh 584 show typical logs obtained.

The Tasmanite generally has an excellent response and was easily discernable on the logs. For future exploration consideration should be given to logging of open holes in preference to diamond drilling, especially if the grade (spore content) of the Tasmanite can be correlated with its geophysical response.
Appendix 1 gives details of logging methods and results.

8. ANALYSIS OF TASMANITE SAMPLES

Tasmanite core intersections were geologically logged and subdivided into sample intervals on the basis of spore content. The core was then sawn into equal halves and one half of each intersection submitted for analysis, the second half being stored at CRAE Burnie offices.

The Australian Mineral Development Laboratories (AMDEL) conducted the analyses. Proximate analyses were carried out on an"as received" and a moisture free basis and the oil yield of the Tasmanite samples was determined by Fischer estimate. The results of these analyses plus a summary of the sample intervals and composite oil yields are given in Appendix 4.

The subdivision of the Tasmanite horizon by spore content is reflected in the analyses, the high oil yields generally reflecting high spore content in upper and lower "rich" zones seperated by spore deficient zones which produce little oil.

The composite oil yields per Tasmanite intersection ranged from 109 litres/tonne (RD 81 MR7) to 177 litres/tonne (RD 81 MR63). The overall weighted average oil yield was 146 litres/tonne over an average total thickness of 1.44 metres. This average is rather higher than that quoted by earlier workers (90-120 litres/tonne).

9. RESOURCE

Plan TASh 582 shows areas of probable Tasmanite occurrence and areas of potential Tasmanite occurrence within the Railton-Latrobe region.

The following estimates correspond to those area on Plan TASh 582 shown as probably underlain by Tasmanite. These estimates can only be regarded as geologically indicated potential resource. They merely serve to give an impression of the order of magnitude of the Tasmanite resource in the area concerned.

		Tasmanite (million tonnes)
Area I		6.8
Area II	Up to	14.0
Area III	Up to	11.0
Area IV	Untested, probably not significant	
Area V	North China Flat	2.2
	South China Flat	0.7
	South Extension	3.5 (tentative)
Area V1		5.0 (very tentative)

(Average thickness of total Tasmanite horizon taken as 1.5 metres; average density taken as 2gm/cc).

The total geologically indicated resource are therefore in the order of 40 million tonnes of Tasmanite, of which probably less than 5 million tonnes is at less the 20 metres depth. The potential resource, as yet totally untested, might increase the total Tasmanite resource of the Railton-Latrobe area to over 70 million tonnes.

Of the areas tested, the largest indicated resource and the most promising potentially Tasmanite bearing areas are Areas 1,11, and 111.

10. DISCUSSION

The most significant point to have been revealed by the recent drilling and the compilation of earlier work is that the Tasmanite oil shale is more wide spread than previously suggested. Attention in the past has concentrated on known occurrences whilst little exploration distal to these areas has been attempted. This has resulted in an under-estimation of the potential Tasmanite resource in the Railton-Latrobe district.

The open cut potential of the district would appear to be very limited. North and South China Flat and part of Area I west of Saggers Hill are currently the most interesting areas of Tasamnite at shallow depth. The latter area offers the most potential as it probably has the largest resource at shallow depth and it is possible that an open-cut operation in that area could advance northwards underground if the extension of the Tasmanite in that direction exists.

The best underground potential is probably that of Area II and III where there are good prospects for locating large fairly continuous Tasmanite resource.

To obtain bulk samples of Tasmanite for technical evaluation, the most attractive target area is South China Flat. Here the Tasmanite, which outcrops in a hillside, dips under the hill at shallow depth. This ground, though recently planted with pines by the State Forestry, is Crown Land.

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12. LOCATION

Burnie	1:250 000	sheet	SK55-3
Launceston	1:250 000	sheet	SK55-4

13. KEYWORDS

Tasmanite, oil shale, bitumen, Permian, drilling, borehole geophysics.

14. LIST OF PLANS

Plan No.	Title	Scale
TASh 579	EL 4/74 Location Plan and Geology	1:63 360
TASh 580	Completed and Proposed Drilling Plan EL 4/74	1:15 000
TASh 581	Compilation of Early Drilling EL 4/74	1:15 000
TASh 582	Indicated and Potential Tasmanite Occurrences EL 4/74	1:15 000
TASh 583	Geological and Geophysical Logs - RD81 MR2	1:1 000
TASh 584	Geological and Geophysical Logs - RD81 MR27	1:1 000

15. LIST OF APPENDICES

Appendix 1. Geophysical logging and response of Tasmanite Oil Shales, Railton, Tasmania, by M.Flis.

2. Summary - 1981 CRAE Drilling.
3. 1981 CRAE Drill Logs
4. Analyses of Tasmanite Oil Shale.
5. Compilation of Tasmanite Intersections Drilled Prior to 1981.

APPENDIX 1

GEOPHYSICAL LOGGING AND RESPONSE OF TASMANITE OIL SHALES, RAILTON, TASMANIA.

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Geophysical Logging and Response of Tasmanite; Railton, Tasmania.

INTRODUCTION

Exploration and delineatary drilling for Tasmanite oil shale commenced in October, 1981 in the Railton area, North Tasmania.

Century Geophysical Corporation was contracted to carry out the geophysical logging of selected holes - primarily those of an exploratory nature. Logs consisted of the suite usually used in coal exploration.

Correlation between observed responses and lithologies was maintained by cored holes. Whilst the majority of holes were cored, logging was necessary to obtain this correlation with the expectation that geophysical logs alone could give an indication of Tasmanite grade; allowing cheaper drilling methods to be used in future drilling programmes.

CONCLUSIONS AND RECOMMENDATIONS

The geophysical logs easily recognised the occurrence of Tasmanite in all holes logged. There were no ambiguities as a distinct set of responses were unique to the Tasmanite (namely low density, high resistivity (or resistance) and low neutron count).

Although the number of samples put in for assay were few and over a relatively large interval for any one hole an antipathetic relationship was observed between volatile matter, ash content, and moisture content and apparent density and neutron count. This would suggest that with proper calibration of the logging system an empirical relationship could be derived and successfully applied as an assaying method.

Any future drilling programme in this area can consist of (cheaper) percussion drilling with a number of evenly placed cored holes for control. Core from these latter holes should be split into assay intervals no larger than 10 centimetres including both Tasmanite and barren rock above and below the seam. These will be used for more accurate calibration of the geophysical responses obtained from logging all holes.

DISCUSSION

Drilling for Tasmanite around Railton consisted of percussion and cored holes. As the programme was of a delineatory nature, Tasmanite samples were needed for assaying purposes. Secondary drilling, of an exploratory nature, was also undertaken. Whilst the majority of holes were cored, it was decided to geophysically log the holes to obtain and define the geophysical signiture of Tasmanite. This was needed to allow recognition of the oil shale in percussion drilled holes in this and future programmes.

Century Geophysical Corporation was contracted for the work. Logs used were those commonly used in the coal industry, namely gamma (NaI crystal, 1 1/8" dia x 4½ " long), gamma-gamma density (100 millicurie ^{137}Cs source, 8" and 2½" spacing), resistivity (focussed, three electrode guard type), resistance (single point), self potential, neutron-neutron (1 Curie AmBe source, ^{3}H detector, 17 inch spacing) and caliper. A logging speed of 6 metres per minute was maintained. Data was collected in two (uphole) runs, digitally recorded, and plotted at a scale of 1:100 via a Compu-log computer based logging truck.

Tasmanite consists of fossil spores which can be individually recognized in hand specimen. It was thus expected that -

a) an increase in spore content will be reflected by a decrease in bulk density.

b) an increase in average hydrocarbon content will cause a decrease in the neutron-neutron count, assuming porosity will remain essentially the same in spore-rich rocks as in barren rocks.

c) bulk resistivity will increase as a function of spore content, and

d) caliper and natural gamma logs will only marginally reflect spore content as the matrix (the bulk of the rock) is similar to barren rock.

Of the 51 sites drilled 18 were geophysically logged, four of which were barren. Two respresentative sets of logs including geology and Tasmanite assays are presented as plans TASh 583 and TASh 584. From these it is seen that the responses were basically as predicted although the seams are completely unrecognizeable in the caliper and natural gamma logs.

The S.P. response was unexpected. The activity recorded around the seams indicates that the seams are in fact of different permeability than the surrounding (barren) mudstone. As the ionic content of the drilling mud and the undisturbed ground waters is not known, little else can be deduced.

Assay values from Tasmanite samples indicate that a correlation between seam quality and geophysical response can be made, although this correlation is by no way definitive due to the restricted number of samples.

M.FLIS

APPENDIX 2

SUMMARY - 1981 CRAE DRILLING

1981 CRAE DRILLING SUMMARY

TASMANITE INTERSECTION

Hole No.	From (m)	To (m)	Thickness (m)	Total Depth (m)
RD81 MR1	approx. 17	approx.20	approx. 3	23.0
RD81 MR2	17.74	19.03	1.29	21.4
RD81 MR3	Collared stratigraphically below Tasmanite horizon			18.0
RD81 MR4	approx. 21	approx.22	approx. 1	22.0
RD81 MR5	20.96	22.18	1.22	24.0
RD81 MR6	approx. 17	approx.18	approx. 1	18.0
RD81 MR7	17.80	19.43	1.63	20.3
RD81 MR8	Collared stratigraphically below Tasmanite horizon			34.0
RD81 MR9	approx. 5.0	approx. 6.3	approx. 1.3	6.5
RD81 MR10	4.40	5.55	1.15	6.3
RD81 MR11	Collared stratigraphically below Tasmanite horizon			10.0
RD81 MR12	"	"	"	12.0
RD81 MR13	Hole stopped in dolerite			17.0
RD81 MR14	approx. 15	approx.16	approx. 1	16.0
*RD81 MR15	15.45	16.50	1.05	18.0
RD81 MR16	Collared stratigraphically below Tasmanite horizon			10.0
*RD81 MR17	60.06	62.15	1.55	66.0
*RD81 MR18	91.3	93.4	2.10	100.0
*RD81 MR19	57.95	59.70	1.75	66.0
RD81 MR20	approx. 83	approx.85	approx. 2	91.0
RD81 MR21	Hole stopped in dolerite			52.0
*RD81 MR22	53.70	54.90	1.20	60.0
RD81 MR23	Collared stratigraphically below Tasmanite horizon			21.0
RD81 MR24	Hole stopped in basalt			36.0
*RD81 MR25	41.20	42.3	1.10	50.0
RD81 MR26	Hole abandoned before intersecting Tasmanite			32.0
RD81 MR27	26.07	28.00	1.93	31.0
RD81 MR28	26.93	28.91	1.99	29.6
*RD81 MR29	36.10	37.90	1.80	44.0
*RD81 MR30	80.65	82.45	1.80	86.0
RD81 MR31	Hole abandoned due to access probelms			6.0

APPENDIX 2

Hole No.	From (m)	To (m)	Thickness (m)	Total Depth (m)
RD81 MR32	Hole abandoned due to access problems			12.0
RD81 MR33	approx. 97	approx. 98	approx. 1	107.0
RD81 MR34	Hole stopped in dolerite			53.0
*RD81 MR35	114.90	116.80	1.90	118.0
RD81 MR36	Collared stratigraphically below Tasmanite horizon			45.0
RD81 MR37	approx. 83	approx. 85	approx. 2	94.0
RD81 MR38	approx. 7	approx. 8.5	approx. 1.5	8.5
RD81 MR39	7.10	8.43	1.33	10.3
RD81 MR40	5.0	5.5	0.5	5.5
RD81 MR41	5.15	6.50	1.35	7.5
RD81 MR42	Collared stratigraphically below Tasmanite horizon			6.0
RD81 MR43	approx. 6	approx. 7	approx. 1	9.0
RD81 MR44	6.15	7.25	1.10	8.0
RD81 MR45	Collared stratigraphically below Tasmanite horizon			19.0
RD81 MR46	"	"	" " "	11.0
RD81 MR47	"	"	" " "	7.0
RD81 MR48	"	"	" " "	12.0
RD81 MR49	"	"	" " "	8.0
RD81 MR50	approx. 5	approx. 6	approx. 1	6.0
RD81 MR51	5.15	6.47	1.32	7.5
RD81 MR52	Collared stratigraphically below Tasmanite horizon			13.0
RD81 MR53	"	"	" " "	12.0
RD81 MR54	"	"	" " "	5.0
RD81 MR55	approx. 71	approx. 73	approx. 2	84.0
RD81 MR56	69.50	72.50	3.0	75.5
RD81 MR57	Hole abandoned because of drilling problems			67.0
RD81 MR58	approx. 69	approx. 70	approx. 1	70.0
RD81 MR59	69.13	70.78	1.65	72.5
RD81 MR60	78.75	80.35	1.60	82.0
RD81 MR61	36.34	38.09	1.75	38.3
RD81 MR62	approx. 22	approx. 24	approx. 2	24.0
RD81 MR63	22.20	23.84	1.64	24.9
RD81 MR64	approx. 52	approx. 53	1	53
RD81 MR65	50.8	52.23	2.15	53.9
RD81 MR66	64.8	66.32	1.52	68.0

* Determined from geophysical logs

APPENDIX 3

1981 CRAE DRILL LOGS

823027

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE Railton 1:25 000

CO-ORDINATES 452600 E 5426250 N DRILLERS Exploration Drilling COMMENCED 7:10:81 DEPTH 23.0m HOLE No. RD 81 MR1

RL COLLAR 68 m ASL INCLINATION -90° DRILL TYPE I R TH60 COMPLETED 7:10:81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	5	OPEN HOLE			WEATHERED ARGILLITES: yellow-ochre clays. Frequent pebbles and fragments of quartz and weathered quartz arenites.					
5	16				MUDSTONE: blue grey. Slightly micaceous, low fissility Traces of disseminated pyrite. Frequent clasts (? thin interbeds) of fine grained quartzite sandstones, often limonitic.					
16	17				SILTSTONE: mid-dark grey fine grained quartz arenite or siltstone. Micaceous. Well sorted.					
17	20				TASMANITE OIL SHALE: and mid grey siltstone as above. The oil shale fragments are honey-brown in colour and moderately rich in Tasmanities spores.					
20	23				MUDSTONE: blue grey. Slightly pyritic. Frequent small (± 1mm) clasts of quartz and other lithotypes. Occassional Tasmanities spores.					
					Hole MR 2 drilled adjacent to this hole in order to core the oil shale.					

823028

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 2

TENEMENT NAME Mersey River JV. No. EL 4/74

PLAN – MAP REFERENCE Railton 1:25 000

CO-ORDINATES 452600 E 5426250 N DRILLERS Exploration Drilling COMMENCED 7:10:81 DEPTH 21.4m HOLE No RD81 MR2

RL COLLAR 68 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 7:10:81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by A.M.D.E.L.) Proximate Analysis (Dry) Oil Yield: Volatile %	Fixed C %	Ash %	L/Tonne
0	7				WEATHERED ARGILLITES: yellow-ochre clays. Minor quartz and quartz arenite.								
7	16.5				MUDSTONE: blue grey, sparsely micaceous. Traces of pyrite.								
16.5	17.74				SILTSTONE: mid grey siltstone/silty mudstones interlaminated (90°) fine grained siltstone beds often show soft sediment deformation into underlying finer grained more argillitic (soft) sediment. Slightly micaceous throughout poorly fissility. Frequent large (to 1.5 cm) clasts: subangular to subrounded, of light grey medium grained quartz - arenite and, less frequently, quartz or mudstone. Lower contact of this unit is indistinct; the basal few centimetres is conglomeratic but this could be load casting. The result is numerous silt clasts enveloped by the underlying Tasmanite oil shale.								
17.74	18.40				TASMANITE OIL SHALE: high (>30%) spore content. Silt - very fine sand grade sediment with a distinctive, somewhat lustrous bronze-brown to greenish-brown colour. Spores are discoidal and lie parallel to bedding giving rise to a strong foliation and resulting high fissility at and intersection angle of 90°. A few small (0.5cm) aggregates of pyrite usually alongate parallel to the foliation, are present. In frequent small (0.3cm) clasts of various quartz-arenites and argillites are present - most noticeable at the top of the unit. The lower contact is interbedded over approx. 2 cm.	98630	17.74	18.40	.66	10.96	13.23	75.81	165

823029

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 2 OF 2

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 452600 E 5426250 N DRILLERS Exploration Drilling COMMENCED 7:10:81 DEPTH 21.4 HOLE No RD81 MR2

RL COLLAR 68 m ASL INCLINATION -90° DRILL TYPE I.R. TH6R COMPLETED " CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatile %	Fixed C %	Ash %	OIL YIELD L/tonne
18.40	18.55	.15			SILTSTONE: with low spore content, except at the upper and lower contacts (up to approx. 5%). Lower contact not seen, core ground.	986304	18.40	18.55	.15	8.28	5.04	86.68	4
8.55	19.03	.48			TASMANITE OIL SHALE: not quite as rich as the upper "seam" other wise very similar. Slightly larger, more numerous clasts. Traces of pyrite (often associated with clasts) Minor calcareous segregations parallel to the foliation (90°). Lower contact is finely interbedded with the underlying argiltite over 7cms.	986305	18.55	18.93	.38	23.12	0.69	76.08	151
						986306	18.93	19.03	.10	8.12	0.92	90.96	12
19.03	21.40	2.37			MUDSTONE: blue grey silty mudstone with "conglomeratic" interbeds.								

823030

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452750 E 5426360 N DRILLERS Exploration Drilling COMMENCED 8:10:81 DEPTH 18.0 HOLE No. RD81 MR3

RL COLLAR 59 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	5.0				WEATHERED ARGILLITE: Very soft, yellow-ochre clay with silty interbeds, similarly weathered.					
5.0	17.0				QUARTZ-ARENITE: Very fine grained, well sorted. Probably sub-arkosic to sub-greywacke range. Dark grey. Finely disseminated pyrite abundant throughout. Rounded pebbles of quartz present. Interbeds of "mudstone conglomerate" - dark grey argillitic matrix with abundant clasts of ten large (+ 5cms), of quartz and a variety of quartz-arenites.					
17.0	18.0				ARGILLITE: Dark grey mudstone. Micaceous. Low fissility.					
					Hole stopped at 18m as the succession intersected appears to be characteristic of the Lower Permian below the Tasmanite oil shale horizon.					

823031

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452730 E 5426040 N DRILLERS Exploration Drilling COMMENCED 8.10.81 DEPTH 22.0m HOLE No RD 81 MR4

RL COLLAR 70 m ASL INCLINATION -90° DRILL TYPE L R TH6R COMPLETED CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	2.0				WEATHERED ARGILLITE: Buff -ochre /yellow clays with silt and quartz fragments.					
2.0	21.0				ARGILLITES: Blue grey mudstone a silty argillites. Slightly micaceous, not strongly fissite. Occassionally pyritic with fine disseminated pyrite or nodules of pyrite. Thin (20cms) mid light grey, fine grained well sorted quartz- arenite (sub-quartzitic). Often pyritic. Very hard below 18m.					
21.0	22.0				TASMANITE OIL SHALE: Brown, slight bronze tinge, oilshale quite high proportion of spores.					
					Hole stopped at 22.0m in Tasmanite oil shale to allow an adjacent hole to be cored. (MR5)					

823032

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 2

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 452730 E 5426040 N DRILLERS Exploration Drilling COMMENCED 8-10-81 DEPTH 24.0m HOLE No RD81 MR5

RL COLLAR 70 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 9-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ARRSL) Proximate Analysis Oil Yield Volatiles %	Fixed C %	Ash %	L/Tonne
0	2.0				WEATHERED ARGILLITE: Buff yellow-ochre.								
2.0	19.0				ARGILLITE: Blue-grey mudstones, poorly fissite. Sparsely micaceous and slightly pyritic. Some silt and fine quartz arenite interbeds, usually 20cms.								
19.0	20.96				ARGILLITES: Mid grey silts and blue grey mudstones interbedded in approximately equal proportions. The silty materials is very fine grained and has numerous thin laminae and wisps of mudstone and frequent (± 10%) clasts of mid-grey argillite and qz-arenite, usually 1cm and sub-rounded. The mudstones are poorly-fissite and poorly micaceous. Usually numerous, thin (2-3mm), interlaminae of silt. Clasts, as above, also occurr in the mudstone horizons. Frequent load casting of the silts into underlying mud-stones. The base of the unit, where in contact with the underlying oil shale is strongly load-cast deformed.								
20.96	21.70	.74			TASMANITE OIL SHALE: Appears to be quite high grade, spores very abundant and noticeable. Foliation caused by flattening of spores is at ±90°. Typical brown colour with an amber to bronze lustre imparted by the Tasmanities spores. Silty texture. A few, small (5mm), clasts (of quartz) are present. Traces of pyrite are often associated with the clasts (either rimming and/or penetrating the clasts) and occassionaly pyrite is found disseminated in the 'oil shale' parallel to the bedding/foliation. Frequency of clast occurrence increases downwards.	986307	20.96	21.70	.74	19.82	0.34	79.44	160

823033

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452730 E 5426040 N DRILLERS Exploration Drilling COMMENCED 8-10-81 DEPTH 24.0 HOLE No. RD81 MR5

RL COLLAR 70 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 9-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatile %	Fixed C %	Ash %	OIL YIELD L/Tonne
					Spore content decreases slightly towards base of unit.								
21.70	21.80	.10			*ARGILLITE: Mid grey silt with very low spore content (± 5%) and numerous clasts of light grey argillite and a light grey fine grained quartz-arenite, these clasts often being pyrite bearing. Vague lamination, often disturbed (soft-sediment deformation) at ± 87°. Upper, and, to especially the lower, contacts quite sharp.*	986308	21.70	21.80	.10	7.90	0.51	91.59	15
21.80	22.18	.28			*TASMANITE OIL SHALE: Fairly rich in spores. Typical colouration and foliation. Upper contact zone has some clasts (± 1cm, sub-round) as in the overlying silt, but the frequency rapidly decreases with depth. Lower contact is very gradational through decreasing spore content and interlamination with the underlying silts.*	986309	21.80	22.18	.28	23.06	0.70	76.24	226
22.18	22.30	.12			*INTERLAMINATED TASMANITE OIL SHALE AND SILTY ARENITES: Overall low spore content, but thin, reasonably rich, laminae to 3-4mm.*	986310	22.18	22.30	.12	9.04	0.65	90.30	18
22.30	24.00				*ARGILLITIC CONGLOMERATE: Midgrey silty matrix with a very variable clast content. Size and frequency of clasts varies from zone to zone. Clast lithologies are dominantly red and dark grey quartz-arenites, quartz and some argillite, most are sub-rounded. Pyrite is commonly found associated with the clasts. Size and frequency of clast tends to increase downwards. Minor carbonate segregations parallel to faint lamination and around some clasts.*								

823034

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452800 E 5425920 N DRILLERS Exploration Drilling COMMENCED 9-10-81 DEPTH 18.0 HOLE No. RD 81 MR 6

RL COLLAR 70 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 9-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	4.0				ARGILLITE: Highly weathered, yellow-ochre clays.					
4.0	17.0				ARGILLITE: Blue-grey silty mudstone. Slightly micaceous Occassionally pyritic. Thin interbeds and ? clasts of find grained, midgrey, quartz-arenite.					
17.0	18.0				TASMANITE OIL SHALE: Moderately high spore content.					
					Hole abandoned to allow redrill of Tasmanite at adjacent site (RD7).					

823035

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 2
TENEMENT NAME Mersey River J.V. No. EL 4/74
PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452800 E 5425920 N DRILLERS Exploration Drilling COMMENCED 9-10-81 DEPTH 40.35 HOLE No. PD81 MR7
RL COLLAR 70 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 9-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	4				ARGILLITE: Highly weathered silty argillite. Yellow-ochre								
4	17				ARGILLITE: Blue grey silty argillites with thin, fine grained quartz-arenite interbeds or ? clasts. Some disseminated pyrite.								
17.00	17.70				ARGILLITE: Blue grey silty mudstone with up to 15% clasts of quartz-arenite, quartz and some argillites. Silt rich interbeds show soft sediment deformation at their lower contacts with finer mudstones. Vague laminae, often contorted, at ± 85°. Traces of pyrite, especially with the clasts.								
17.70	17.80				CAVITY: Only small fragments of strongly limonitic argillite recovered.								
17.80	18.53	.73			TASMANITE OIL SHALE: The upper contact is marked by silt load casts intruding and warping the oil shale. Pyrite is abundantin the oil shale. A sub-vertical highly limonitic and careous fissure cuts this entire intersection. The spore content is only moderate. Foliation/bedding is at ± 90°. Very large (5cm) nodules of pyrite plus thin veinlets (1mm) of pyrite occur. Clasts of quartz and quartz arenite are present but very frequent. Spore content decreases rapidly in the lower 15cms.	986300	17.80	18.53	.73	13.19	2.28	80.54	144
18.53	18.60	.06			SILT: Very fine silty arenite with low percentage of spores Fairly abundant disseminated and vein (1mm) pyrite. Lower contact is lost.	986301	18.53	18.60	.06	5.16	2.11	92.72	0

823036

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Hersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452800 E 5425920 N DRILLERS Exploration Drilling COMMENCED 9-10-81 DEPTH 20.35 HOLE No. PD81 MR7

RL COLLAR 70 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 9-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
18.60	19.00				Core loss								
19.00	19.43	.43			TASMANITE OIL SHALE: Extremely weathered, very soft, spongy to feel, very flexible. Brown with green or bronze lustre. High spore content. Clasts (also highly weathered) of quartz arenite to 5mm are quite common. Lower contact is interbedded and spore content decreases down towards it.	986302	19.00	19.43	0.43	26.05	2.21	11.34	170
19.43	19.54				ARGILLITES: Dark grey silt-mudstone with numerous small clasts of a variety of lithotypes, dominantly quartz-arenite.								
19.54	20.00				Core Loss								
20.00	20.35				ARGILLITES: As above.								

823037

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. EL. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452960 E 5426030 N DRILLERS Exploration Drilling COMMENCED 10-10-81 DEPTH 34 m HOLE No. RD81 MR8

RL COLLAR 65 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 10-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	4				ARGILLITE: Highly weathered, yellow-brown. Numerous pebbles of quartz.					
4	12				ARGILLITE: Silty blue grey mudstone with abundant quartz-arenite clasts. Pyritic.					
12	18				ARGILLITIC CONCLOMERATE: Mudstone-silt matrix with clasts of quartz and quartz arenites. Silty and arenitic inter-beds up to 30 cms quite abundant.					
18	24				INTERBEDDED ARGILLITES AND ARGILLITIC CONGLOMERATE: The two facies described above but interbedded on a 0.5 - 1m scale.					
24	34				ARGILLITES: Dark grey, silty mudstones, occassional arg-illitic conglomerate interbeds.					
					Hole stopped as believed to be collared below the Tasmanite oil shale horizon. From 4-18m is regarded as belonging to the "Lower Mudstone Conglomerate", and from 18-34 as belonging to the "Lower Mudstone", both of which occur below the oil shale.					

823038

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 452950 E 5425780 N DRILLERS Exploration Drilling COMMENCED 10.10.81 DEPTH 6.5 HOLE No. RD81 MR9

RL COLLAR 60 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 10.10.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	2				ARGILLITE: Highly weathered. Yellow-ochre. Somewhat silty.					
2	5				ARGILLITE: Blue grey, slightly silty, mudstone. Surprisingly hard. Sparsely micaceous, likewise pyritic. Occassional clasts of fine grained quartz-arenite.					
5.0	6.25				TASMANITE OIL SHALE: Surprisingly fresh in appearance. High spore content.					
6.25	6.5				ARGILLITE: Blue grey silt/mudstone.					

823039

SHEET 1 OF 2

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 452950 E 5425780 N DRILLERS Exploration Drilling COMMENCED 10:10:81 DEPTH 6.35m HOLE No PD81 MR10

RL COLLAR 60 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 10:10:81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	2				ARGILLITE: Highly weathered, silty mudstone. Yellow - ochre.								
2	4.4				ARGILLITE: Blue grey mudstone, slightly silty.								
4.40	4.77	.27			TASMANITE OIL SHALE : (4.40-4.50 percussion drilled, remainder diamond drilled). Moderate spore content. Very uniform. Sparsely pyritic. Foliation/lamination at ± 88°. Typical brownish colouration.	986434	4.50	4.77	.27	33.76	< 0.1	66.6	293
4.77	4.97	.20			TASMANITE OIL SHALE: Striped appearance caused by interlamination of rich bands (2-3mm) and spore poor bands, the latter having noticeable pyrite. This grade controlled interlamination is very distinctive in appearance, the brown, rich bands contrasting with the low grade, midgrey horizons.	986435	4.77	4.97	.20	15.76	3.40	80.83	166
4.97	5.20	.20			SILT: Midgrey silt-fine quartz-arenite. Very low spore content except in a few thin, wavey laminae. Some disseminated pyrite, plus minor pyrite veinlets and nodules. Occassional round chert and quartz arenite clasts to 1cm. Lower contact sharp at 88°.	986436	4.97	5.20	.20	8.16	1.13	90.71	18
5.20	5.55	.35			TASMANITE OIL SHALE: Fairly massive appearance, although lamination/foliation is quite well developed (± 88°). Moderately good grade. Grit size clasts of quartz, argillite and quartz arenite are quite common. Little pyrite throughout. Lower contact is gradational by decreasing spore content and interlamination of the underlying unit.	986437	5.20	5.55	.35	21.82	1.06	77.12	182

823040

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 2 OF 2

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452950 E 5425780 N DRILLERS Exploration Drilling COMMENCED 10-10-81 DEPTH 6.35m HOLE No PD81 MR10

RL COLLAR 60 m ASL INCLINATION - 90° DRILL TYPE LR THGR COMPLETED 10-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
5.55	6.35				ARGILLITIC CONGLOMERATE: Dark grey silty mudstone matrix with large sub rounded clasts of quartz arenite, argillite and schist. The matrix has well developed convolute lamination especially ground clasts. Occassional Tasmanities spores visible in the matrix. Thin silt or fine grained arenite interbeds display loadcasting into the underlying mudstone/silt at their lower contacts.					

823041

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452840 E 5425480 N DRILLERS Exploration Drilling COMMENCED 10·10·81 DEPTH 10m. HOLE No. RD81 MR11

RL COLLAR 64 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 10·10·81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	5				ARGILLITE: Highly weathered, yellow-ochre clays. Abundant quartz-arenite clasts.					
5	10				ARGILLITIC CONGLOMERATE: Blue grey mudstone (Silty) matrix hosting abundant grit size clasts of quartz and argillite plus larger, subround clasts of quartz and quartz arenite.					
					Hole collared stratigraphically below Tasmanite horizon.					

823042

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452575 E 542540 N DRILLERS Exploration Drilling COMMENCED 10 · 10 · 81 DEPTH 12.0m HOLE No. MR12

RL COLLAR 76 m ASL INCLINATION - 90° DRILL TYPE L R TH60 COMPLETED 10 · 10 · 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	6				ARGILLITIC RUBBLE: Brown-ochre clays with numerous clasts of quartz, quartz-arenite and quartzite.					
6	12				ARGILLITIC CONGLOMERATE: Mudstone matrix with numerous quartz, quartz-arenite and argillite clasts. Minor interbeds of gritty quartz-arenite.					
					Hole collared stratigraphically below Tasmanite horizon.					

823043

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453120 E 5426030 N DRILLERS Exploration Drilling COMMENCED 10. 10. 81 DEPTH 17 HOLE No. RD81 MR13

RL COLLAR 85 m ASL INCLINATION - 90° DRILL TYPE L.R. TH6R COMPLETED 10. 10. 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	10				ARGILLITE: Brown-ochre clay, very weathered. Quartz and quartz-arenite clasts.					
10	15				ARGILLITE: Much as above but less weathered. Numerous large clasts.					
15	17				DOLERITE: Weathered at top, rapidly becoming extremely hard.					
					Hole stopped in dolerite.					

823044

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452620 E 5425800 N DRILLERS Exploration Drilling COMMENCED 10-10-81 DEPTH 16.0 m HOLE No. RD81 MR14

RL COLLAR 75 m ASL INCLINATION - 90° DRILL TYPE LR THGR COMPLETED 10-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	4				ARGILLITE: Highly weathered plus light grey, fine grained quartz-arenite interbeds.					
4	15				ARGILLITE: Blue grey mudstone, somewhat silty in parts. Sparingly pyritic and micaceous.					
15	16				TASMANITE OIL SHALE: Typical colouration. Moderately rich in spores.					
					Hole stopped to allow redrill and coring of the Tasmanite at adjacent site.					

823045

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452620 E 5425800 N DRILLERS Exploration Drilling COMMENCED 10:10:81 DEPTH 18.0 HOLE No. RD81 MR15

RL COLLAR 75 m ASL INCLINATION - 90° DRILL TYPE L.R. THOR COMPLETED 10:10:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	4				ARGILLITIC RUBBLE: Clay and fine grained arenite interbeds. Weathered .					
4	14				ARGILLITE: Blue grey mudstone. Slightly silty in parts.					
14.00	15.00				ARGILLITE: Blue grey mudstone, very uniform. Slightly micaceous. Non fissile. Very few clasts or silty interbeds. Poorly laminated at 90°. Frequently badly broken, probable core loss. Lower 15cm very soft and clay rich.					
15.00	15.20	0.10			TASMANITE OIL SHALE: Very soft. Extensively broken. Well laminated, fairly pyritic.	NOT SAMPLED				
15.20	17.00	–			Core loss					
17.00	18.00	1.00			ARGILLITE: Silty, midgrey					
					Geophysical logging defined Tasmanite at 15.45 - 16.50 m.					

823046

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. EL. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452190 E 5425885 N DRILLERS Exploration Drilling COMMENCED 10.10.81 DEPTH 10.00m HOLE No RD81 MR16

RL COLLAR 90 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 10.10.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	10				*CONGLOMERATE: Highly weathered throughout. Upper parts tend to be argillaceous, but becomes arenitic with depth. Clasts are dominantly quartz-arenite plus some quartz, often well rounded.*					
					Hole stopped, believed to be collared in the basal Permain conglomerate below the Tasmanite oil shale.					

823047

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 454170 E 5423265 N DRILLERS Exploration Drilling COMMENCED 11:10:81 DEPTH 66m HOLE No. RD81 MR17

RL COLLAR 75 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 11:10:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	8				ARGILLITE: Highly weathered. Brown-ochre clays with possible fine grained quartz-arenite interbeds. Numerous clasts of quartz and quartz arenite.					
8	10				QUARTZ-ARENITE: Calcareous. Fine grained, buff-yellow in colour. Well sorted. A few small quartz clasts (2-3mm)					
10	54				ARGILLITES: Blue grey, sparingly micaceous. Poor fissility. Fairly abundant clasts of quartz and quartz arenite, round to sub rounded and up to 1½cm dia. Frequent thin (0.3m) interbeds of a) dark grey, hard silty arenite, and b) fine grained, well sorted, buff coloured quartz-arenite Below 32m the frequency and size of these interbeds decreases.					
54	61				SILT: Mid to dark grey argillitic siltstones. Distinctly coarser and harder than overlying mudstones. Sparingly micaceous and quite fissile. Low pyrite except in some thin (20cm) interbeds of fine grained, dark grey quartz-arenite which contain noticeable disseminated pyrite.					
61	62.3				TASMANITE OIL SHALE: Typical brown colouration with greenish-bronze lustre. Appears to be fairly rich in spores.	986474	(Hand sorted chip samples).			
62.3	66				ARGILLITIC CONGLOMERATE: Very hard. Dark grey argillic matrix, but very "dirty" abundant grit size quartz fragments. Clasts of quartz and quartz arenite.					
					Geophysical logging determined Tasmanite at 60.6 - 61.7 m.					

823048

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450385 E 5429915 N DRILLERS Exploration Drilling COMMENCED 12:10:81 DEPTH 100m HOLE No RD81 MR18

RL COLLAR 35 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 12:10:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	18				ARGILLITE: Blue grey, highly weathered down to 10m. Clasts of quartz and quartz arenite are rounded and up to 1cm diameter. Below 10m, interbeds (to 0.5m) of fine grained dark grey silty quartz-arenite are present. Slightly pyritic throughout. Red and brown quartz-arenite clasts common in lower 8m.					
18	32				SILTSTONES: Dominantly dark grey silt. Fairly compact. Traces of pyrite. Low mica content. Clasts (qz mainly) are in frequent. Bryozoan fossil fragments present. Thin (10cm) chert horizons, slightly greenish grey in colour are present.					
32	38				SILTSTONES AND QUARTZ ARENITES: Interbedded siltsones, dark grey, poorly sorted and fine grained mid grey quartz-arenites. Minor blue-grey argillite interbeds.					
38	42				SILTSTONES: Dark grey silty mudstone and poorly sorted siltstones.					
42	90				ARGILLITE: Blue grey mudstone. Occassional clasts of quartz or quartz-arenite. Very occassional quartz-arenite interbeds - fine grained, mid grey, slightly pyrite.					
90	92				SILTSTONE/QUARTZ ARENITE: Very hard, fine grained silt or silty qz-arenite.					
92	93.5				TASMANITE OIL SHALE: Moderately high spore content. Typical brown colour with greenish/bronze lustre.	986523	(Hand spiked cuttings sample)			

823049

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 2 OF 2

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450385 E 5429915 N DRILLERS Exploration Drilling COMMENCED 12.10.81 DEPTH 100m HOLE No. RD81 MR18

RL COLLAR 35 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 12.10.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
93.5	100				SILTSTONES AND QUARTZ ARENITE: Mid dark grey siltstones and dark grey, medium fine grained quartz arenite interbeds. Clasts of qz quite common.					
					Geophysical logging determined Taemanite at 91.6-93.3m.					

823050

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/76

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450625 E 5430765 N DRILLERS Exploration Drilling COMMENCED 13:10:81 DEPTH 66 HOLE No RD81 MR19

RL COLLAR 43 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 13:10:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	11				QUARTZ ARENITE: Buff coloured medium grained, quartz-felspar-arenite. Probably sub-arkozic. Frequent clasts, up to 2cm, of a variety of arenitic lithotypes, often well rounded.					
11	26				ARGILLITE: Blue grey mudstone. Slightly micaceous. Not very fissile.					
26	34				SILTSTONES: Mid grey siltstones with interbeds (thin) of blue grey mudstone.					
34	54				ARGILLITES: Blue grey, poorly fissile mudstones. Traces of pyrite. Occassional silt or fine grained qz arenite interbed or clast.					
54	58				SILTSTONE: Fine grained siltstone/silty arenite. Mid grey. Hard.					
58	60			*	TASMANITE OIL SHALE: Typical appearance. Does not appear to be particularly rich in spores.	986556	(Hand picked cuttings).			
60	66				ARGILLITE: Mid grey and blue grey mudstones and some silts. Very few clasts.					
					* Geophysical logging determined Tasmanite at 58.20-59.70m.					

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

823051 SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450625 E 5431510 N DRILLERS Exploration Drilling COMMENCED 13.10.81 DEPTH 91 m HOLE No. RD81 MR20

RL COLLAR 17 m ASL INCLINATION - 90° DRILL TYPE LR TH60 COMPLETED 15.10.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	10				ALLUVIAL GRAVELS: Often very coarse. Dominantly quartz-arenite pebbles and boulders.					
10	24				SILTSTONES: and fine grained silty arenites. Slightly pyritic . All mid grey.					
24	83				ARGILLITES: Blue grey mudstones, sometimes silty. Occassional thin cherty horizons between 30-36m. Very few clasts. A more uniform succesion than is usual.					
83	85				TASMANITE OIL SHALE: Harder than usual. Not very rich in spores.	986601	(Hand sorted cuttings).			
85	91				SILTSTONE: Dark grey siltstone, surprisingly hard. Occassional clasts of dark grey, compact quartz-arenite.					

823052

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/76

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450650 E 5432310 N DRILLERS Exploration Drilling COMMENCED 15-10-81 DEPTH 52 metres HOLE No. RD81 MR21

RL COLLAR 10 m ASL INCLINATION - 90° DRILL TYPE LR TH60 COMPLETED 17-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	10				ALLUVIAL GRAVELS: Often very coarse. Quartz-arenite clasts predominate.					
10	32				SILTSTONES: and fine grained silty arenites. Dark grey, fairly soft. Few clasts.					
32	42				ARGILLITE: Blue-grey mudstone, slightly silty in parts.					
42	46				SILTSTONES: Dark-grey, hard.					
46	52				DOLERITE: Soft down to 49m, very hard thereafter.					
					Hole abandoned in dolerite.					

823053

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. EL 4/7

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 454920 E 5427660 N DRILLERS Exploration Drilling COMMENCED 17.10.81 DEPTH 60 HOLE No. PD81 MR2

RL COLLAR 120 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 17.10.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	5				ARGILLITE: Light buff clays, very soft. Highly weathered. Surprisingly little quartz or other clast types.					
5	49				ARGILLITE: Blue-grey mudstone. Very few clasts. Soft. Sparingly micaceous & non-pyritic.					
49	52				SILTSTONES: Mid-grey, fairly soft siltstone. Sparse mica.					
52	54				TASMANITE OIL SHALE: and siltstones as above. Tasmanite is of low spore content (very low in comparison to other areas) and is probably fairly thin.	986617	Hand worked drill cuttings			
54	60				ARGILLITE CONGLOMERATE: Matrix is silty mudstone, dark grey. Numerous clasts of quartz, chert, quartz-arenite.					

823054 SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 455380 E 5426950 N DRILLERS Exploration Drilling COMMENCED 13:10:91 DEPTH 21 metres HOLE No. RD81 MR23

RL COLLAR 58 m ASL INCLINATION - 90° DRILL TYPE L R THM COMPLETED 17:10:91 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	2				ARGILLITE SOIL: Buff, yellow clays.					
2	5				ARGILLITE: Highly weathered. Yellow-buff clays.					
5	9				SILTSTONES: Mid grey siltstones, frequent quartz and quartz-arenite clasts.					
9	15				SILTSTONES/FINE ARENITES: Brown, highly weathered siltstones and fine, silty arenites.					
15	21				CONGLOMERATE: Highly weathered. Sandy matrix, very poorly sorted. Clasts of quartz and quartz-arenites are very abundant, usually sub rounded.					
					Hole stopped, believed to be collared below the oil shale.					

823055

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450990 E 5429320 N DRILLERS Exploration Drilling COMMENCED 18:10:81 DEPTH 36m HOLE No RD81 MR24

RL COLLAR 68 m ASL INCLINATION -90° DRILL TYPE LR THGA COMPLETED 19:10:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	20				BASALT: Very highly weathered. Abundant clays.					
20	36				BASALT: Vesicular. Abundant zeolites. Coarsening downwards.					
					Hole abandoned in basalt, believed to be collared over vent area.					

823056

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452600 E 5431285 N DRILLERS Exploration Drilling COMMENCED 13-10-81 DEPTH 50 m HOLE No. RD81MR25

RL COLLAR 53 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 19-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	18				CLAY: ex basalt, light, buff-ochre clay, obviously derived from a basalt, fragments of which are abundant, usually highly weathered.					
18	29				BASALT: Hard, vesicular, zeolitic. Often scoriaceous and weathered in thin (± 1m) horizons.					
29	36				ARGILLITE: Blue-grey mudstone. Fairly silty in parts.					
36	40				SILTSTONES AND ARGILLITE: Interbedded siltstones and silty mudstones. Overall brownishgrey colouration. Frequent, fairly large, clasts of quartz or quartz-arenite.					
40	42				SILTY QUARTZ ARENITE: Fine grained, Mid grey. Sparsely micaceous.					
42	45				TASMANITE OIL SHALE: Very low grade Tasmanite. Chips spread over a relatively large interval but not abundant. Darker colour than usual, the low spore content being responsible for this.					
45	50				SILTSTONES: Mid to dark grey. Poorly sorted. Frequent clasts.					

823057

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 452420 E 5430450 N DRILLERS Exploration Drilling COMMENCED 19-10-81 DEPTH 32 m HOLE No. RD81 MR26

RL COLLAR 59 m ASL INCLINATION -90° DRILL TYPE I.R. THOR COMPLETED 19-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	6				ARGILLITE: Highly weathered to brown and ochre clays.					
6	30				ARGILLITE: Very uniform blue-grey slightly silty (in parts) mudstone. Clast are infrequent. Sparsely micaceous, non fissile.					
30	32				SILTSTONE: Mid-grey. Almost a fine arenite. This horizon is probably that which is normally found immediately above the Tasmanite oilshale.					
					Hole abandoned due to loss of circulation. Almost certainly the hole just reached the oil shale before circulation was lost. Redrilled 100m east as MR27 and 28.					

823058

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452550 E 5430455 N DRILLERS Exploration Drilling COMMENCED 19-10-81 DEPTH 31 m. HOLE No. RD81 MR27

RL COLLAR 75 m ASL INCLINATION -90° DRILL TYPE L.R. THOR COMPLETED 19-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	4				ARGILLITE: Highly weathered to buff clays.					
4	24				ARGILLITE: Blue-grey slightly silty mudstone. Clasts of quartz-arenite present but infrequent. Sparsely micaceous, non fissile. Occassionally slightly pyritic.					
24	26				SILTSTONE: or fine arenite. Mid grey, fairly well sorted. Quite hard.					
26	28				TASMANITE OIL SHALE: Low spore content therefore more greyish than usual. Surprisingly hard.	986644	(Handpicked drill cuttings)			
28	31				ARGILLITIC CONGLOMERATE: Mid-dark grey silty mudstone matrix with abundant clasts of quartz and quartz-arenite.					

823059

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 2

TENEMENT NAME Mersey River LV. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452550 E 5430455 N DRILLERS Exploration Drilling COMMENCED 19-10-81 DEPTH 29.59m HOLE No. RD81.MR28

RL COLLAR 75 m ASL INCLINATION -90° DRILL TYPE LR THM COMPLETED 20-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ANDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	4				ARGILLITE: Highly weathered.								
4	23.7				ARGILLITE: Blue grey mudstone. Uniform. Clasts in frequent.								
23.7	26.93				ARGILLITE: Silty mudstone with up to 5% clasts. Becoming coarser and harder with depth. Poorly sorted. Clasts are dominantly fine and medium grained arenites, though a few igneous lithotypes are present. Low quantities of disseminated and modular pyrite, often associated with the clasts.								
26.93	27.18	0.25			TASMANITE OIL SHALE: Low spore content. Frequent sub-round clasts of quartz, quartz arenites and even granite, up to 2cms diameter. Minor pyrite, usually concentrated around clasts. Foliation at ± 90° . Spore content decreases at the base of the unit.	986651	26.93	27.18	0.25	10.26	0.75	88.99	27
27.18	27.44	0.26			TASMANITE OIL SHALE: Very low grade (± 5% spores). Basically a siltstone with a few spores and a few thin (± 3mm) interlaminae of richer oil shale. Poorly sorted, though large clasts are not especially common except in the lowest 5cm where sub rounded clasts of quartz-arenite and a leuco-granite occur.	986652	27.18	27.44	0.26	15.18	0.92	83.89	102
27.44	27.95	0.51			TASMANITE OIL SHALE: Fairly good grade. Silty, harder than is usual. Clasts to 1cm (qz-arenite) are fairly common. Pyrite is only very sparse. Laminae adjacent to the clasts do not appear to be disturbed, which might be unusual considering the proposed dropstone origin of the clasts.	986653	27.44	27.95	0.51	35.00	3.75	61.26	240

823060

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 2 OF 2
TENEMENT NAME Mersey River I.V. No. E.L. 4/74
PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 452550 E 5430455 N DRILLERS Exploration Drilling COMMENCED 19-10-81 DEPTH 29.59 HOLE No. RD81 MR28
RL COLLAR 75 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 20-10-81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
					Upper contact fairly sharp, lower contact is gradational by decrease in spore content and interlamination with the underlying silts.								
27.95	28.32	0.37			SILTSTONES: Mid grey, very (5%) low spore content at upper and lower contacts, elsewhere virtually barren. Very poorly sorted abundant small (1-2mm) quartz clasts plus larger subround clasts to 4mm. Abundant pyrite, often in nodules. Upper and lower contacts gradational.	986654	27.95	28.32	0.37	9.84	0.56	89.60	23
28.32	28.91	0.59			TASMANITE OIL SHALE: Moderate to good grade. Large (1cm) sub round clasts of fine grained and very coarse grained quartz-arenites clasts are fairly frequent - again they do not disturb the foliation/lamination of the "shale" (±90°) Clasts often concentrated at distinct level. Upper and lower contacts gradational by decrease in spore content.	986655	28.32	28.91	0.59	22.33	4.19	73.48	152
28.91	29.59				SILTSTONES: Very poorly sorted. Frequent clasts of mid size range and degree of sphericity/roundness. Low pyrite content.								
					The Tasmanite Oil Shale occurs as 3 distinct, fairly spore rich seams seperated by virtually barren siltstones.								

823061

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 451500 E 5431650 N DRILLERS Exploration Drilling COMMENCED 20.10.81 DEPTH 44 m Cored HOLE No. RD81 MR29

RL COLLAR 27 m ASL INCLINATION -90° DRILL TYPE LR THM COMPLETED " CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	10				ALLUVIAL GRAVELS: Not extremely coarse.					
10	28				ARGILLITES: Blue grey mudstones. Sparsely micaceous. Traces of pyrite. Soft except for occassional slightly silty horizons or qz-arenite clasts.					
28	36				SILTSTONE: Mid grey, almost a fine qz-arenite (sub grey-wacke) with occassional clasts.					
36	38				TASMANITE OIL SHALE: Typical bronze lustre, greenish colour. Fairly high spore content.	987713	(Hand sorted drill cuttings)			
38	44				SILTSTONES: Very poorly sorted, abundant clasts.					

823062

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 451860 E 5431970 N DRILLERS Exploration Drilling COMMENCED 20 - 10 - 81 DEPTH 86 metres HOLE No. RD81 MR3

RL COLLAR 32 m ASL INCLINATION - 90° DRILL TYPE I.R. TH6R COMPLETED 21 - 10 - 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	12				QUARTZ ARENITE: Rubble, highly weathered. Soft very broken. Med - fine grained. Yellow-ochre in colour.					
12	20				QUARTZ-ARENITE: Very poorly sorted. Mid grey, fine grained sub-greywacks. Some siltstone horizons.					
20	74				ARGILLITE: Blue grey, mudstones, often silty. Very sparsely micaceous. Few clasts. Slightly pyritic. Very uniform.					
74	78				SILTSTONE: Mid grey. Fairly hard, almost a dirty qz-arenite. Low pyrite. Clasts. (very hard, cherty quartz-arenite) quite abundant.					
78	80				TASMANITE OIL SHALE: Good grade. Typical appearance, moderate grade.	986757	(Handpicked drillcuttings).			
80	86				SILTSTONES: "Dirty", poorly sorted, hard. Surprisingly few clasts.					

823063

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River LV. No. EL 6/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 451140 E 5432130 N DRILLERS Exploration Drilling COMMENCED DEPTH HOLE No. RD81 MR31

RL COLLAR 22 m ASL INCLINATION -90° DRILL TYPE L R THOR COMPLETED CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	6				Rubble, soil and qz-arenite fragments.					
					Hole abandoned because of failure of water truck to reach site.					

823064

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450930 E 5432200 N DRILLERS Exploration Drilling COMMENCED 8 - 10 - 91 DEPTH 12 m HOLE No RD91 MR32

RL COLLAR 5 m ASL INCLINATION - 90° DRILL TYPE I.R. THOR COMPLETED 21 - 10 - 91 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	2				SOIL: Very rubbly					
2	12				ALLUVIUM: Coarse gravels and large boulders					
					Hole abandoned after 4 hours attempting to clear hole of falling gravel.					

823065

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 451090 E 5432535 N DRILLERS Exploration Drilling COMMENCED 20-10-81 DEPTH 107 m HOLE No RD81 MR33

RL COLLAR 14 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 22-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	2				SOILS: Mid-brown, sandy					
2	10				ALLUVIAL GRAVELS: Not extremely coarse, few large clasts					
10	40				ARGILLITES: Extremely soft blue grey mudstone. Sparingly micaceous. No pyrite (too weathered). Low degree of fissility. Infrequent clasts.					
40	56				QUARTZ-ARENITE/SILTSTONES: Fine grained, mid grey arenites and associated siltstones. Fairly hard. Well sorted.					
56	66				ARGILLITES: and siltstones, the latter being poorly sorted, almost gritty because of their content of small clasts. Extremely soft. Mid grey.					
66	71				ARGILLITE: Blue grey mudstone. Pyritic. Fairly hard.					
71	73				SILTY QZ-ARENITE: Midgrey, very soft. Poorly sorted.					
73	97				ARGILLITE: Mudstone, blue grey. Slightly pyritic. Fairly hard, occassional silty horizons.					
97	98				TASMANITE OIL SHALE: Low grade. Low proportion of cuttings suggests only a thin seam.	986814	(Hand sorted drill cuttings).			
98	107				ARGILLITIC CONGLOMERATE: mid to dark grey mudstone/siltstone matrix (itself poorly sorted having numerous small clasts) with frequent clasts of very hard, usually dark grey, quartz arenites.					

823066 SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450255 E 5432495 N DRILLERS Exploration Drilling COMMENCED 23-10-81 DEPTH 53 metres HOLE No. PD81 MR34

RL COLLAR 8 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 24-10-81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	4				ALLUVIUM: Very coarse alluvial gravels. Numerous very large clasts.					
4	52				ARGILLITE: Blue grey mudstone. Very uniform. Sparsely micaceous. Slightly fissile. Clasts very infrequent as are silt or qz-arenite interbeds.					
52	53				DOLERITE: Med-coarse grained. Very hard.					

823067

SHEET 1 OF 2

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450030 E 5430780 N DRILLERS Exploration Drilling COMMENCED 25 : 10 : 81 DEPTH 113m HOLE No. RD81 MR35

RL COLLAR 22 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 26 : 10 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	3				SUPERFICIAL DEBRIS: Dominantly road materials.					
3	13				ARGILLITES: Mid grey. Very highly weathered. Occassional siltstones and fine grained quartz arenite interbeds.					
±13	±14				BITUMINOUS COAL: Small fragments but very numerous. Hard.					
14	35				INTERBEDDED ARGILLITES-QUARTZ ARENITES: Mid grey and blue grey, somewhat silty mudstones interbedded with light mid-grey, fine and medium grained quartz arenites.					
35	37				?CONGLOMERATE: Extremely hard. Cuttings recovered are dominantly a very dark grey, extremely compact quartzite. Fine grained and well sorted. However, numerous fragments of obviously well rounded clasts of quartz-arenites also recovered.					
37	56				QUARTZ ARENITE: Medium-fine grained. Often moderately pyritic. Not well sorted. Slightly silty in places. Fairly hard.					
56	61				SILTSTONES: Mid grey. Slightly micaceous. Uniform.					
61	109				ARGILLITES: and minor siltstones. Blue grey mudstone and sub ordinate mid grey siltstones. Occassionally pyritic. Clasts very infrequent.					
109	113				QUARTZ-ARENITE: Very hard. Mid grey, fine grained (silty in parts). Occassional clasts of ? chert.					

823068

SHEET 2 OF 2

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River I.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450030 E 5430780 N DRILLERS Exploration Drilling COMMENCED 25:10:81 DEPTH 118m HOLE No RD81 MR35

RL COLLAR 22 m ASL INCLINATION -90° DRILL TYPE LR THGR COMPLETED 26:10:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
113	115				TASMANITE OIL SHALE: Lightish in colour. Distinct green tinge. High spore content.	986876	(Handpicked drill cuttings)			
115	118				SILTSTONES: Mid grey, generally poorly sorted.					

823069

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River LV. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450080 E 5429200 N DRILLERS Exploration Drilling COMMENCED 27 : 10 : 81 DEPTH 45 m HOLE No. RD81 MR36

RL COLLAR 40 m ASL INCLINATION - 90° DRILL TYPE LR IH60 COMPLETED 27 : 10 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	4				WEATHERED ARGILLITE: Buff brown clays.					
4	27				ARGILLITE: Blue-grey mudstone, slightly silty. Occassional clasts of qz-arenite. Mudstone only poorly fissile. Low mica. Occassional pyrite.					
27	37				INTERBEDDED ARGILLITE: Very soft mid grey, poorly sorted mudstone. QZ-ARENITE: Med grained, poorly sorted mid light grey greywacke. CONGLOMERATE: Thin, cherty, siliceous thoughout. Clasts are abundant throughout all interbeds, dominantly igneous and meta-igneous.					
37	45				QUARTZITE: Red-pink quartzite. Extremely compact and hard. Fine grained. Well sorted.					
					Hole stopped in pre - Permian basement.					

823070

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River LV. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 454380 E 5422890 N DRILLERS Exploration Drilling COMMENCED 28.10.81 DEPTH 94 metres HOLE No RD81 MR37

RL COLLAR 74 m ASL INCLINATION -90° DRILL TYPE LR THOR COMPLETED 28.10.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	12m				Clay and gravels. Yellow clay with very abundant clasts of qz and qz-arenite.					
12	35				QUARTZ-ARENITE: Mid grey, Fine-medium grained, sometimes silty. Fairly well sorted. Hard.					
35	80				ARGILLITES: Blue-grey silty mudstone. Slightly micaceous, pyritic. Occassional clasts and thin (0.5m) interbeds of mid grey quartz arenites.					
80	83				SILTSTONE: Mid grey, fine-medium grained siltstone/qz-arenite. Not well sorted. Distinctly harder than the overlying argillite.					
83	85				TASMANITE OIL SHALE: Typical greenish-bronze colouration. Appears to be quite rich , high spore content.	986943	(Hand picked drill cuttings)			
85	94				ARGILLITES: Mid grey, & blue grey silty mudstones.					

823071

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453440 E 5424925 N DRILLERS Exploration Drilling COMMENCED 10:11:81 DEPTH 8.5m HOLE No. RD81 MR38

RL COLLAR 80 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 10:11:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	2				ARGILLITE: Brown-ochre-yellow, highly weathered argillite					
2	5				ARGILLITE: Blue grey slightly silty mudstone					
7	8.5				TASMANITE OIL SHALE: Not particularly rich in spores. Typical slightly lustrous brown-greenish colouration.					
					Hole MR39 drilled adjacent to this hole in order to core the Tasmanite oil shale.					

823072

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 2

TENEMENT NAME Mersey River I.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453440 E 5424925 N DRILLERS Exploration Drilling COMMENCED 10:11:81 DEPTH 10.3 metres HOLE No RD81 MR39

RL COLLAR 80 m ASL INCLINATION -90° DRILL TYPE L.R. TH6R COMPLETED 10:11:81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ANDEI) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	2				ARGILLITE: Weathered. Brown-ochre-yellow clays.								
2	5				ARGILLITE: Blue grey argillite. Slightly micaceous. Poorly fissile.								
5	7.1				SILTY ARGILLITES: Mid grey, micaceous. Not very well sorted.								
7.10	7.72	0.42			TASMANITE OIL SHALE: (approx. 20cm lost at top of intersection). Typical brownish-green appearance. Spores very abundant; good grade. Very low specific gravity. Well foliated at ± 80°, with some minor convolution of the foliation. No noticeable pyrite. Spore content decreases at the boundary.	986656	7.10	7.72	0.42	22.26	1.52	76.22	237
7.72	8.02	0.30			SILT WITH TASMANITES SPORES: Basically mid grey silty argillite but with a low proportion of spores, usually only noticeable in a few, wavey interlaminae which have a higher proportion than the enclosing sediment. Occassional clasts: subrounded quartz and weathered quartz-arenite pebbles up to 0.7cms. Like the upper contact, the lower contact of this unit is gradational.	986657	7.72	8.02	0.30	7.95	1.34	90.71	47
8.02	8.43	0.41			TASMANITE OIL SHALE: Moderately good grade, not as rich in spores as the top portion of the seam. Clasts, with associated pyrite, up to 1cm and sub rounded are present but not abundant. Lower contact is gradational by a fairly rapid decrease downwards of spore content.	986658	8.02	8.43	0.41	18.38	5.38	76.24	127

823073 SHEET 2 OF 2

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453440 E 5424925 N DRILLERS Exploration Drilling COMMENCED 10 : 11 : 81 DEPTH 10.3 HOLE No RD81 MR39

RL COLLAR 80 m ASL INCLINATION - 90° DRILL TYPE I R TH60 COMPLETED 10 : 11 : 81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
8.43	9.80				SILTY ARGILLITE: Mid grey, Very poorly sorted. Abundant fragments and clasts 0.1 - 1.0 cm, dominantly sub angular in shape. Some disseminated pyrite is present, often somewhat more abundant around, in particular, argillite clasts. Significant core loss (lonly 67cm recovered).					
9.80	10.30				SILTY AGRILLITE: Not well sorted, much as above but distinquished by less frequent large (0.5cm) clasts. Pyrite is common, disseminated throughout the lithology.					

823074

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453325 E 5424795 N DRILLERS Exploration Drilling COMMENCED 10.11.81 DEPTH 5.5m HOLE No. RD81 MR40

RL COLLAR 83 m ASL INCLINATION - 90° DRILL TYPE L.R. TH60 COMPLETED 10.11.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	5				ARGILLITES: Highly weathered silty argillites . Buff ochre clays.					
5	5.5				TASMANITE OIL SHALE: Fairly soft and weathered.					
					Hole stopped to allow and ajacent hole MR41 to core the oil shale					

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

823075 SHEET 1 OF 2

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453325 E 5424795 N DRILLERS Exploration Drilling COMMENCED 10.11.81 DEPTH 7.5m HOLE No. RD81 MR41

RL COLLAR 83 m ASL INCLINATION -90° DRILL TYPE I.R. THG0 COMPLETED 10.11.81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	4.5				ARGILLITES: Highly weathered. Buff ochre-brown clays.								
4.50	5.15				SILTY ARGILLITE: Mid grey. Very soft. Poorly laminated. Zones of core loss, usually associated with (flanked by) zones with abundant clasts, most of which have been totally weathered out leaving a very careous rock. Traces of pyrite and also towards the base, Tasmanities spores.								
5.15	5.52	0.37			TASMANITE OIL SHALE: High spore content, good grade. Upper contact well defined, distinquished by soft sediment load casting of the oil shale by the overlying silt. Well foliated at ±90°. A few, thin (± 2mm) interlaminae of mid grey silt which is often pyritic though much of the pyrite is fairly oxidised. Lower contact is sharp.	986659	5.15	5.52	0.37	26.61	2.33	71.06	298
5.52	6.05	0.53			SILT WITH TASMANITIES SPORES: Very low grade "oil shale" A mid grey silt, well sorted, with fairly frequent thin interlaminae with a low-moderate spore content. Obviously rate of sedimentation exceeded spore production/deposition. Upper and lower contacts sharp. Few clasts.	986660	5.52	6.05	0.53	10.30	1.39	88.31	78
6.05	6.50	0.45			TASMANITE OIL SHALE: Very rich in spores in the upper 30 cms, decreasing spore content in the lower 15 cms to virtually nil. Clasts of quartz and quartz-arenite are fairly abundant in the uppermost 5cms, decreasing in frequency below that. Lower contact fairly sharp.	986661	6.05	6.50	0.48	11.79	0.87	87.34	167

823076

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453325 E 5424795 N DRILLERS Exploration Drilling COMMENCED 10.11.81 DEPTH 7.5m HOLE No. RD81MR41

RL COLLAR 83 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 10.11.81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
6.50	7.50				SILTY ARGILLITE: Very poorly sorted. Mid grey argillitic / silty matrix with numerous clasts to 2cms (qz, argillite and qz-arenite) and ubiquitous grit size angular fragments. Low pyrite content, disseminated and concentrated around clasts.					

823077

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453170 E 5424675 N DRILLERS Exploration Drilling COMMENCED 10: 11: 81 DEPTH 6.0 m HOLE No. RD81MR42

RL COLLAR 82 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 10: 11: 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	6				*SILTSTONES: and possibly fine quartz arenites. All highly weathered. Numerous quartzclasts, sub rounded, up to 2cms plus weathered argillite, arenite and igneous clasts. Dominantly ochre-brown clay.*					
					Hole collared in the Lower Spreyton succession, below the horizon of the Tasmanite oil shale. Hole abandoned.					

823078

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453415 E 5424490 N DRILLERS Exploration Drilling COMMENCED 10:11:81 DEPTH 9.0m HOLE No. RD81 MR43

RL COLLAR 85 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 10:11:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	6				SILTS AND ARGILLITES: Highly weathered. Yellow-ochre clays with quartz pebbles.					
6	7				TASMANITE OIL SHALE: Typical greenish brown colour. Low spore content.					
7	9				SILTSTONES: Blue-grey siltstones with clasts.					
					Hole stopped to allow coring of the oil shale in an adjacent hole, MR44.					

823079

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453415 E 5424490 N DRILLERS Exploration Drilling COMMENCED 10:11:81 DEPTH 8.0m HOLE No. RD81MR44

RL COLLAR 85 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 10:11:81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ANDEI) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	5				SILTY ARGILLITES: Weathered to buff-ochre clays.								
5.00	6.15				SILTY ARGILLITE: Highly weathered to buff-ochre clay. Occassional clasts, but virtually rotted away except for those which are quartz.								
6.15	7.25				TASMANITE OIL SHALE: Overall of good grade. Unusual in that there is no distinct low grade area splitting the horizon into two seams. However, the seam is subdivided by a downward decrease in spore content from the top to 6.91m at which point there is a sharp increase again in spore content, but this again decreases downwards to the lower contact.								
6.15	6.91	.76			Very high grade in the upper 20cms, but spore content then decreases progressively downwards. Very uniform apart from this spore content variation. Lower contact sharp.	986662	6.15	6.91	0.76	15.22	1.85	82.93	141
6.91	7.25	.34			Again rich in the upper parts, decreasing below that. Very similar to the "shale" above except that occassional clasts (qz, qz-arenite) are present. The lower most contact is very gradational through decreasing spore content.	986663	6.91	7.25	0.34	16.62	1.50	81.88	161
7.25	8.00				SILT: Very poorly sorted; abundant grit size, angular, fragments plus frequent large (to 1½cm) clasts of a variety of lithotypes, but dominatly quartz. Minor spore content in upper 10cms.								

823080

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453545 E 5424300 N DRILLERS Exploration Drilling COMMENCED 9 11 81 DEPTH 19.0 HOLE No. RD81MR45

RL COLLAR 78 m ASL INCLINATION - 90° DRILL TYPE L R TH60 COMPLETED 10 11 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	6				SILT AND ARGILLITES: Highly weathered to buff - brown ochre clays with occassional quartz clasts.					
6	10.5				ARGILLITE: Blue grey silty argillite. Not well sorted but large clasts not extremely frequent. Poorly laminated Sparsely micaceous and pyritic.					
10.5	19.0				ARGILLACEOUS CONGLOMERATE: Mid-dark grey silty argillite (poorly sorted) matrix with very numerous clasts, dominantly quartz. Some clasts up to 10cms evident.					
					Hole collared below the Tasmanite oil shale horizon.					

823081

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River 1V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453695 E 5424290 N DRILLERS Exploration Drilling COMMENCED \\ / \\ / 81 DEPTH \\.0 m HOLE No. RD81MR46

RL COLLAR 59 m ASL INCLINATION - 90° DRILL TYPE LR TH60 COMPLETED \\ / \\ / 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	8				SILTS: Highly weathered to brown-buff clays with frequent clasts of quartz.					
8	10				SILTS: As above but fresher. Mid grey, clasts still very weathered.					
10	11				CONGLOMERATE: Quartzose. Sandy matrix and dominantly quartz clasts.					
					Hole collared stratigraphically below the Tasmanite oil shale.					

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

823082 SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453800 E 5424430 N DRILLERS Exploration Drilling COMMENCED 11 : 11 : 81 DEPTH 7.0m HOLE No. RD81MR47

RL COLLAR 51 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED " CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	7				SILTS: Highly weathered silts and silty argillites with abundant quartz and weathered qz-arenite clasts. Buff-yellow in colour.					
					Hole collared stratigraphically below the Tasmanite oil shale horizon.					

823083 SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453810 E 5424545 N DRILLERS Exploration Drilling COMMENCED 11 : 11 : 81 DEPTH 12.0m HOLE No. RD81MR48

RL COLLAR 55 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 11 : 11 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	8				SILTS: Poorly sorted abundant clasts. Very highly weathered to buff-ochre sandy clays.					
8	12				SILTS: As above but fresher. Mid grey. Very poorly sorted often gritty (but with argillitic matrix).					
					Hole collared in the Lower Spreyton succession stratigraphically below the Tasmanite oil shale horizon.					

823084

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453580 E 5424590 N DRILLERS Exploration Drilling COMMENCED \\ \\ 81 DEPTH 8.0m \ 1.5m HOLE No. RD81MR49

RL COLLAR 76 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED " CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	3				SILTS: Highly weathered to buff-ochre clays.					
3	8				ARGILLITIC CONGLOMERATE: Mid grey poorly sorted silt matrix hosting abundant sub rounded clasts of quartz and pink, fine grained, quartzite.					
					Hole collared stratigraphically below the Tasmanite oil shale horizon.					

823085

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453470 E 5424630 N DRILLERS Exploration Drilling COMMENCED \\:\\:81 DEPTH 6.0m HOLE No. RD81MR50

RL COLLAR 87 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED \\:\\:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	2				ARGILLITE: Highly weathered to brown-ochre clays.					
2	5				ARGILLITE: Blue grey, mudstone and silts, the latter slightly lighter in colour. Few clasts.					
5	6				TASMANITE OIL SHALE: Typical appearance. Fairly rich in spores.					
					Hole stopped to allow redrill and coring of the oil shale at an adjacent site, MR51					

823086

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453470 E 5424630 N DRILLERS Exploration Drilling COMMENCED 11:11:81 DEPTH 7.50m HOLE No. RD81 MR51

RL COLLAR 87 m ASL INCLINATION -90° DRILL TYPE LR TH60 COMPLETED 11:11:81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ANDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	2				ARGILLITE: Weathered to buff-yellow-ochre clays.								
2	4.5				ARGILLITE: Blue grey silty mudstone.								
4.50	4.94				ARGILITE: Blue grey silty mudstone. Occassional clasts and soft sediment load casts (at interface of silt and mudstone laminae).								
4.94	5.15				QUARTZ-ARENITE: Light grey fine grained, well sorted. Very hard. Massive. Clast to 1cm of qz and qz-arenite, plus similarly sized nodules of pyrite. Upper and lower contacts are both sharp.								
5.15	5.84	0.69			TASMANITE OIL SHALE: Moderate to good grade at the top decreasing slightly in the lower half. Lower contact gradational by spore content decrease.	986664	5.15	5.84	0.69	9.64	2.18	78.18	219
5.84	6.13	0.29			SILT WITH TASMANITIES SPORES: Mid grey, well sorted siltstone with a low proportion of Tasmanities spores. One large (10cm) clast of a pyritised ? igneous lithotype. Lower contact sharp at 90°.	986665	5.84	6.13	0.29	9.89	2.38	83.73	22
6.13	6.47	0.34			TASMANITE OIL SHALE: Good grade. Surprisingly uniform No clasts and no pyrite. Upper and lower contacts sharp.	986666	6.13	6.47	0.34	16.61	0.94	83.45	122
6.47	7.50				ARGILLITE: Mid grey, slightly silty. No large clasts. Very soft. Low pyrite content.								
					Oil shale occurs between 5.15-6.47m with a low grade parting parting between 5.84-6.13								

823087

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453600 E 5425020 N DRILLERS Exploration Drilling COMMENCED \\ : \\ : 81 DEPTH 13.0 HOLE No. RD81 MR52

RL COLLAR 62 m ASL INCLINATION - 90° DRILL TYPE LR 1160 COMPLETED \\ : \\ : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	7				ARGILLITE: Highly weathered buff-ochre clays. Frequent quartz clasts.					
7	13				SILTS: Poorly sorted silts and argillites with numerous clasts, dominantly pink quartzites.					
					Hole is collared stratigraphically below the Tasmanite oil shale horizon.					

823088

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 453300 E 5424980 N DRILLERS Exploration Drilling COMMENCED 11:11:81 DEPTH 12.0m. HOLE No.

RL COLLAR 82 m ASL INCLINATION -90° DRILL TYPE L.R. THOR COMPLETED 11:11:81 CASING LEFT DPO No(s) RD81MR53

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	8				ARGILLITE: Highly weathered argillite with numerous clasts brown-ochre in colour.					
8	13				SILTS AND ARGILLITES: Weathered, numerous clasts, dominantly quartz and pink quartzite.					
					Hole is collared stratigraphically below the Tasmanite oil shale horizon.					

823089

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 453320 E 5424240 N DRILLERS Exploration Drilling COMMENCED 12 : 11 : 81 DEPTH 5.0m HOLE No RD81 MR54

RL COLLAR 68 m ASL INCLINATION - 90° DRILL TYPE LR TH60 COMPLETED 12 : 11 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	5				ARGILLITIC CONGLOMERATE: Highly weathered, argillitic matrix with very abundant clasts, dominatly qz and quartzite.					
					Hole is collared stratigraphically below the Tasmanite oil shale horizon.					

823090

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25,000

CO-ORDINATES 450480 E 5430325 N DRILLERS Exploration Drilling COMMENCED 12:11:81 DEPTH 344.0 HOLE No. RD81 MR55

RL COLLAR 40 m ASL INCLINATION -90° DRILL TYPE LR TH6R COMPLETED 12:11:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	7				ARGILLITE: Highly weathered. Ochre clays, slightly silty.					
7	20				SILTS AND QZ ARENITES: Mid grey silts and very fine grained qz arenites (poorly sorted - sub greywackes) Clasts, of qz and qz-arenite, weathered, are fairly common (up to 12cm) but abundant grit size clasts. Occassional shell fragments and thin chert horizons. Pyritic.					
20	30				SILTS: Mid grey, as above but not as coarse or as poorly sorted. Slight fining downwards.					
30	67				ARGILLITE: Mid grey-blue grey slightly silty mudstone. Micaceous, slightly pyritic. Clasts are present but not abundant.					
67	71				ARGILLITE: Blue-grey silty argillite much as above but slightly harder and less fissile.					
71	73				TASMANITE OIL SHALE: Good grade					
72	84				SILT: Poorly sorted silt. Numerous clasts.					

823091

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 1 OF 2

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450480 E 5430325 N DRILLERS Exploration Drilling COMMENCED 12·11·81 DEPTH 75.5 HOLE No. RD81 MR56

RL COLLAR 40 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 12·11·81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	7				ARGILLITE: Weathered. Ochre, yellow clay.								
7	20				SILTS: Mid grey silts & very fine quartz arenites.								
20	30				SILTS: Mid grey. Occassional clasts.								
30	66				ARGILLITE: Mid blue grey slightly silty mudstone								
66.0	69.50				ARGILLITE: Mid grey, slightly silty containing approx. 10% clasts. Matrix is farily well sorted, poorly laminated Angular, small (1mm) clasts are fairly frequent-generally quartz. More noticeable is the population of large (1-5cm) clasts which are generally well rounded and cover a wide range of lithotypes with dark grey argillite being most prominent. Also present are quartz and quartz arenite (often pyritic) and a variety of igneous clasts. Strong, but irregular fracturing, sometimes with calcareous coating on fracture surfaces. Possible core loss at lower end of run.								
69.50	70.15	0.65			TASMANITE OIL SHALE: (top of oil shale lost - possibly 20cm missing). Moderately good grade and uniform except for the lower 10cm within which the spore content falls off somewhat. Clasts, up to 1cm, well rounded are present but not frequent. Argillite clasts are the most numerous. Pyrite is often disseminated through or surrounding such clasts. Intersection angle of the oil shale foliation lamination is ± 45°. The oil shale is quite heavily fractured (perpendicular to foliation/lamination), often with calcite coating the fractures.	986667	69.50	70.15	0.65	30.13	1.91	67.96	280

823092

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES ..... E ..... N DRILLERS Exploration Drilling COMMENCED 13 : 11 : 81 DEPTH 75.5 HOLE No. RD81MR56

RL COLLAR ..... m ASL INCLINATION - 90° DRILL TYPE LR TH60 COMPLETED 13 : 11 : 81 CASING LEFT ..... DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
					Lower contact is lost in broken core, but a definate decrease in spore content is noticeable in the last recovered core.								
70.15	70.60				*ARGILLITE: Mid grey mudstone. Very soft, highly fractured Traces numbers of spores. Upper and lower contacts lost. Clasts present but are few and all small.*								
70.60	71.02	0.42			*TASMANITE OIL SHALE: Moderate grade. Generally very similar to the higher Tasmanite horizon. Clast type size and frequency as above, intersection angle ±45°. The lower 15cms is strongly brecciated - dilational brecciation with "rock flour" and calcite infilling (approx. 15%). Lower contact appears to be a fault plane, intersection angle of which is 45°, and which is coated with "dogs tooth" calcite.*	986668	70.60	71.02	0.42	22.65	4.84	72.51	141
71.02	72.12				*ARGILLITIC CONGLOMERATE: Mid grey. Matrix is a silty mudstone, not well sorted but not particularly "gritty" No spores visible. Very little pyrite except where associated with clasts. Massive. Clasts are in the 0.5 - 1cm range, well rounded and dominantly light grey, fine grained quartz-arenites. Other lithotypes:- chert, mudstone, quartz and grantie. Clasts tend to be concentrated in well defined zones. Contacts sharp: upper contact is probably a fault and has reticulate calcite veination associated. The lower contact may also be faulted. It intersects at 60° has calcite coatings and minor associated brecciation of the oil shale.*								

823093

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 3 OF 3

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES ..... E ..... N ..... DRILLERS Exploration Drilling ..... COMMENCED ..... DEPTH 75.5 HOLE No. RD81 MR56

RL COLLAR ..... m ASL ..... INCLINATION - 90° ..... DRILL TYPE LR THGR ..... COMPLETED ..... CASING LEFT ..... DPO No(s) 30390

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
72.12	72.50	0.30			TASMANITE OIL SHALE: Moderately good grade. Intersection angle of 45°. Abundant clasts (up to 15%) up to 1cm, dominantly angillite. Upper 2cms brecciated with calcite infilling. Lower contact very broken - no real indication of its nature.	986669	72.12	72.50	0.30	20.22	4.45	74.74	138
72.5	75.5				ARGILLITIC CONGLOMERATE: Matrix mid grey- very poorly sorted silty mudstone. Clasts not particularly abundant but much more angular than above. Highly fractured, with minor calcite veination.								

823094

SHEET 1 OF 1

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450980 E 5431410 N DRILLERS Exploration Drilling COMMENCED 9 : 11 : 81 DEPTH 57.0m HOLE No. RD81MR57

RL COLLAR 13 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 13 : 11 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	9				ALLUVIAL GRAVELS: Very coarse recent gravels.					
9	36				SILTS and fine 'dirty' quartz-arenites . Occassional thin shale horizons. Extensive contamination from the overlying gravels.					
36	67				ARGILLITE: Mid grey - blue grey slightly silty mudstones. Well sorted, slightly micaceous, poorly fissile. Clast frequency difficult to determine because of contamination.					
					Hole abandoned because of drilling problems. A nearby hole, drilled in ? 1940's, reported oil shale at 83m.					

823095

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 6/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450580 E 5431170 N DRILLERS Exploration Drilling COMMENCED 19 : 11 : 81 DEPTH 70.0m HOLE No. RD81 MR58

RL COLLAR 36 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 19 : 11 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	7				ARGILLITE: Highly weathered, buff- yellow clays.					
7	60				ARGILLITE: Very uniform blue grey mudstone. Fairly fissile. Slightly micaceous, traces of pyrite. Occassional silty horizons and/or clasts.					
60	62				ARGILLITE AND SILTS: As above but noticeable increase in proportion of mid grey, well sorted silts.					
62	69				SILTS: Mid grey, well sorted silts/very fine quartz arenites.					
69	70				TASMANITE OIL SHALE: Moderately good grade.					
					Hole stopped to allow a redrill (MR 59) to core the oil shale					

823096

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 3

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450580 E 5431170 N DRILLERS Exploration Drilling COMMENCED 20·11·81 DEPTH 72.5 HOLE No RD81MR59

RL COLLAR 36 m ASL INCLINATION -90° DRILL TYPE L.R. TH60 COMPLETED 20·11·81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ANDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	7				ARGILLITE: Highly weathered. Buff-yellow clays.								
7	60				ARGILLITE: Blue grey argillite. Uniform. Occassional silty horizons.								
60	68				SILTS: Mid grey, well sorted. Fine qz-arenite clasts/ interbeds.								
68.20	69.13				ARGILLITE CONGLOMERATE: Mid grey silty matrix hosting bands of well rounded clasts (0.5 - 5cms) of hard quartzites grits, fine grained quartz-arenites, dark grey argillite plus brachiopod shells. The matrix is, in parts, slightly gritty, but is generally not too badly sorted. Zones up to 30 cms of low clast frequency show a poorly developed lamination in the silt which is non-fissile. The base of of the unit is distinctly less well sorted, having a higher proportion of small (2-3mm), argular clasts within the silty matrix. Pyrite associated with clasts. Slight load casting into the underlying shale.								
69.13	69.38	0.25			CONGLOMERATIC TASMANITE OIL SHALE: Very similar to the horizon above but the silt matrix holds a low - moderate proportion of Tasmanities spores. Better developed lamination as a result of the spore content (90°). Lower contact is extremely sharp at 90°.	986670	69.13	69.38	0.25	10.34	0.67	88.99	35

823097

SHEET 2 OF 3

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. EL 4/7

PLAN – MAP REFERENCE 1 : 25 000.

CO-ORDINATES 450580 E 5431170 N DRILLERS Exploration Drilling COMMENCED 20.11.81 DEPTH 72.5 HOLE No. MR59

RL COLLAR 36 m ASL INCLINATION - 90° DRILL TYPE L.R. TH60 COMPLETED 20.11.81 CASING LEFT DPO No(s) 30.301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
69.38	69.89	0.51			TASMANITE OIL SHALE: Good grade. Uniform, well laminated at approx. 90°. Well rounded clasts, generally ± 1cm form less than 5% of the unit. Compaction deformation of the laminae around these clasts is well displayed. Lower contact is slightly diffuse over 1cm by decrease in spore content.	986671	69.38	69.89	0.51	33.11	40.1	66.91	301
69.89	70.37	0.48			SILT: with low (5-10%) proportion of Tasmanities spores. Basically a mid grey silt/silty mudstone with occassional clasts. Spores concentrated in discrete laminae (90°). Spore content is slightly higher in the upper and lower contact areas. The lower 5cms is conglomeratic, having very abundant clasts (0.5 - 2.5 cms) of many lithotypes, generally subrounded and often pyritic. The spore content of the matrix in this lower 5cm is high but the proportion of the matrix is low. The lower contact is sharp, the clasts stop abruptly whilst the rich matrix persists downwards.	986672	69.89	70.37	0.48	10.95	0.99	88.08	42
70.37	70.78	0.41			TASMANITE OIL SHALE: Moderately good grade. Clasts present, slightly smaller and less well rounded and more abundant than in the upper seam. Frequency of clasts increases downwards. Lower contact is gradational by downward decrease in spore content.	986673	70.37	70.78	0.41	20.34	< 0.1	79.96	154
70.78	70.95				ARGILLITE: Poorly sorted, especially towards the base, with a low proportion of Tasmanities spores. Clasts in the 2-3mm range are fairly abundant and tend to be subangular. Lower contact fairly sharp.	986674	70.78	70.95	0.17	8.48	0.86	90.66	13

823098

SHEET 3 OF 3

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450580 E 5431170 N DRILLERS Exploration Drilling COMMENCED 20:11:81 DEPTH 72.5 HOLE No. MR59

RL COLLAR 36 m ASL INCLINATION -90° DRILL TYPE L R THOR COMPLETED 20:11:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
70.95	72.5				SILT: Very poorly sorted. Conglomeratic in parts. Clasts 0.3-10cms, dominantly quartz arenites and igneous lithotypes Matrix is fairly massive, midgrey silt. Traces pyrite.					

823099

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 2

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 451860 E 5431970 N DRILLERS Exploration Drilling COMMENCED 21-11-81 DEPTH 82.0 HOLE No. MR60

RL COLLAR 31 m ASL INCLINATION -90° DRILL TYPE L.R. TH60 COMPLETED 21-11-81 CASING LEFT DPO No(s) 39391

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	20				QUARTZ - ARENITES: Highly weathered in upper 8m. Silty midgrey, fine grained poorly sorted sub greywackes.								
20	74				ARGILLITE: Blue grey mudstones often silty.								
74	78.75				SILTSTONES: Mid grey not well sorted.								
78.75	78.99	0.24			TASMANITE OIL SHALE: Top 7cm of core lost - probably oil shale therefore top contact assumed to be approx.78.75 Moderately good grade. Abundant (10%) clasts, sub angular-subrounded, up to 2cms. Foliation (90°), deformed around clasts. Quartz-arenite and granites form majority of the clasts and are often pyritic. Lower contact sharp.	986675	78.75	78.99	0.24	16.38	1.66	81.97	113
78.99	79.13	0.14			SILTSTONE: With abundant small (0.5cm) quartz, chert and quartzite clasts plus approx. 10% Tasmanities spores. Poorly laminated at 90°. Pyritic in and around clasts. Upper and lower contacts sharp.	986676	78.99	79.13	0.14	10.49	0.73	88.79	50
79.13	79.67				TASMANITE OIL SHALE: Moderately good grade. Clasts present, more abundant in the upper half of the seam, which includes a 1cm band of conglomerate at 79.17m. Generally however, the clasts are isolated, subround and usually ±1cm. Foliation is at 90°. Spore content decreases rapidly in the lower 15cms. The lower contact is gradational.	986677	79.13	79.67	0.54	21.45	0.62	77.93	193
79.67	79.95				SILTSTONE: Mid grey, poorly laminated, generally well sorted except for occassional small (1-3mm) clasts usually in discrete 3-4mm bands. Micaceous, slightly pyritic. Spore content 5%. Lower contact sharp	986678	79.67	79.95	0.28	8.39	1.24	90.37	15

823100

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 451860 E 5431970 N DRILLERS Exploration Drilling COMMENCED 21 11 81 DEPTH 82.0 HOLE No. MR60

RL COLLAR 31 m ASL INCLINATION -90° DRILL TYPE I.R. TH6A COMPLETED 21 11 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
79.95	80.35	0.40			TASMANITE OIL SHALE: Moderate good grade. Very similar to the upper oil shale seam except that the clasts are generally smaller (approx. 0.5cm). Whilst the upper contact is sharp, the lower is gradational over 5cm.	986679	79.95	80.35	0.40	21.88	11.29	36.94	155
80.35	81.75				SILTSTONE with clasts. Upper 5cm has a low spore content (± 5%). Mid grey, generally massive siltstone. Not poorly sorted except for a) isolated subrounded clasts to 1cm of quartz, quartzite etc. b) thin laminae (±0.3cm) containing small (1mm) angular clasts. Minor calcite veination. Slight tendency to downward coarsening overall.								

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

823101 SHEET 1 OF 2

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 451500 E 5431650 N DRILLERS Exploration Drilling COMMENCED 22 11 81 DEPTH 38.3 HOLE No. MR61

RL COLLAR 27 m ASL INCLINATION - 90° DRILL TYPE L R TH60 COMPLETED 22 11 81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	10				ALLUVIAL GRAVELS: Not coarse.								
10	28				ARGILLITES: Blue grey mudstones. Micaceous. Occassional siltbands, clasts fairly infrequent.								
28	35.3				SILTSTONES: Mid grey, fairly well sorted. Lighten and coarsen slightly downwards. Clasts fairly frequent-dominatly quartz-arenite.								
35.3	36.34				SILTSTONES: Mid grey, not particularly well sorted, abundant clasts, up to 3cm, but concentrated in narrow bands at irregular intervals. Clasts are rounded and often slightly pyritic and are of several lithotypes but dominantly quartz arenite. The lower contact is marked by a 3cm band of small, rounded clasts which have deformed the laminae of the underlying oil shale.								
36.34	37.07	0.73			TASMANITE OIL SHALE: Split by a virtually barren zone between 36.48-36.67. Above this is moderate grade oil shale (i.e. 36.34 - 36.48) with a few clasts. most noticeable at the top. The "barren" zone is much the same as the oil shale except that it has a very low spore content and an increase in small, angular clasts (often chert) with traces of pyrite. The contacts of this low grade zone are fairly sharp. Beneath low grade zone, (36.67-37.07) is moderate grade grade Tasmanite Oil Shale. Clasts not abundant. Lower contact is gradational through decrease in spore content.	986680	36.34	37.07	0.73	10.25	0.15	89.60	155

823102

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 2 OF 2

TENEMENT NAME Mersey River JV. No. EL 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 451500 E 5431650 N DRILLERS Exploration Drilling COMMENCED 22 · 11 · 81 DEPTH 38.3m HOLE No. MR61

RL COLLAR 27 m ASL INCLINATION - 90° DRILL TYPE LR 1H60 COMPLETED 22 · 11 · 81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
37.07	37.57	0.50			SILTSTONE: Mid grey, basically the same as the overlying oil shale but with only ± 5% spores. Poorly laminated (90°). Occassional, isolated clasts to 1cm except base of unit where there is a 2cm band with abundant clasts.	986681	37.07	37.57	0.50	11.07	1.09	87.84	48
37.57	38.09	0.52			TASMANITE OIL SHALE: Low to moderate grade. Isolated clasts, rounded 0.5 - 2cms, dominantly quartz arenite 37.79-37.84 a 5cm band of darker grey siltstone well laminated, with very few Tasmanities spores and hosting, towards its base a 2mm thick disrubted lamina of calcareous material. Contacts of this band are sharp. The lower contact of the oil shale is gradual over a few centimetres by decreasing spore content.	986682	37.57	38.09	.52	19.33	0.61	80.06	
38.09	38.30				SILTSTONE: Mid grey. The upper 5cm has a very low spore content rapidly decreasing downwards. The silt is fairly well sorted but does have quite a few clasts, but generally isolated. Micaceous, traces of pyrite.								

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

823103 SHEET 1 OF 1

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 450160 E 5431090 N DRILLERS Exploration Drilling COMMENCED 22:11:81 DEPTH 24.0m HOLE No. RD81MR62

RL COLLAR 22 m ASL INCLINATION -90° DRILL TYPE LR THOR COMPLETED 22:11:81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	2				CLAYS: Weathered argillite and soil.					
2	19				ARGILLITE: Blue grey mudstone and monor siltstones.					
19	22				SILTSTONES: Mid grey, poorly sorted. Clasts fairly frequent.					
22	24				TASMANITE OIL SHALE: Moderately good grade.					

823104 SHEET 1 OF 2

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450160 E 5431090 N DRILLERS Exploration Drilling COMMENCED 22 · 11 · 81 DEPTH 24.9m HOLE No. RD81MR63

RL COLLAR 22 m ASL INCLINATION - 90° DRILL TYPE I.R. TH60 COMPLETED 23 · 11 · 81 CASING LEFT DPO No(s) 3830\

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
20.90	22.20				SILTSTONE: With abundant clasts - almost an argillitic conglomerate. Mid grey. Not well sorted, clasts are sub-angular - subrounded, 1-2cm. Chert clast type is quartz arenite. Traces of pyrite and calcite associated with clasts. Lower contact is sharp at 90°.								
22.20	22.46	0.26			TASMANITE OIL SHALE: With abundant clasts. Basically very similar to the overlying silt but with a fairly high proportion of Tasmanities spores. Some pyrite associated with the clasts.	986683	22.20	22.46	0.20	12.33	0.78	86.99	27
22.46	23.14	0.68			TASMANITE OIL SHALE: Moderate grade. Fairly uniform. Clasts not abundant - include a large brachiopod shell. The clasts are surprisingly angular. Lamination/foliation at 90°, distorted around clasts - with pyrite occupying the pressure shadows. Lower contact is gradational.	986684	22.46	23.14	0.68	27.95	0.84	71.22	252
23.14	23.43	0.29			SILTSTONE: Basically same as the overlying oil shale but with only a very low spore content. Clast frequency as above. Lower contact is marked by a line of clasts (pyritic).	986685	23.14	23.43	0.29	8.94	0.68	90.38	29
23.43	23.84	0.41			TASMANITE OIL SHALE: Moderate grade. Clasts frequent and very poorly sorted. Noticeable content of small 0.5 - 1.5mm clasts (chert and quartz), not usually seen in the oil shale. At 23.84m is a 1cm band of small clasts below which the grade of the oil shale (i.e. spore content) rapidly decreases to nil.	986686	23.43	23.84	0.41	17.45	2.17	80.38	252

823105

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 2 OF 2

TENEMENT NAME Mersey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1:25,000

CO-ORDINATES 450160 E 5431090 N DRILLERS Exploration Drilling COMMENCED 22 11 81 DEPTH 24.9 m HOLE No. RD81 MR63

RL COLLAR 22 m ASL INCLINATION - 90° DRILL TYPE L.R. IH60 COMPLETED 23 11 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
23.84	24.90				SILTSTONE: Poorly sorted, mid grey. Clasts are abundant and totally unsorted. The upper 10cms has a very low (5%) content of Tasmanities spores. Very poorly laminated. Traces of pyrite associated with clasts.					

823106

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

SHEET 1 OF 1

TENEMENT NAME Mersey River LV. No. EL 6/74

PLAN – MAP REFERENCE 1 : 25 000

CO-ORDINATES 450225 E 5431435 N DRILLERS Exploration Drilling COMMENCED 23 : 11 : 81 DEPTH 53.0m HOLE No. RD81MR64

RL COLLAR ±15 m ASL INCLINATION - 90° DRILL TYPE LR TMR COMPLETED 23 : 11 : 81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by.....)
0	2				CLAY: Soil and road rubble.					
2	40				ARGILLITE: and silts, the latter being mid grey and increasing in frequency with depth. The argillites are blue grey and mid grey mudstones, micaceous, occassionally pyritic.					
40	52				SILTSTONES: Mid grey. Well sorted. Unusually few clasts.					
52	53				TASMANITE OIL SHALE: Very good grade.					
					Hole abandoned to allow redrill, MR65, to core the Tasmanite oil shale.					

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

823107 SHEET 1 OF 2

TENEMENT NAME Massey River J.V. No. EL 4/74

PLAN – MAP REFERENCE 1:25,000

CO-ORDINATES 450225 E 5431435 N DRILLERS Exploration Drilling COMMENCED 23 11 81 DEPTH 53.9 m HOLE No. RD81MR65

RL COLLAR ±15 m ASL INCLINATION - 90° DRILL TYPE LR IH60 COMPLETED 23 11 81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by ANDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
0	2				Rubble, clay, road materials.								
2	40				ARGILLITE: Blue grey argillite with some mid grey silts, the latter increasing in frequency with depth.								
40	50.8				SILTSTONES: Mid grey, fairly well sorted. Very few clasts.								
50.8	51.37	0.47			TASMANITE OIL SHALE: Approx. 10cms lost at top of coring run therefore upper contact inprecise. Good grade oil shale, abundant Tasmanities spores, very low relative density. Typical greenish-brown appearance, well developed lamination/ foliation as a result of the discoidal nature of the spores (90°). Very few clasts, those which are present are ± 1cm subrounded and usually quartz-arenite or chert. The lower contact is gradational by spore content decrease.	986687	50.8	51.37	0.47	28.40	1.28	70.32	252
51.37	51.81	0.44			SILTSTONE: With low (5-10%) spore content. Basically very similar to the overlying oil shale seam but with less Tasmanities spores. Mid grey, well sorted except for occassional 1cm subrounded chert or arenite clasts. Base of the siltstone is marked by a 2cm band rich in such clasts.	986688	51.37	51.81	0.44	9.92	0.45	89.63	45
51.81	52.04	0.23			TASMANITE OIL SHALE: Moderate to good grade, less well sorted than the upper seam, having a noticeable population of small (0.1 - 0.5 cm), angular - subrounded clasts, principally of quartz or chert in addition to the usual population of larger better rounded arenite clasts. Well laminated at 90°. Lower contact is gradational through downward decreasing spore content.	986689	51.81	52.04	0.23	18.90	1.82	79.28	125

823108

C.R.A. EXPLORATION PTY. LIMITED

DRILL CORE LOG

SHEET 2 OF 2

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25,000

CO-ORDINATES 450225 E 5431435 N DRILLERS Exploration Drilling COMMENCED 23 11 81 DEPTH 53.9m HOLE No. RD81MR65

RL COLLAR ±15 m ASL INCLINATION -90° DRILL TYPE LR IMA COMPLETED 23 11 81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To (M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
52.04	52.23	0.19			SILTSTONE: plus a low (5%) spore content. Mid grey, fairly well sorted. Spore content is greatest at top (±5%) and decreases with depth. Poorly laminated. Lower contact is conglomeratic and marks the downward extent of visible spores.	986690	52.04	52.23	0.19	9.48	0.50	90.02	20
52.23	53.90				SILTSTONES/argillitic conglomerate. Fairly poorly sorted siltstones with abundant clasts, frequently concentrated in narrow zones as well as bieng distributed throughout. Silt is gritty in parts and is generally massive.								

823109

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River I.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25,000

CO-ORDINATES 451110 E 5431260 N DRILLERS Exploration Drilling COMMENCED 24·11·81 DEPTH 68.0 HOLE No. RD81MR66

RL COLLAR 12 m ASL INCLINATION -90° DRILL TYPE L.R. Tiger COMPLETED 24·11·81 CASING LEFT DPO No(s)

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by)
0	4				CLAYS - dark brown clays (exargillite) with quartz and quartz arenite rubble plus ome alluvial pebbles.					
4	14				SILTSOTNES: Mid and light grey siltstone very fine quartz arenties. Not very well sorted. Micaceous, traces of pyrite visible.					
14	24				ARGILLITES AND SILTSTONES: Interbedded mid grey silts and blue grey mudstones.					
24	44				ARGILLITE: Blue grey, sparingly micaceous mudstone. Non fissile. Very few clasts noticeable.					
44	53				SILTSTONES: Light - mid grey. Reasonably well sorted but with frequent large clasts, most noticeable being of chert.					
53.0	58.53				ARGILLITE: Blue grey mudstone, poorly fissile. Micaceous 90° lamination. Clasts infrequent, size range 0.5-2cms rounded generally quartz-arenite. No visible pyrite. Fragments of brach shell.					
58.53	60.03				ARGILLITE: Mid grey, - blue grey. Distinctly more clasts, poorly rounded, 0.1 - 2cms. Traces pyrite. Some calcite veination.					
60.03	64.8				SILTSTONE: Mid grey. Not well sorted. Numerous clasts (dominantly arenites and cherts).					

823110

SHEET 2 OF 2

C.R.A. EXPLORATION PTY. LIMITED
DRILL CORE LOG

TENEMENT NAME Mersey River J.V. No. E.L. 4/74

PLAN – MAP REFERENCE 1:25 000

CO-ORDINATES 451110 E 5431260 N DRILLERS Exploration Drilling COMMENCED 24·11·81 DEPTH 68. HOLE No. RD81MR66

RL COLLAR 12 m ASL INCLINATION -90° DRILL TYPE I.R. TH60 COMPLETED 24·11·81 CASING LEFT DPO No(s) 30301

DEPTH From (M)	DEPTH To(M)	Core Rec. (M)	Core Size	Graphic Log	CORE DESCRIPTION	Sample No.	From (M)	To (M)	Rec (M)	ASSAY VALUES (Analysed by AMDEL) PROXIMATE ANALYSIS (DRY) Volatiles %	Fixed C %	Ash %	OIL YIELD L/Tonne
64.8	65.39	0.39			TASMANITE OIL SHALE: Typical appearance. Moderately rich in spores. Occassional arenite and argillite clasts. Lower contact gradational.	986691	64.8	65.39	0.39	28.12	1.13	70.75	253
65.39	65.85	0.46			SILTSTONE: + low spore content. Lower contact sharp, marked by clast rich horizon.	986692	65.39	65.85	0.46	9.35	0.47	90.18	33
65.85	66.32	0.47			TASMANITE OIL SHALE: As upper seam but clasts much more numerous. Slightly lower spore content. Lower contact gradational.	986693	65.85	66.32	0.47	20.39	1.97	77.64	156
66.32	67.97				SILTSTONE: Typical mid grey - blue grey. Well sorted siltstone. Occassional clasts increasing in frequency downwards.								

APPENDIX 4

ANALYSES OF TASMANITE OIL SHALE

SUMMARY OF TASMANITE INTERSECTIONS, PROXIMATE ANALYSES, OIL YIELDS AND COMPOSITE OIL YIELDS.

Hole No.	Sample No.	From (m)	To (m)	Length (m)	PROXIMATE ANALYSIS (Dry) Volatiles %	Fixed C %	Ash %	Oil Yield L/Tonne	Composite Oil Yield
MR 2	986303	17.74	18.40	0.66	10.96	13.23	75.81	165	
"	986304	18.40	18.55	0.15	8.28	5.04	86.69	4	1.19m @ 140 L/tonne
"	986305	18.55	18.93	0.38	23.22	0.69	76.08	151	
"	986306	18.93	19.03	0.10	8.12	0.92	90.96	12	
MR 5	986307	20.96	21.70	0.74	19.82	0.74	79.44	160	
"	986308	21.70	21.80	0.10	7.90	0.51	91.59	15	1.22m @ 168 L/tonne
"	986309	21.80	22.18	0.38	23.06	0.70	76.24	226	
"	986310	22.18	22.30	0.12	9.04	0.65	90.30	18	1.34m @ 155 L/tonne
MR 7	986300	17.80	18.53	0.73	17.19	2.28	80.54	144	
"	986301	18.53	18.60	0.07	5.16	2.11	92.72	0	1.63m @ 109 L/tonne
	986302	19.00	19.43	0.43	26.05	2.21	71.74	170	(Assuming last core yielded 0 L/tonne).
MR 10	986434	4.50	4.77	0.27	33.76	< 0.1	66.64	297	
"	986435	4.77	4.97	0.20	15.76	3.40	80.83	156	1.05m @ 170 L/tonne
"	986436	4.97	5.20	0.23	8.16	1.12	90.71	18	
"	986437	5.20	5.55	0.35	21.82	1.06	77.12	182	
MR 28	986651	26.93	27.18	0.25	10.26	0.75	88.99	27	
"	986652	27.18	27.44	0.26	15.18	0.92	83.89	102	1.98m @ 128 L/tonne
"	986653	27.44	27.95	0.51	35.50	1.75	62.75	240	
"	986654	27.95	28.32	0.37	9.84	0.56	89.60	23	1.73m @ 142 L/tonne
"	986655	28.32	28.91	0.59	22.83	4.19	72.98	152	

Hole No.	Sample No.	From (m)	(To (m)	Length (m)	PROXIMATE ANALYSIS (Dry) % Volatiles	% Fixed C	% Ash	Oil Yield L/tonne	Composite Oil Yield
MR 39	986656	7.10	7.72	0.62	22.26	1.52	76.22	237	
"	986657	7.72	8.02	0.30	7.95	1.34	90.71	47	1.33m @ 160 L/tonne
"	986658	8.02	8.43	0.41	18.28	5.38	76.24	127	
MR 41	986659	5.15	5.52	0.37	26.61	2.33	71.06	298	
"	986660	5.52	6.05	0.53	10.30	1.39	88.31	78	1.35m @ 147 L/tonne
"	986661	6.05	6.50	0.45	11.79	0.87	87.24	107	
MR 44	986662	6.15	6.91	0.76	15.22	1.85	82.93	141	1.10m @ 144 L/tonne
"	986663	6.91	7.25	0.34	16.62	1.50	81.88	151	
MR 51	986664	5.15	5.84	0.69	19.64	2.18	78.18	219	
"	986665	5.84	6.13	0.29	9.89	2.38	87.73	22	1.32m @ 150 L/tonne
"	986666	6.13	6.47	0.34	15.16	0.94	83.45	122	
MR 56	986667	69.50	70.15	0.65	30.13	1.91	67.96	280	
"		70.15	70.60	0.45	BARREN-NOT SAMPLED				Repetition of Tasmanite Horizon by Faulting Compositing of Intersections Not Valid
	986668	70.60	71.02	0.42	22.65	4.84	72.51	141	
	-	71.02	72.12	1.10	BARREN-NOT SAMPLED				
	986669	72.12	72.50	0.38	20.82	4.45	74.74	122	
MR 59	986670	69.13	69.38	0.25	10.54	0.67	88.79	35	
"	987771	69.38	69.89	0.51	33.11	< 0.1	66.91	301	1.82m @ 136 L/tonne
"	986672	69.89	70.37	0.48	10.95	0.97	88.08	42	
"	986673	70.37	70.78	0.41	20.34	< 0.1	79.96	154	1.40m @ 169 L/tonne
"	986674	70.78	70.95	0.17	8.48	0.86	90.66	13	

Hole No.	Sample No.	From (m)	To (m)	Length (m)	PROXIMATE ANALYSIS (Dry) Volatiles %	Fixed C %	Ash %	Oil Yield L/tonne	Composite Oil Yield
MR 60	986675	78.75	78.99	0.24	16.38	1.66	81.97	113	
"	987776	78.99	79.13	0.14	10.49	0.73	88.97	50	
"	986677	79.13	79.67	0.54	21.45	0.62	77.93	153	1.60m @ 114 L/tonne
"	986678	79.67	79.95	0.28	8.39	1.24	90.37	15	
"	986679	79.95	80.35	0.40	21.88	1.29	76.84	155	
MR 61	986680	36.34	37.07	0.73	20.25	0.15	79.60	155	
"	986681	37.07	37.57	0.50	11.07	1.09	87.84	48	1.23m @ 111L/tonne
"	986682	37.57	38.09	0.52	19.33	0.61	80.05	Not available	(Incomplete)
MR 63	986683	22.20	22.46	0.26	12.23	0.78	86.99	27	
"	986684	22.46	23.14	0.68	27.95	0.84	71.22	252	1.64m @ 177 L/tonne
"	986685	23.14	23.43	0.29	8.94	0.68	90.38	29	
"	986686	23.43	23.84	0.41	17.45	2.17	80.38	252	1.38m @ 205 L/tonne
MR 65	986687	50.80	51.37	0.57	28.40	1.28	70.32	252	
"	986688	51.37	51.81	0.44	9.92	0.45	89.63	45	1.43m @ 137 L/tonne
"	986689	51.81	52.04	0.23	18.80	1.82	79.38	125	
"	986690	52.04	52.23	0.19	9.48	0.50	90.02	20	1.24m @ 155 L/tonne
MR 66	986691	64.80	65.39	0.59	28.12	1.13	70.95	253	
	986692	65.39	65.85	0.46	9.35	0.47	90.18	33	1.52m @ 156 L/tonne
	986693	65.85	66.32	0.47	20.39	1.97	77.64	156	

(All Determinations are by AMDEL. Oil Yields are Fischer Estimates.)

823115

KEY:		
Hole No.	MR 7	
Sample Interval (m)	17.80 - 18.53	
Recovery (m)	(0.73)	

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 1

PROXIMATE COAL ANALYSIS CODE 51 RESULTS IN PERCENTAGES

	MR 7 17.80 - 18.53 (0.73)	MR 7 18.53 - 18.60 (0.06)	MR 7 19.00 - 19.43 (0.43)
	986300	986301	986302
SAMPLE AS RECEIVED			
Moisture	1.03	0.27	7.37
Volatile Matter	17.01	5.15	24.13
Fixed Carbon	2.25	2.11	2.05
Ash	79.70	92.47	66.45
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	17.19	5.16	26.05
Fixed Carbon	2.28	2.11	2.21
Ash	80.54	92.72	71.74
	100.00	100.00	100.00

	MR 2 17.74 - 18.40 (0.66)	MR 2 18.40 - 18.55 (0.15)	MR 2 18.55 - 18.93 (0.38)
	986303	986304	986305
SAMPLE AS RECEIVED			
Moisture	0.82	0.65	0.75
Volatile Matter	10.87	8.22	23.05
Fixed Carbon	13.12	5.00	0.69
Ash	75.19	86.12	75.51
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	10.96	8.28	23.22
Fixed Carbon	13.23	5.04	0.69
Ash	75.81	86.69	76.08
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 2

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 2 *18.93 - 19.03* *(0.10)*	*MR 5* *20.96 - 21.70* *(0.74)*	*MR 5* *21.70 - 21.80* *(0.10)*
	986306	986307	986308
SAMPLE AS RECEIVED			
Moisture	0.79	0.88	0.70
Volatile Matter	8.06	19.65	7.84
Fixed Carbon	0.91	0.73	0.51
Ash	90.24	78.74	90.95
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	8.12	19.82	7.90
Fixed Carbon	0.92	0.74	0.51
Ash	90.96	79.44	91.59
	100.00	100.00	100.00

	MR 5 *21.80 - 22.18* *(0.28)*	*MR 5* *22.18 - 22.30* *(0.12)*	*MR 10* *4.50 - 4.77* *(0.27)*
	986309	986310	986434
SAMPLE AS RECEIVED			
Moisture	0.76	0.79	0.65
Volatile Matter	22.88	8.97	33.55
Fixed Carbon	0.69	0.65	*<0.1*
Ash	75.67	89.59	66.21
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	23.06	9.04	33.76
Fixed Carbon	0.70	0.65	*<0.1*
Ash	76.24	90.30	66.64
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 3

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 10 4.77 - 4.97 (0.20)	*MR 10 4.97 - 5.20 (0.20)*	*MR 10 5.20 - 5.55 (0.35)*
	986435	986436	986437
SAMPLE AS RECEIVED			
Moisture	1.10	0.94	0.63
Volatile Matter	15.59	8.08	21.68
Fixed Carbon	3.37	1.12	1.05
Ash	79.95	89.86	76.64
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	15.76	8.16	21.82
Fixed Carbon	3.40	1.13	1.06
Ash	80.83	90.71	77.12
	100.00	100.00	100.00

	MR 28 26.93-27.18 (0.25)	*MR 28 27.18-27.44 (o.20)*	*MR 28 27.44-27.95 (0.51)*
	986651	986652	986653
SAMPLE AS RECEIVED			
Moisture	0.52	0.70	0.53
Volatile Matter	10.21	15.08	35.31
Fixed Carbon	0.75	0.92	1.74
Ash	88.52	83.30	62.42
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	10.26	15.18	35.50
Fixed Carbon	0.75	0.92	1.75
Ash	88.99	83.89	62.75
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 4

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 28 *27.95-28.32* *(0.37)*	*MR 28* *28.32-28.91* *(0.59)*	*MR 39* *7.10-7.72* *(0.42)*
	986654	986655	986656
SAMPLE AS RECEIVED			
Moisture	0.76	0.55	0.98
Volatile Matter	9.76	22.70	22.06
Fixed Carbon	0.56	4.17	1.51
Ash	88.91	72.58	75.55
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	9.84	22.83	22.26
Fixed Carbon	0.56	4.19	1.52
Ash	89.60	72.98	76.22
	100.00	100.00	100.00

	MR 39 *7.72-8.02* *(0.30)*	*MR 39* *8.02-8.43* *(0.41)*	*MR41* *5.15-5.52* *(0.37)*
	986657	986658	986659
SAMPLE AS RECEIVED			
Moisture	0.77	0.74	0.73
Volatile Matter	7.89	18.25	26.42
Fixed Carbon	1.33	5.34	2.31
Ash	90.01	75.68	70.54
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	7.95	18.38	26.61
Fixed Carbon	1.34	5.38	2.33
Ash	90.71	76.24	71.06
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 5

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 41 *5.52-6.05* *(0.53)*	*MR 41* *6.05-6.50* *(0.45)*	*MR 44* *6.15-6.91* *(0.76)*
	986660	986661	986662
SAMPLE AS RECEIVED			
Moisture	1.03	1.00	0.76
Volatile Matter	10.20	11.67	15.10
Fixed Carbon	1.38	0.86	1.84
Ash	87.40	86.47	82.30
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	10.30	11.79	15.22
Fixed Carbon	1.39	0.87	1.85
Ash	88.31	87.34	82.93
	100.00	100.00	100.00

	MR 44 *6.91-7.25* *(0.34)*	*MR 51* *5.15-5.84* *(0.69)*	*MR 51* *5.84-6.13* *(0.29)*
	986663	986664	986665
SAMPLE AS RECEIVED			
Moisture	0.74	0.80	1.29
Volatile Matter	16.49	19.48	9.76
Fixed Carbon	1.49	2.17	2.35
Ash	81.28	77.55	86.59
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	16.62	19.64	9.89
Fixed Carbon	1.50	2.18	2.38
Ash	81.88	78.18	87.73
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 6

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 51 *6.13-6.47* *(0.34)*	*MR 56* *69.50-70.15* *(0.65)*	*MR 56* *70.60-71.02* *(0.42)*
	986666	986667	986668
SAMPLE AS RECEIVED			
Moisture	0.82	0.74	0.84
Volatile Matter	15.48	29.91	22.46
Fixed Carbon	0.94	1.89	4.80
Ash	82.77	67.46	71.90
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	15.61	30.13	22.65
Fixed Carbon	0.94	1.91	4.84
Ash	83.45	67.96	72.51
	100.00	100.00	100.00

	MR 56 *72.12-72.50* *(0.30)*	*MR 59* *69.13-69.38* *(0.25)*	*MR 59* *69.38-69.89* *(0.51)*
	986669	986670	986671
SAMPLE AS RECEIVED			
Moisture	0.89	0.59	0.64
Volatile Matter	20.63	10.48	32.90
Fixed Carbon	4.41	0.67	*<0.1*
Ash	74.07	88.26	66.49
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	20.82	10.54	33.11
Fixed Carbon	4.45	0.67	*<0.1*
Ash	74.74	88.79	66.91
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 7

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 59 69.89-70.37 (0.48)	*MR 59 70.37-70.78 (0.41)*	*MR 59 70.78-70.95 (0.17)*
	986672	986673	986674
SAMPLE AS RECEIVED			
Moisture	0.73	0.61	0.75
Volatile Matter	10.87	20.22	8.42
Fixed Carbon	0.96	*<0.1*	0.85
Ash	87.44	79.47	89.98
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	10.95	20.34	8.48
Fixed Carbon	0.97	*<0.1*	0.86
Ash	88.08	79.96	90.66
	100.00	100.00	100.00
	MR 60 78.75-78.99 (0.24)	*MR 60 78.99-79.13 (0.14)*	*MR 60 79.13-79.67 (0.54)*
	986675	986676	986677
SAMPLE AS RECEIVED			
Moisture	0.29	0.64	0.54
Volatile Matter	16.33	10.42	21.33
Fixed Carbon	1.65	0.72	0.61
Ash	81.73	88.22	77.51
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	16.38	10.49	21.45
Fixed Carbon	1.66	0.73	0.62
Ash	81.97	88.79	77.93
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 8

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR60 *79.67-79.95* *(0.28)* 986678	*MR 60* *79.95-80.35* *(0.40)* 986679	*MR 61* *36.34-37.07* *(0.73)* 986680
SAMPLE AS RECEIVED			
Moisture	0.59	0.48	0.56
Volatile Matter	8.34	21.77	20.14
Fixed Carbon	1.24	1.28	0.15
Ash	89.84	76.47	79.16
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	8.39	21.88	20.25
Fixed Carbon	1.24	1.29	0.15
Ash	90.37	76.84	79.60
	100.00	100.00	100.00

	MR 61 *37.07-37.57* *(0.50)* 986681	*MR 61* *37.57-38.09* *(0.52)* 986682	*MR 63* *22.20-22.46* *(0.20)* 986683
SAMPLE AS RECEIVED			
Moisture	0.49	0.42	0.46
Volatile Matter	11.02	19.25	12.17
Fixed Carbon	1.09	0.61	0.78
Ash	87.41	79.72	86.59
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	11.07	19.33	12.23
Fixed Carbon	1.09	0.61	0.78
Ash	87.84	80.05	86.99
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 9

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 63 22.46-23.14 (0.68)	*MR 63 23.14-23.43 (0.29)*	*MR 63 23.43-23.84 (0.41)*
	986684	986685	986686
SAMPLE AS RECEIVED			
Moisture	0.54	0.51	0.55
Volatile Matter	27.80	8.89	17.36
Fixed Carbon	0.83	0.68	2.16
Ash	70.83	89.92	79.94
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	27.95	8.94	17.45
Fixed Carbon	0.84	0.68	2.17
Ash	71.22	90.38	80.38
	100.00	100.00	100.00
	MR 65 50.80-51.37 (0.47)	*MR 65 51.37-51.81 (0.44)*	*MR 65 51.81-52.04 (0.23)*
	986687	986688	986689
SAMPLE AS RECEIVED			
Moisture	0.12	0.51	0.46
Volatile Matter	28.36	9.87	18.71
Fixed Carbon	1.28	0.44	1.31
Ash	70.23	89.18	79.02
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	28.40	9.92	18.80
Fixed Carbon	1.29	0.45	1.82
Ash	70.32	89.63	79.38
	100.00	100.00	100.00

AMDEL ANALYTICAL SERVICES 13-JAN-82 JOB 3385/82 PAGE 10

PROXIMATE COAL ANALYSIS CODE S1 RESULTS IN PERCENTAGES

	MR 65 52.04-52.23 (0.19)	*MR 66 64.80-65.39 (0.39)*	*MR 66 65.39-65.85 (0.46)*
	986690	986691	986692
SAMPLE AS RECEIVED			
Moisture	0.49	0.34	0.37
Volatile Matter	9.44	28.03	9.32
Fixed Carbon	0.49	1.12	0.47
Ash	89.58	70.51	89.85
	100.00	100.00	100.00
MOISTURE FREE			
Volatile Matter	9.48	28.12	9.35
Fixed Carbon	0.50	1.13	0.47
Ash	90.02	70.75	90.18
	100.00	100.00	100.00

	MR 66 65.85-66.32 (0.47)
	986693
SAMPLE AS RECEIVED	
Moisture	0.43
Volatile Matter	20.30
Fixed Carbon	1.97
Ash	77.30
	100.00
MOISTURE FREE	
Volatile Matter	20.39
Fixed Carbon	1.97
Ash	77.64
	100.00

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

823125

AC 3385/82

FORM 38

REPORT AC I 313/82

ANALYSIS FISCHER ESTIMATE

Sample N°	Oil YIELD L/TONNE			Sample N°	Oil YIELD L/TONNE			
986300	144			986661	107			
01	0			62	141			
02	170			63	151			
03	165			64	219			
04	4			65	22			
05	151			66	122			
06	12			67	280			
07	160			68	141			
08	15			69	122			
09	226			986670	35			
986310	18			71	301			
986434	297			72	42			
35	156			73	154			
36	18			74	13			
37	182			75	113			
986651	27			76	50			
52	102			77	153			
53	240			78	15			
54	23			79	155			
55	152			986680	155			
56	237			81	48			
57	47			83	27			
58	127			84	252			
59	298			85	29			
986660	78			986686	252			

METHOD: R6/1

THE AUSTRALIAN MINERAL DEVELOPMENT LABORATORIES

AC 3385/82

823126

FORM 38

REPORT AC 1313/82

ANALYSIS FISCHER ESTIMATE

Sample N°	OIL YIELD L/TONNE							
986687	252							
88	45							
89	125							
986690	20							
91	253							
92	33							
986693	156							

METHOD: R6/1

APPENDIX 5

COMPILATION OF TASMANITE INTERSECTIONS DRILLED PRIOR TO 1981.

AUSTRALIAN SHALE OIL CORPORATION - ca 1925

Holes are located on leases on the west bank of the Mersey River approximately 4 km. south of Latrobe (Area III).

TASMANITE INTERSECTION

Hole No.	From (m)	To (m)	Thickness (m)	Oil Yield
1	67.3			
2	53.9			
3	8.6			
4	25.9			
5	-			
6	10.6			
7	39.3			
8	52.1			
9	-			
10	57.0			
11	31.0			
12	51.9			
13	37.2			
14	22.5			
15	10.0			
16 (Shaft)	5.3			
16	Dolerite (Depth not given)			
17	31.3			
18	20.7			
19	27.4			
20	25.9			
21	56.8			
22	12.0			
23	10.4			
24	12.0			
25	15.1			
26	24.3			
27	14.6			
28	75.9			
29	83.2			

TASMANITE SHALE OIL COMPANY - 1928 DRILLING

Holes are located to the north of the Great Bend of the Mersey River.

1 (DD 1M)	Drilled 53.9m in basalt.	
2 (DD 2M)	Drilled 32.3m in schist	
3 (DD 3M)	40.84 - 42.36	1.53

The following holes were also drilled in the Great Bend area but the dates of drilling and the company responsible are not known.

CD1M	Failed to reach Tasmanite oil shale
CD2M	16.1
CD3M	13.3
CD4M	Depth not known, no Tasmanite oil shale intersected.
CD5M	"Not bottomed" - presumably stopped above the Tasmanite oil shale.
TC1	78.0
TC2	83.0
MVA	15.1
MVB	31.7

LATROBE SHALE OIL COMPANY DRILLING - ca 1930

These holes and shafts were sunk in the China Flat area (Area V)

Line A

6	No Tasmanite oil shale intersected at 67m		
7	21.48	22.55	1.07
8	6.40	7.16	0.76
9	Collared below the Tasmanite horizon (depth of hole 8.07m)		

Line B

1	12.95	14.33	1.38
2	12.95	14.33	1.38
3	21.64	23.01	1.37
4	No Tasmanite shale intersected at <46m		
5	4.42 Approx.	5.42 Approx	1.0

Line C

1	7.01	8.23	1.22	
2	Probably collared below the Tasmanite horizon			(7.92m)
3	" " " " " "			(6.09m)
4	1.0	1.5	0.5	
5	Probably collared below the Tasmanite horizon			(3.66m)

Line D

10	Collared below the Tasmanite horizon			(15.25m)
11	" " " " "			(14.32m)
12	21.94	23.32	1.38	
13	45.41	46.03	0.62	

TASMANIAN MINES DEPARTMENT DRILLING - 1933

Holes are located in the Tasmanite Mine area, north of the Great Bend of the Mersey River.

1	65.53	66.98	1.45	30gal/ton (upper band)
2	60.50	62.18	1.68	17.9 "
3	51.87	54.10	2.23	20.7 "
4	55.93	57.48	1.53	24.0 "
5	58.14	59.74	1.60	
6	92.05	93.59	1.54	
7	69.49	71.12	1.63	
8	Not known			
9	83.38	85.42	2.04	
10	87.93	88.85	0.92	
11	Basalt/dolerite to 45m			
12	Permian sediments to 68.5m, schists 68.5-76.5m			
13	Schist to 17m			
14	Basalt overlying sandstone (44.2m total)			
15	Schists to 18.6m			
16	No shale down to 96m			

TASMANIAN MINES DEPARTMENT DRILLING - 1940/41

Tasmanite Mine Area

T1	61.72	63.47	1.75	20gal/ton
T2	Not known			
T3	45.79	47.39	1.60	27gal/ton
T4	36.95	38.91	1.96	28gal/ton
T5	22.68	24.66	1.98	24gal/ton
T6	33.48	35.97	2.49	22gal/ton
T7	28.70	30.50	1.80	22gal/ton
T8	16.71	19.08	2.37	
T9	37.34	39.80	2.46	
T10	40.69	42.98	2.29	
T11	48.35	50.49	2.14	
T12	43.20	45.47	2.27	
T13	49.81	52.13	2.32	
T14	55.17	57.38	2.21	
T15	49.15	51.48	2.33	
T16	47.14	48.87	1.73	

Knights Area (area I)

1A	? Weathered Tasmanite at 3m?		
1	No Tasmanite reported, possibly collared below the Tasmanite horizon.		
2	?31.69	?32.82	?1.13
3	61.19	62.52	1.33
4	Collared below the Tasmanite horizon		
5	3.27	4.11	0.84
6	7.92	9.29	1.37
7	4.72	5.82	1.10
8	18.62	19.81	1.19
9	40.28	41.83	1.55

ENDEAVOUR OIL COMPANY - 1975 DRILLING

2	No Tasmanite shale at < 42.6m			
3	" " " " < 47.2m			
4	" " " " < 48.8m			
5	17.07	17.68	0.61	
6	Hole collared below the Tasmanite horizon (18.2m)			
7	6.89	8.23	1.34	
8	8.41	9.78	1.37	
9	Hole collared below the Tasmanite horizon			
10	" " " " "			
11	1.37	1.95	0.58	
12	15.33	16.98	1.65	
13	21.52	22.74	1.22	
14	Hole abandoned at 1.6m in dolerite			
15	-			
16	9.45			
17	Hole collared below the Tasmanite shale horizon (17.7m)			
18	" " " " " " "			(14.3m)
19	" " " " " " "			(10.7m)
20	" " " " " " "			(19.8m)
21	" " " " " " "			(24.4m)
22	" " " " " " "			(33.5m)
23	" " " " " " "			(28.9m)
24	" " " " " " "			(41.2m)
25	" " " " " " "			(17.4m)
26	" " " " " " "			(15.2m)
27	7.01	8.76	1.75	
28	3.87	5.57	1.70	
29	7.09	8.61	1.52	
30	7.92	9.63	1.71	
31	29.56	30.78	1.22	(Approx.)
32	No Tasmanite shale at < 46.2m			
33	Hole collared below the Tasmanite shale horizon (29.9m)			
34	No Tasmanite shale at < 49.8m			
35	" " " " < 47.1m			
36	" " " " < 47.2m			
37	" " " " < 51.4m			
38	" " " " < 65.4m			

440 000 mE

450 000 mE

460 000 mE

470 000 mE

5 440 000 mN

5 430 000 mN

5 420 000 mN

DEVONPORT

PORT SORELL

LATROBE

RIVER FORTH

AREA II

AREA III

AREA I

SASSAFRAS

AREA IV

AREA VI

AREA V

RAILTON

SHEFFIELD

MERSEY RIVER

P

LEGEND

E. L. 4 / 74

Area of Plans TASh 580, 581, 582.

P — Permian

Tasmanite Oil Shale Mines (abandoned)

5 cm

LATROBE

LAUNCESTON

QUEENSTOWN

HOBART

• Tasmanite Oil Shale Occurences

823133

CRA EXPLORATION PTY. LIMITED

82-1707. E. L. 4/74

LOCATION PLAN AND DISTRIBUTION OF PERMIAN STRATA

Ref SK55 - 3	
Scale 1 : 63 360	Report N°. 11047
Author I. M. C.	Date JAN 1982
Drawn R. T.	Plan N°. TASh 579

5434000 mN
5433000 mN
5432000 mN
5431000 mN
5430000 mN
5429000 mN
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5427000 mN
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5422000 mN
5421000 mN
5420000 mN

450 000 mE
451 000 mE
452 000 mE
453 000 mE
454 000 mE
455 000 mE
456 000 mE

AREA I
AREA II
AREA III
AREA IV
AREA V
AREA VI

MR 33
MR 34
MR 21
MR 32
MR 31
MR 30-60
MR 29-61
MR 64-65
MR 20
MR 57
MR 66
MR 58-59
MR 62-63
MR 35
MR 19
MR 25
MR 26
MR 27-28
MR 55-56
MR 18
MR 36
MR 24
MR 22
MR 23
MR 3
MR 1-2
MR 13
MR 16
MR 4-5
MR 8
MR 6-7
MR 14-15
MR 9-10
MR 12
MR 11
MR 52
MR 53
MR 38-39
MR 40-41
MR 42
MR 50-51
MR 49
MR 48
MR 43-44
MR 47
MR 46
MR 54
MR 45
MR 17
MR 37

Oppenheim Hill
Saggers Hill
Dulverton Hill
RAILTON
MERSEY RIVER
Bennett Creek
Smiths Creek
Paramatta Creek
Redwater Creek
MERSEYLEA

REFERENCE

QUATERNARY	Qra	Recent alluvium
	Qt	Basalt dolerite quartzite and conglomerate talus
	Qg	Sands clays and residual gravels
PERMIAN	Pf	Fernree group
	Pw	Woodbridge group
	Pm	Mersey coal measures
	Pbb	Basal beds including Tasmanite oil shale member
	P	
ORDOVICIAN	Og	Skarn and Gordon limestone
	Om	Moina sandstone including Caroline Creek beds
	Or / Od	Roland and dial conglomerates
CAMBRIAN	€gg	Gog Range greywacke
	€b / €sf	Bott conglomerate / Sprent Formation
	€m	Motton Spilite
PRE-CAMBRIAN	p€	Undifferentiated
IGNEOUS ROCKS	Tb	Tertiary Basalt
	Jdl	Jurassic Dolerite

LEGEND

- Fault
- Unconformity
- Geological boundary — indefinite / approximate
- River, creek, watercourse
- Railway line
- Road, track
- Borehole locations
  - 3 ● Endeavour - 1975
  - MR 480 CRAE - 1981
  - ⊙ Proposed Drill Hole

SCALE

250 500 200 400 500 1000 1500 2000 metres

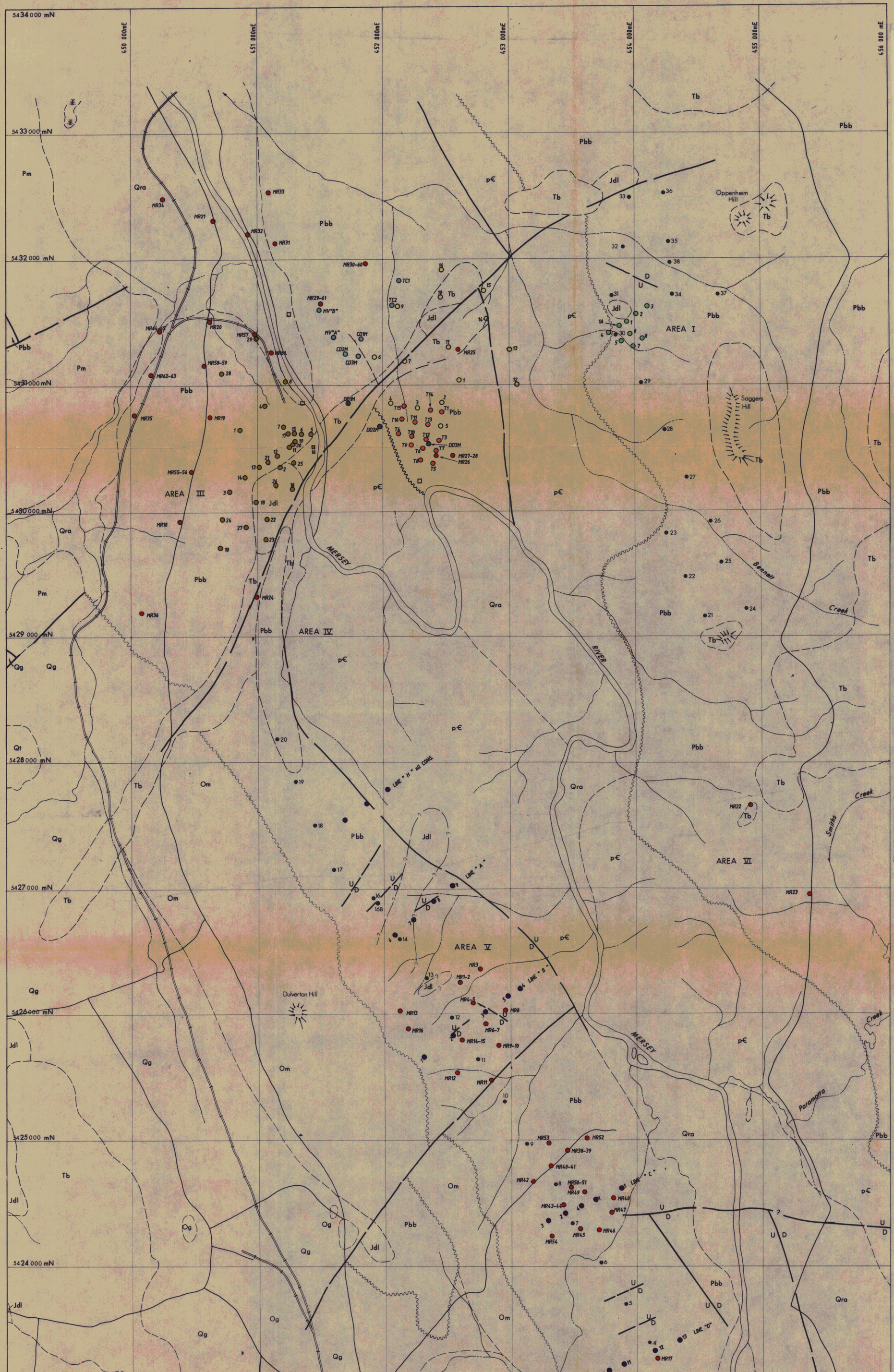
5 cm

823134
82-1707

CRA EXPLORATION PTY. LIMITED

TASMANITE OIL SHALE
EXPLORATION LICENCE 4/74
PROPOSED DRILLING PROGRAMME
1982

Geologist C. S. Gloe I. M. Clementson	Scale 1 : 15 000
Drawn J.D. Sept. 1980 R.T. Jan 1982	Report No. 11047
Ref, SK55 - 3	Plan No. TASh 580



LEGEND

- Fault
- Unconformity
- Geological boundary
  - indefinite
  - approximate
- River, creek, watercourse
- Railway line
- Road, track.

Hole No.	Year Drilled	Authority	From (m)	To (m)	Length (m)	Oil Yield
1	1975	ENDEAVOUR				
2	1975	ENDEAVOUR	No Tasmanite shale at <42·6m			
3	1975	ENDEAVOUR	No Tasmanite shale at <47·2m			
4	1975	ENDEAVOUR	No Tasmanite shale at <48·8m			
5	1975	ENDEAVOUR	17·07	17·68	0·61	
6	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (18·2m)			
7	1975	ENDEAVOUR	6·89	8·23	1·34	
8	1975	ENDEAVOUR	8·41	9·78	1·37	
9	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon			
10	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon			
11	1975	ENDEAVOUR	1·37	1·95	0·58	
12	1975	ENDEAVOUR	15·33	16·98	1·65	
13	1975	ENDEAVOUR	21·52	22·74	1·22	
14	1975	ENDEAVOUR	Hole abandoned at 1·6m in dolerite			
15	1975	ENDEAVOUR				
16	1975	ENDEAVOUR	9·45			
17	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (17·7m)			
18	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (14·3m)			
19	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (10·7m)			
20	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (19·8m)			
21	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (24·4m)			
22	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (33·5m)			
23	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (28·9m)			
24	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (41·2m)			
25	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (17·6m)			
26	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (15·2m)			
27	1975	ENDEAVOUR	7·01	8·76	1·75	
28	1975	ENDEAVOUR	3·87	5·57	1·70	
29	1975	ENDEAVOUR	7·09	8·61	1·52	
30	1975	ENDEAVOUR	7·92	9·63	1·71	
31	1975	ENDEAVOUR	29·56	30·78	1·22	
32	1975	ENDEAVOUR	No Tasmanite shale at <46·2m			
33	1975	ENDEAVOUR	Hole collared below the Tasmanite horizon (29·9m)			
34	1975	ENDEAVOUR	No Tasmanite shale at <49·8m			
35	1975	ENDEAVOUR	No Tasmanite shale at <47·1m			
36	1975	ENDEAVOUR	No Tasmanite shale at <47·2m			
37	1975	ENDEAVOUR	No Tasmanite shale at <51·4m			
38	1975	ENDEAVOUR	No Tasmanite shale at <65·4m			
1	1925	ASO Corp.	67·3			
2	1925	ASO Corp.	53·9			
3	1925	ASO Corp.	8·6			
4	1925	ASO Corp.	25·9			
5	1925	ASO Corp.	-			
6	1925	ASO Corp.	10·6			
7	1925	ASO Corp.	39·3			
8	1925	ASO Corp.	52·1			
9	1925	ASO Corp.	-			
10	1925	ASO Corp.	57·0			
11	1925	ASO Corp.	31·0			
12	1925	ASO Corp.	51·9			
13	1925	ASO Corp.	37·2			
14	1925	ASO Corp.	22·5			
15	1925	ASO Corp.	10·0			
16	1925	ASO Corp.	Dolerite (depth not given)			
16 (shaft)	1925	ASO Corp.	5·3			
17	1925	ASO Corp.	31·3			
18	1925	ASO Corp.	20·7			
19	1925	ASO Corp.	27·4			
20	1925	ASO Corp.	25·9			
21	1925	ASO Corp.	56·8			
22	1925	ASO Corp.	12·0			
23	1925	ASO Corp.	10·4			
24	1925	ASO Corp.	12·0			
25	1925	ASO Corp.	15·1			
26	1925	ASO Corp.	24·3			
27	1925	ASO Corp.	14·6			
28	1925	ASO Corp.	75·9			
29	1925	ASO Corp.	83·2			
T1	1940/41	Mines Dep	61·72	63·47	1·75	20gal/ton
T2	1940/41	Mines Dep	Not Known			
T3	1940/41	Mines Dep	45·79	47·39	1·60	27gal/ton
T4	1940/41	Mines Dep	36·95	38·91	1·96	28gal/ton
T5	1940/41	Mines Dep	22·68	24·66	1·98	24gal/ton
T6	1940/41	Mines Dep	33·48	35·97	2·49	22gal/ton
T7	1940/41	Mines Dep	28·70	30·50	1·80	22gal/ton
T8	1940/41	Mines Dep	16·71	19·08	2·37	
T9	1940/41	Mines Dep	37·34	39·80	2·46	
T10	1940/41	Mines Dep	40·69	42·98	2·29	
T11	1940/41	Mines Dep	48·35	50·49	2·14	
T12	1940/41	Mines Dep	63·20	45·47	2·27	
T13	1940/41	Mines Dep	49·81	52·13	2·32	
T14	1940/41	Mines Dep	55·17	57·38	2·21	
T15	1940/41	Mines Dep	49·15	51·48	2·33	
T16	1940/41	Mines Dep	47·14	48·87	1·73	
1A			? Weathered Tasmanite at 3m ?			
1			No Tasmanite reported			
2			31·69	32·82	1·13	
3			61·19	62·52	1·33	
4			Collared below the Tasmanite horizon			
5			3·27	4·11	0·84	
6			7·92	9·29	1·37	
7			4·72	5·82	1·10	
8			18·62	19·81	1·19	
9			40·28	41·83	1·55	
1	1933	Mines Dep	65·53			
2	1933	Mines Dep	60·50			
3	1933	Mines Dep	51·07			
4	1933	Mines Dep	55·93			
5	1933	Mines Dep	58·14			
6	1933	Mines Dep	92·05			
7	1933	Mines Dep	69·49			
8	1933	Mines Dep	Not known			
9	1933	Mines Dep	83·38			
10	1933	Mines Dep	87·93			
11	1933	Mines Dep	Basalt/dolerite to 45m			
12	1933	Mines Dep	Permian sediments to 68·5m, schists 68·5 - 76·5m			
13	1933	Mines Dep	Schist to 17m			
14	1933	Mines Dep	Basalt overlying sandstone (44·2m total)			
15	1933	Mines Dep	Schists to 17m			
16	1933	Mines Dep	No shale down to 96m			
LINE "A"						
6	1930	LSO Co.	No Tasmanite oil shale intersected at 67m			
7	1930	LSO Co.	21·48	22·55	1·07	
8	1930	LSO Co.	6·40	7·16	0·76	
9	1930	LSO Co.	Collared below the Tasmanite horizon (depth of hole 8·07m)			
LINE "B"						
1	1930	LSO Co.	12·95	14·33	1·38	
2	1930	LSO Co.	12·95	14·33	1·38	
3	1930	LSO Co.	21·64	23·01	1·37	
4	1930	LSO Co.	No Tasmanite shale intersected at <46m			
5	1930	LSO Co.	4·42	5·42	1·00	
LINE "C"						
19	1930	LSO Co.	7·01	8·23	1·22	
2	1930	LSO Co.	Probably collared below the Tasmanite horizon (17·92m)			
3	1930	LSO Co.	Probably collared below the Tasmanite horizon (16·09m)			
4	1930	LSO Co.	1·00	1·50	0·50	
5	1930	LSO Co.	Probably collared below the Tasmanite horizon (3·66m)			
LINE "D"						
10	1930	LSO Co.	Collared below the Tasmanite horizon (15·25m)			
11	1930	LSO Co.	Collared below the Tasmanite horizon (14·32m)			
12	1930	LSO Co.	21·94	23·32	1·38	
13	1930	LSO Co.	45·41	46·03	0·62	
DD 1M	1928	TSO Co.	Drilled 53·9m in basalt			
DD 2M	1928	TSO Co.	Drilled 32·3m in basalt			
DD 3M	1928	TSO Co.	40·84	42·36	1·53	
CD1M			Failed to reach Tasmanite oil shale			
CD2M			16·1			
CD3M			13·3			
CD4M			Depth not known, no Tasmanite oil shale intersected			
CD5M			"Not bottomed" presumably stopped above the Tasmanite oil shale.			
TC1			78·0			
TC2			83·0			
MVA			15·1			
MVB			31·7			
MR1	1981	CRAE	17·0	20	3	
MR2	1981	CRAE	17·74	19·03	1·29	140L/tonne
MR3	1981	CRAE	Collared stratigraphically below Tasmanite horison			
MR4	1981	CRAE	21	22	1	
MR5	1981	CRAE	20·96	22·18	1·22	168L/tonne
MR6	1981	CRAE	17	18	1	
MR7	1981	CRAE	17·80	19·43	1·63	109L/tonne
MR8	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR9	1981	CRAE	5·0	6·3	1·3	
MR10	1981	CRAE	4·40	5·55	1·15	170L/tonne
MR11	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR12	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR13	1981	CRAE	Hole stopped in dolerite			
MR14	1981	CRAE	15	16	1	
MR15	1981	CRAE	15·45	16·50	1·05	
MR16	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR17	1981	CRAE	60·06	62·15	1·55	
MR18	1981	CRAE	91·3	93·4	2·10	
MR19	1981	CRAE	57·95	59·70	1·75	
MR20	1981	CRAE	83	85	2	
MR21	1981	CRAE	Hole stopped in dolerite			
MR22	1981	CRAE	53·7	54·90	1·20	
MR23	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR24	1981	CRAE	Hole stopped in basalt			
MR25	1981	CRAE	41·20	42·3	1·10	
MR26	1981	CRAE	Hole abandoned befor intersecting Tasmanite			
MR27	1981	CRAE	26·07	28·00	1·93	
MR28	1981	CRAE	26·93	28·91	1·99	128L/tonne
MR29	1981	CRAE	36·10	37·90	1·80	
MR30	1981	CRAE	80·65	82·45	1·80	
MR31	1981	CRAE	Hole abandoned due to access problems			
MR32	1981	CRAE	Hole abandoned due to access problems			
MR33	1981	CRAE	97	98	1	
MR34	1981	CRAE	Hole stopped in dolerite			
MR35	1981	CRAE	114·90	116·80	1·90	
MR36	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR37	1981	CRAE	83	85	2	
MR38	1981	CRAE	7	8·5	1·5	
MR39	1981	CRAE	7·10	8·43	1·33	160L/tonne
MR40	1981	CRAE	5·0	5·5	0·5	
MR41	1981	CRAE	5·15	6·50	1·35	147L/tonne
MR42	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR43	1981	CRAE	6	7	1	
MR44	1981	CRAE	6·15	7·25	1·10	144L/tonne
MR45	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR46	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR47	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR48	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR49	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR50	1981	CRAE	5	6	1	
MR51	1981	CRAE	5·15	6·47	1·32	150L/tonne
MR52	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR53	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR54	1981	CRAE	Collared stratigraphically below Tasmanite horizon			
MR55	1981	CRAE	71	73	2	
MR56	1981	CRAE	69·50	72·50	3·0	
MR57	1981	CRAE	Hole abandoned because of drilling problems			
MR58	1981	CRAE	69	70	1	
MR59	1981	CRAE	69·13	70·78	1·65	153L/tonne
MR60	1981	CRAE	78·75	80·35	1·60	114L/tonne
MR61	1981	CRAE	36·34	38·09	1·75	111L/tonne
MR62	1981	CRAE	22	24	2	
MR63	1981	CRAE	22·2	23·84	1·64	177L/tonne
MR64	1981	CRAE	52	53	1	
MR65	1981	CRAE	50·8	52·23	2·15	146L/tonne
MR66	1981	CRAE	64·8	66·32	1·52	156L/tonne

ALL INTEGER VALUES APPROXIMATE ONLY.

0 100 200 300 400 500 1000 1500 metres

REFERENCE

QUATERNARY
- Qra — Recent-alluvium
- Qt — Basalt dolerite quartzite and conglomerate talus
- Qg — Sands clays and residual gravels

PERMIAN
- Pf — Fernree group
- Pw — Woodbridge group
- Pm — Mersey coal measures
- Pbb — Basal beds including Tasmanite oil shale member
- P

ORDOVICIAN
- Og — Skarn and Gordon limestone
- Om — Moina sandstone including Caroline Creek beds
- Or/Od — Roland and dial conglomerates

CAMBRIAN
- €gg — Gog Range greywacke
- €b/€sf — Bott conglomerate / Sprent Formation
- €m — Motton Spilite

PRE-CAMBRIAN
- p€ — Undifferentiated

IGNEOUS ROCKS
- Tb — Tertiary Basalt
- Jdl — Jurassic Dolerite

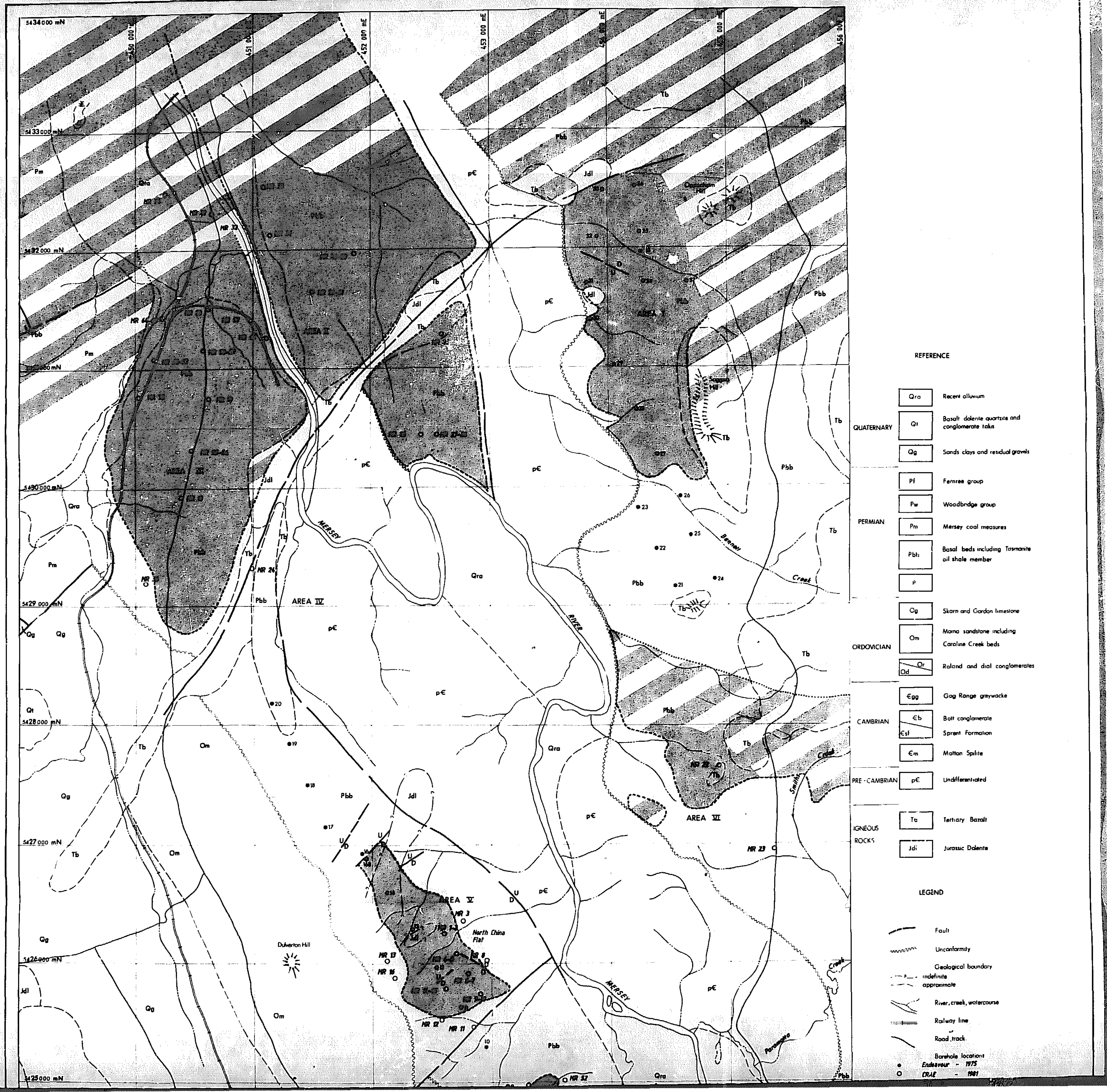
5 cm

CRA EXPLORATION PTY. LIMITED

82-1707. 823135

TASMANITE OIL SHALE
EXPLORATION LICENCE 4/74
COMPILATION OF EARLY DRILLING

Geologist :	C. S. Glae I. M. Clementson	Scale :	1 : 15 000
Drawn :	J.D. Sept. 1980 R.T. Feb. 1982	Report No. :	11047
Ref :	SK55 - 3	Plan No.	TASh 581



5434 000 mN
5433 000 mN
5432 000 mN
5430 000 mN
5429 000 mN
5428 000 mN
5427 000 mN
5426 000 mN
5425 000 mN
450 000 mE
451 000 mE
452 000 mE
453 000 mE
456 000 mE
AREA II
AREA III
AREA IV
AREA V
AREA VI
MERSEY
RIVER
Bennett Creek
Smith's Creek
North China Flat
Dulverton Hill
Paramatta
REFERENCE
QUATERNARY
Qra Recent alluvium
Qt Basalt dolerite quartzite and conglomerate talus
Qg Sands clays and residual gravels
PERMIAN
Pf Ferntree group
Pw Woodbridge group
Pm Mersey coal measures
Pbb Basal beds including Tasmanite oil shale member
P
ORDOVICIAN
Og Skarn and Gordon limestone
Om Moina sandstone including Caroline Creek beds
Or Od Roland and dial conglomerates
CAMBRIAN
€gg Gog Range greywacke
€b Bott conglomerate
€sf Sprent Formation
€m Motton Spilite
PRE-CAMBRIAN
p€ Undifferentiated
IGNEOUS ROCKS
Tb Tertiary Basalt
Jdl Jurassic Dolerite
LEGEND
Fault
Unconformity
Geological boundary
indefinite
approximate
River, creek, watercourse
Railway line
Road, track
Borehole location
Endeavour - 1975
CRAE - 1981

CAMBRIAN
- €b — Bott conglomerate
- €st — Sprent Formation
- €m — Mathon Spilite

PRE-CAMBRIAN
- p€ — Undifferentiated

IGNEOUS ROCKS
- Tb — Tertiary Basalt
- Jdl — Jurassic Dolerite

LEGEND

- Fault
- Unconformity
- Geological boundary
  - indefinite
  - approximate
- River, creek, watercourse
- Railway line
- Road, track
- borehole locations
  - Endeavour – 1975
  - CRAE – 1981
- Area of Geologically Indicated Tasmanite Occurrence.
- Area of Potential Tasmanite Occurrence.

SCALE

250 500 200 400 500 1000 1500 2000 metres

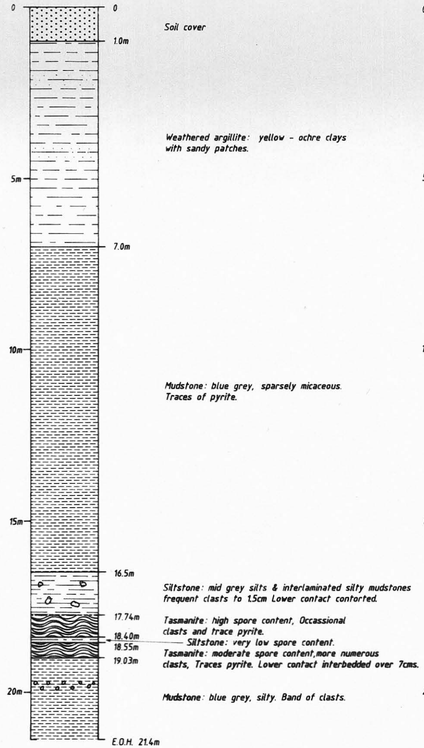
CRA EXPLORATION PTY. LIMITED

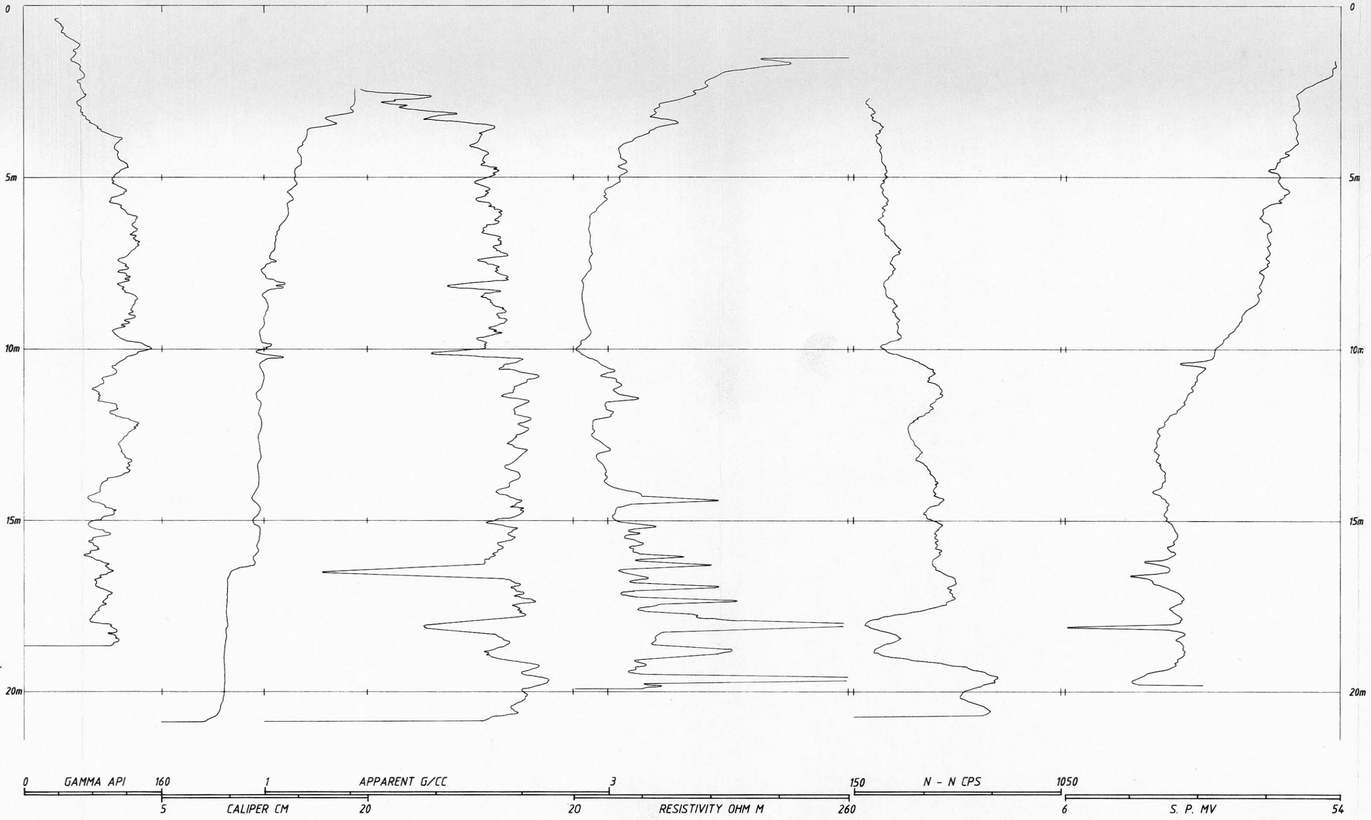
TASMANITE OIL SHALE

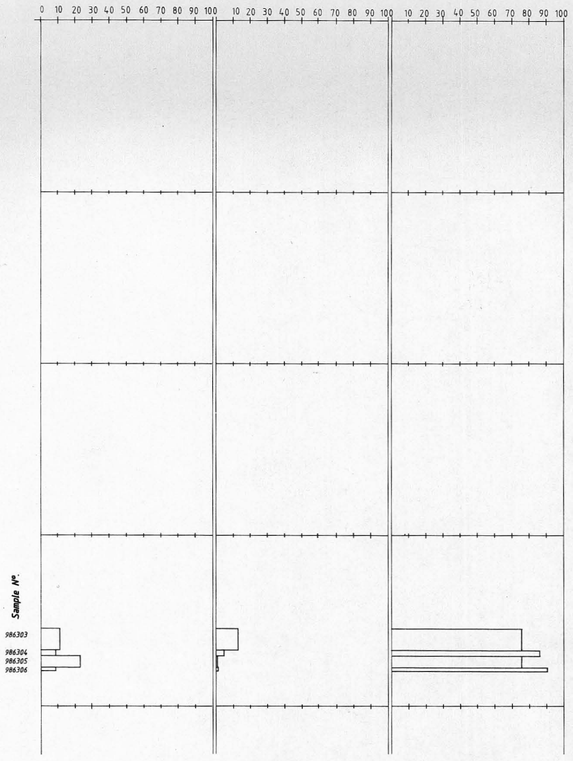
EXPLORATION LICENCE 4/74

Indicated And Potential Tasmanite Occurrence

Author	C. S. Cloe. I. M. Clements	Scale	1: 15 000
Drawn	J.D. Sept. 1980 R.T. Jan. 1982	Report No.	11047
Ref.	SK55 – 3	Plan No.	TASh 582







5 cm

82-1707.

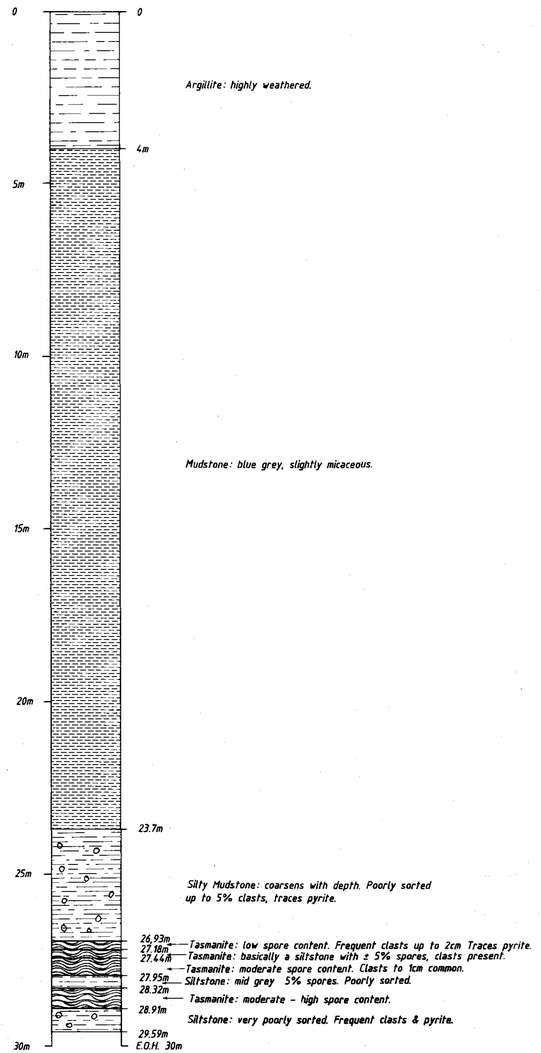
CRA EXPLORATION PTY. LIMITED

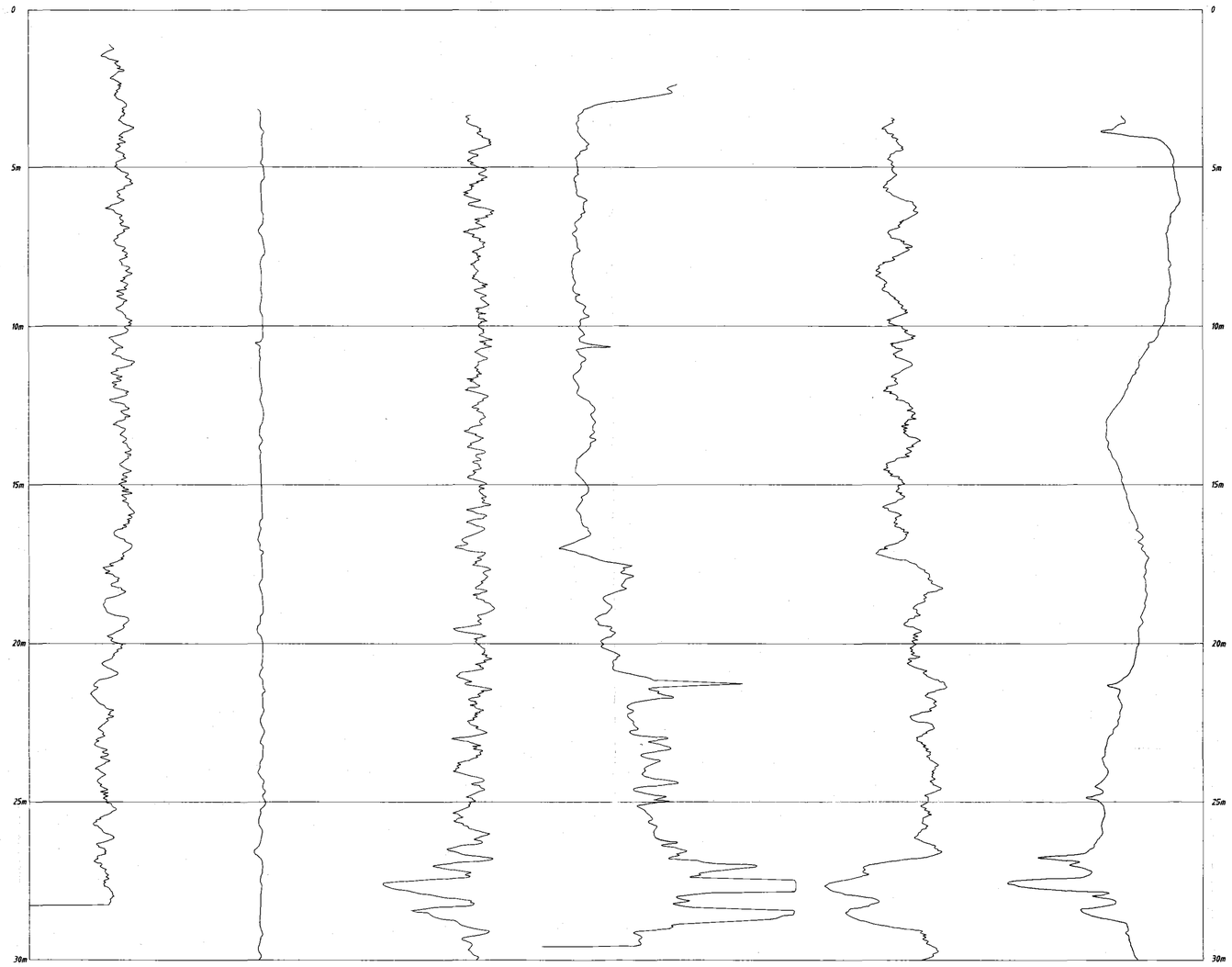
GEOLOGICAL & GEOPHYSICAL LOGS
RD 81 MR 2

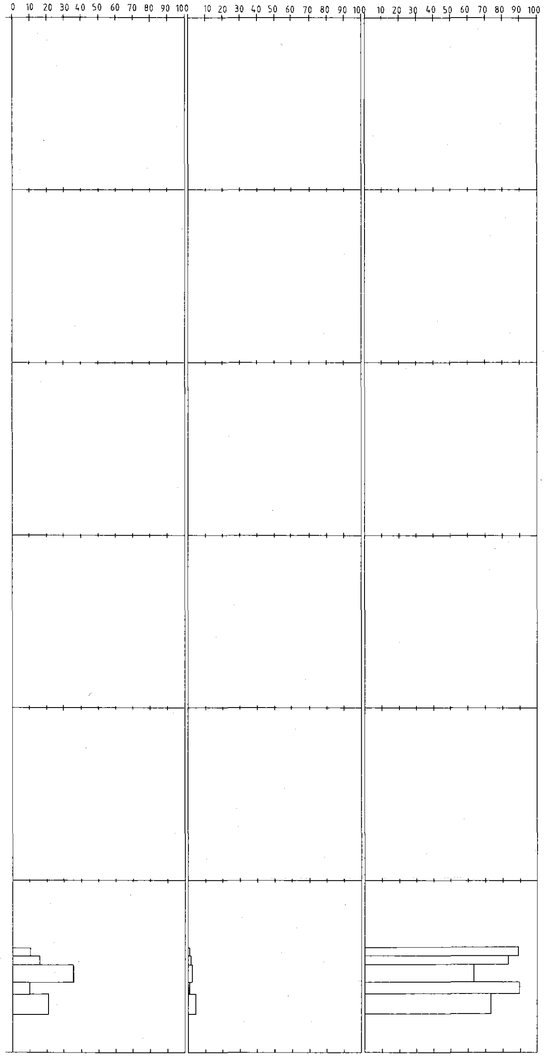
Plus Proximate Analyses of Tasmanite Samples

Ref.	SK55 - 3		
Scale	As Shown	Drawn	R. T.
Author	I. M. CLEMENTSON	Report No.	11047
Date	4th. FEBRUARY 1982	Plan No.	TASh 583

823137







92-1707.

CRA EXPLORATION PTY. LIMITED

GEOLOGICAL & GEOPHYSICAL LOGS

RD81 MR 27 -28

Plus Proximate Analyses of Tasmanite Samples

Ref. SKSS - 3	
Scale. AS SHOWN	Drawn. R. T.
Author. I. M. CLEMENTSON	Report N°. 11047
Date. 4th FEBRUARY 1982	Plan N°. TASh 584

823138