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THE SHELL COMPANY OF AUSTRALIA LIMITED
(Incorporated in Victoria)
and
INDUSTRIAL AND MINING INVESTIGATIONS PTY LIMITED
(Incorporated in the A.C.T.)

EXPLORATION LICENCE E.L. 5/61 (AREA 1)
TASMANIA

GEOLOGY AND COAL RESOURCE OF MOUNT ELEPHANT, NORTH-EASTERN TASMANIA

by

R.M.D. FORD

CEPR 24/82

OCTOBER 1982

CONTENTS

SUMMARY

The Mount Elephant coal prospect is situated on a north-south trending ridge, 7 km southeast of St Marys, Tasmania. It lies within Exploration Licence 5/61 which is jointly held by The Shell Company of Australia (60%) and Industrial and Mining Investigations Pty. Limited. The region is adjacent to a traditional coal mining area which is well serviced by roads, a 1067mm gauge railway, and community facilities.

The prospect comprises an outlier (5 km^2) of Upper Triassic coal measures disconformably overlying a sequence of predominantly Permian marine sediments. Coal measures consist of a sequence about 200 m thick of lithic sandstones, shale and coal seams. Two remnants of a dolerite sill cap the deposit. During the Pleistocene, periglacial weathering of the dolerite sill produced a superficial cover of dolerite boulders in a clay matrix.

Regional dip varies between 1°-4° and is to the south-southeast. Mt Elephant is an upthrown block bounded by a major fault to the west and south. Two normal faults (displacement 16 and 30m) occur on the eastern side of Mt Elephant. Smaller scale faulting is presumed to exist.

Coal outcrops are found near the base of the coal measure sequence. During the late 1940's two exploratory adits were driven in from outcrops on the south and east sides of Mt Elephant.

Channel and ply samples were collected from the entrance of one adit. Coal is a dull, high volatile bituminous steaming coal. It contains a high proportion of ash (34.5%) in a finely disseminated form. Float-sink tests produced low yields with a moderately high ash content. Treatment at R.D. 1.70 gave a yield 52.9% with an ash 24.0%.

A preliminary estimate of the coal resource is as follows:

R.D. 1.62

Assumed seam thickness	1.5m	2.0m
Insitu Reserves	12 million tonnes	16 million tonnes
Recoverable Reserves (60%)	7 million tonnes	10 million tonnes

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1. INTRODUCTION

1.1 Scope

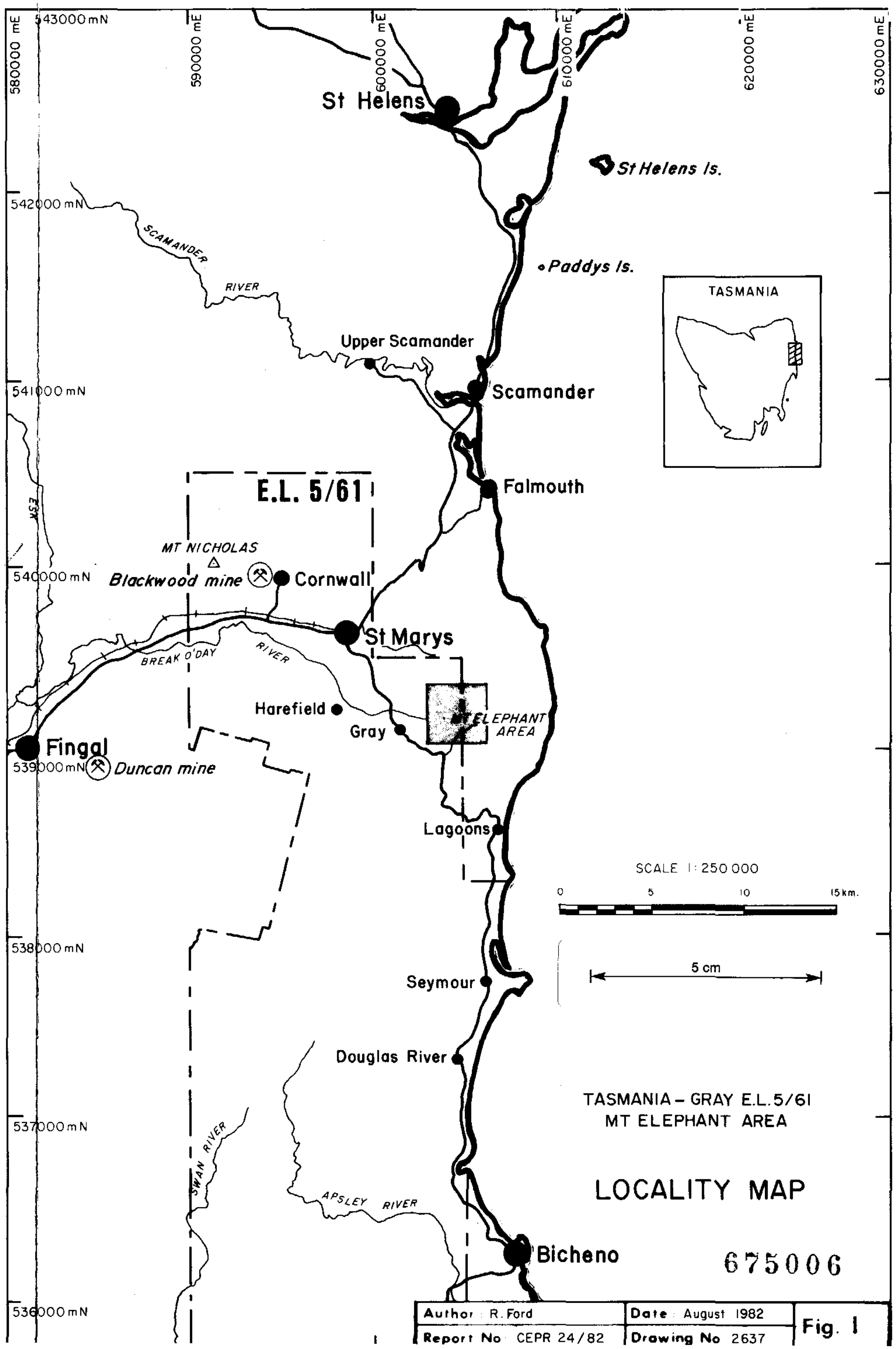
Recent exploration by the Shell Company of Australia (SCOA) in the Fingal Valley, N.E. Tasmania, has defined a prospective steaming coal deposit at Mount Nicholas. Prefeasibility studies indicate that a small coal mine and associated wash plant could be an economic proposition (Dames & Moore 1981, Wollff et. al. 1981). Subsequent exploration activities have concentrated on finding other accessible coal deposits in the region with the object of increasing the size of the reserves available for benefication, and thus spreading infrastructure costs. The search for prospective deposits was guided by two criteria; firstly the deposit must be easily accessible from the Fingal Valley, and secondly it must possess a simple geological structure to facilitiate mining.

In the Fingal Valley suitable areas are limited; to the south geological conditions are unfavourable (Patterson, 1982), and a mining tenement held by the Cornwall Coal Company extends along the remainder of the Mt Nicholas Range. However, at the head of the Fingal Valley there is a largely unexplored outline of coal measures which may satisfy the criteria.

This report presents a geological description of the Mt Elephant area, and an appraisal of the quantity and quality of the coal resource. It is based on published information supplemented by a brief reconnaisance survey undertaken by R. Kuhn, a post graduate student employed during the 1982 exploration programme. Kuhn re-examined earlier mapping by McNeil (1965), mapped coal outcrops and collected bulk and ply samples from an adit situated on the south side of Mt Elephant.

1.2 Location, Access and Local Communities

Figure 1 shows the position of Mt Elephant with respect to the main road and rail links, and local communities. St Marys, a regional centre, is the nearest town. It is situated 7 km northwest of the prospect and provides a range of community services including hotel, schools, post office and hospital.


580000 mE
590000 mE
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536000 mN
St Helens
St Helens Is.
Paddys Is.
SCAMANDER RIVER
Upper Scamander
Scamander
Falmouth
TASMANIA
E.L. 5/61
MT NICHOLAS
Blackwood mine
Cornwall
St Marys
BREAK O'DAY RIVER
ESK
Harefield
Gray
MT ELEPHANT AREA
Fingal
Duncan mine
Lagoons
SCALE 1:250 000
0
5
10
15 km.
5 cm
Seymour
Douglas River
SWAN RIVER
APSLEY RIVER
Bicheno
TASMANIA – GRAY E.L.5/61
MT ELEPHANT AREA
LOCALITY MAP
675006
Author: R. Ford
Date: August 1982
Report No: CEPR 24/82
Drawing No 2637
Fig. 1

The Esk Highway and a 1067 mm gauge railway line connect St Marys with the main population and industrial centres - Hobart, Launceston, Burnie and Devonport. The coastal Tasman Highway crosses the southern flank of Mt Elephant, and an unsealed track - Mt Elephant Road, provides access to the eastern side of the deposit. To the east of St Marys, a network of tracks extends on to the northern side of Mt Elephant from the Irishtown Road.

1.3 Topography, Climate and Vegetation

Mt Elephant is the highest point on an elongate N-S trending ridge which separates the headwaters of the Break O'Day River from several small streams draining the coastal escarpment.

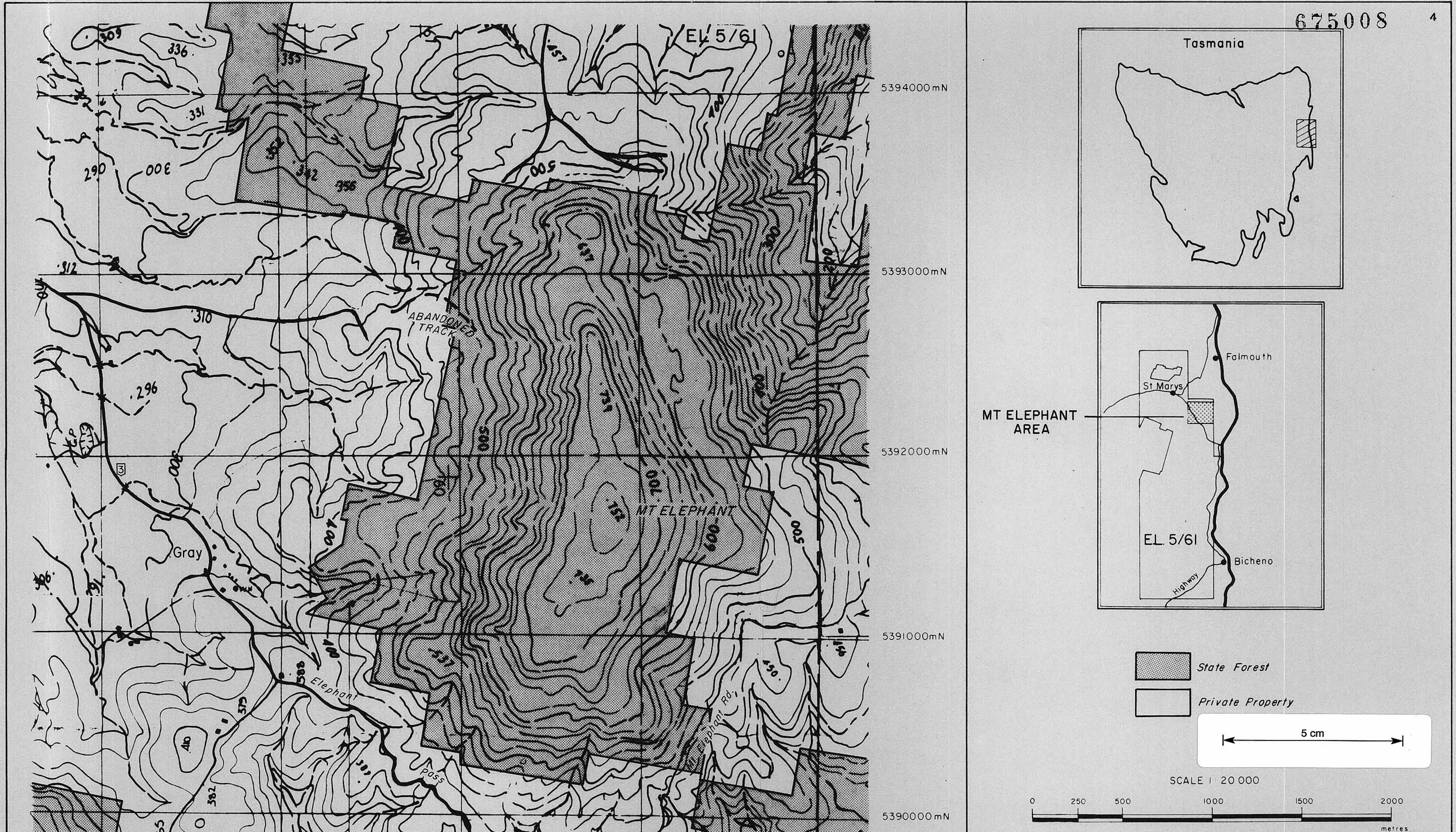
The climate may be classified as temperate marine, with mild summers and cool winters (MacKinnon, 1980). Rainfall is distributed fairly evenly throughout the year. Heavy rain (defined as 20 mm/24 hours) may occur 13 days per year whilst exceptionally heavy falls (defined as 100mm/24 hours) may happen only 1 day per year. Heavy falls tend to be more frequent during Autumn when small depressions track off the east coast of Tasmania causing strong onshore winds (MacKinnon, 1980).

The prevailing wind direction is from the west and northwest although topographic channelling can produce local effects. From December to March sea breezes develop in the afternoon often causing local cloud to form on the coastal hills. During winter, frosts are common in the upper Fingal Valley and probably occur more frequently at higher elevations.

Upper slopes of Mt Elephant are covered in dry scherophyll forest. The lower slopes and a small area on the eastern side have been cleared of forest for farming.

1.4 Mining and Land Tenure

The prospect is situated in the northeastern corner of Exploration Licence (E.L.) 5/61 (Gray) which was granted to Industrial & Mining Investigations Pty. Limited (I.M.I.) on the 23rd Febuary 1961. SCOA acquired a 60% interest in the Exploration Licence in August 1981.



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA-GRAY EL 5/61

MT ELEPHANT AREA

TOPOGRAPHY and LAND TENURE

(source: Lands Dept. 1979)

Scale 1 20 000

Author R. Ford	Date September 1982	Fig. 2
Report No CEPR 24/82	Drawing No 2658	

The upper portion of Mt Elephant which includes most of the coal measures underlies the Mt Elephant State Forest administered by the Forestry Commission, Fingal (Fig. 2). A small block of private land, known locally as 'Mt Elephant Farm' is situated high on the eastern slopes and probably overlies a portion of the coal measures.

1.5 Previous Work

Rather surprisingly, Mt Elephant was not mapped or studied until relatively recently. Hills et. al. (1922) neglected to include the area in their comprehensive survey - 'Coal Resources of Tasmania'. Since 1951 the area has been mapped by three authors - Everard (1951), McNeil (1965) and Sansom (1979). Although there is general agreement over the distribution of lithologies, they differ in their structural interpretation. Everard (1951) mapped the limestone outcrops on the southern side of Mt Elephant and postulated several north-south trending faults. The first detailed mapping of the region was undertaken by McNeil (1965). He was able to subdivide the marine sequence of Parmeener Supergroup into a number of informal units but mapped the upper coal measures as a single unit. The results of his work were incorporated directly into the survey of the 'North-East Coalfields' by Threader (1965), the Launceston 1:250,000 geological map (McClenaghan and Baillie, 1974), and early compilation reports prepared by SCOA geologists. The preliminary results of more recent, regional mapping by the Department of Mines have been incorporated into more recent versions of SCOA geological maps (Sansom 1979).

A photogeological survey of E.L. 5/61 prepared by Layton and Associates (1978) for SCOA shows a large N-S lineament on the east side of the prospect and a smaller NW-SE lineament crossing the SW corner. However, field work elsewhere in the Exploration Licence has found that these features often do not correspond to known structural features (Sansom, 1979).

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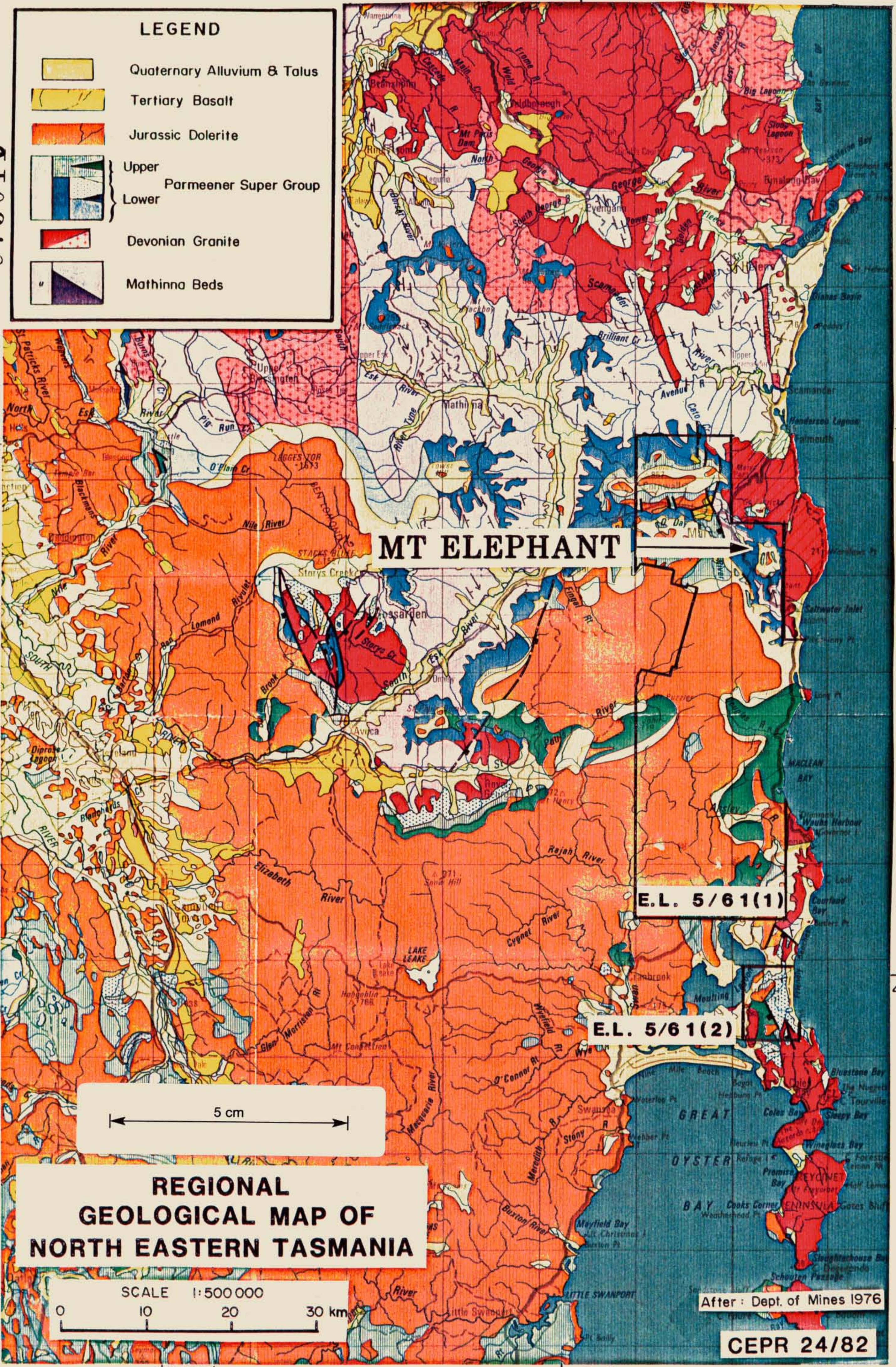


Drg. No. C-1988

FIG.3

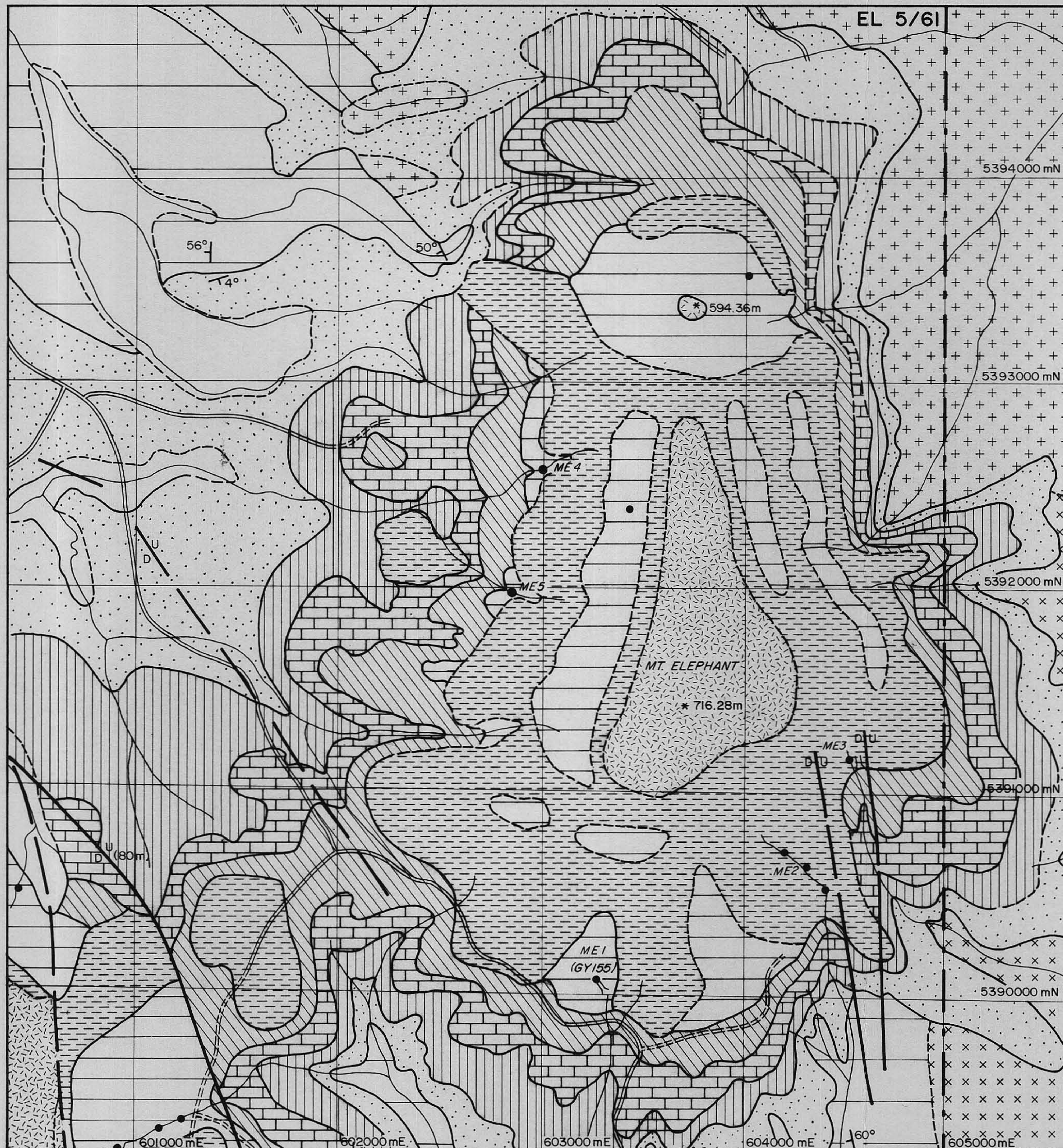
2. GENERAL GEOLOGY

2.1 Regional Setting

The east coast region of Tasmania is composed of a sequence of nearly flat lying marine and fluviatile sediments which were originally deposited in the shallow Tasmania Basin from late Carboniferous to late Triassic (Fig. 3). These rocks rest unconformably on an uneven basement of steeply dipping beds, composed of quartzite, sandstone, shale and slate (Mathinna Beds), and late Devonian granitic rocks (Leaman and Richardson, 1981). During the Jurassic, thick dolerite sills and dykes were intruded into the upper part of the Tasmania Basin, and now form a widespread undulating plateau obscuring the underlying sediments.

Faulting accompanied the dolerite intrusion and reoccurred in the early Tertiary to form a series of predominantly north-northwest striking normal faults (Hale, 1962). Joint patterns with a similar trend occur in the late Paleozoic rocks and overlying sediments, comprising a primary set trending north-northwest and a secondary set trending north-northeast. Comparison of joint and fault trends suggest that tensional stress fields have persisted from the late Paleozoic to the early Tertiary (McNeil, 1965, Williams, 1967). During the Pleistocene, periglacial activity has produced thick deposits of dolerite talus at the base of the dolerite escarpments (Davies, 1962).

Banks *et. al.* (1973) introduced the name Parmeener Supergroup to include all of the sedimentary rocks deposited in the Tasmania Basin. This unit has been subdivided into two broad lithofacies; a lower division comprising marine and glacial sediments, and an upper division consisting of fluviatile sediments (Forsyth *et. al.* 1973). In the east coast region, the total sequence is diminished; several units which occur further west are not present and evidence from megaspores and potassium-argon dating indicates that a major disconformity separates the lower division (Permian) from the upper division (late Triassic). (Townrow, 1962, Calver and Castleden, 1981).

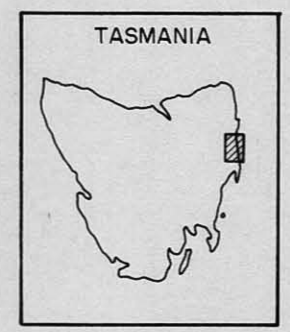


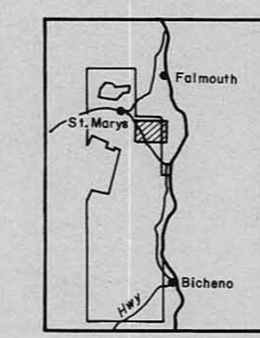
LEGEND

LITHOLOGY	FORMATION	GROUP	SERIES
Alluvium			Quaternary
Dolerite talus			
Dolerite			Jurassic
Lithic sandstone, coal, mudstones		Upper Division	Triassic
Poorly sorted mudstone	Ferntree Mudstone } equiv.	Lower Division (Parmeener Supergroup)	Permian
Calcareous shale and siltstone, limestone	Berriedale Limestone		
Poorly sorted siltstones and pebbly sandstones	Gray Siltstone & Sandstone (informal)		
Quartz sandstone, mudstone, shale, conglomerates in basal section			
Regional Unconformity			
Quartz - feldspar - pyroxene porphyry	St. Marys Porphyry		Devonian
Adamellite			
Quartzwacke and mudstone	Mathinna Beds		? Silurian - Devonian

SYMBOLS

- 30° Strike and dip
- Geological boundary
- Inferred geological boundary
- D/U Fault
- Inferred fault
- Creek
- ME 4 Coal outcrop
- Adit
- Road
- Track
- Boundary of E.L. 5/61





5 cm

SCALE 1: 20 000

0 500 1000 1500 2000 metres

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TASMANIA - GRAY 5/61

MT ELEPHANT AREA

GEOLOGICAL MAP

Scale 1: 20000

Author: Modified from Mc Neil (1965)	Date: August 1982	Fig. 4
Report No: CEPR 24/82	Drawing No: 2642	

2.2 Geology of Mt Elephant

Mt Elephant comprises an outlier of coal measures (upper division) resting on an upthrown block of lower division sediments and capped with a remnant of the dolerite sheet. It is separated from the main expanse of coal measures by the Gray (Cornwall) Fault (McNeil, 1965). The contact between the two units is disconformable, and decreases from 460m a.s.l. at the north to 430m at the south end of Mt Elephant (Sansom, 1979).

The following description of the geology is based upon the work of McNeil (1965) with the stratigraphic terminology modified to follow the recommendations of Forsyth et. al. (1973). The geology of Mt Elephant is illustrated in Fig. 3.

2.2.1 Mathinna Beds and Granites

The oldest rocks in the area - the Mathinna Beds, consist of poorly sorted quartz sandstones interbedded with mudstones which underwent very low grade regional metamorphism during the early to middle Devonian (Turner, 1980). The St Marys Porphyry (quartz-hypersthene porphyry) and Piccaninny Creek adamellite were emplaced on the western side of the prospect during the late Devonian. The contact between the two units is obscured by the overlying sediments.

2.2.2 Lower Division of Parmeener Supergroup

The predominantly marine sediments of the lower division are found around the lower slopes of Mt Elephant and below Elephant Pass. McNeil (1965) was able to subdivide the sequence into 6 units and they are summarised in Table 1. The total thickness of the lower division is estimated to be between 140-160m.

2.2.3 Upper Division of Parmeener Supergroup

This unit comprises approximately 200m of grey-brown and yellow lithic sandstones interbedded with shales and coal seams. The sandstone is medium to fine grained and consists of rock fragments (70-80%) and quartz (15-20%) with minor plagioclase and mica.

TABLE 1 - LITHOLOGICAL UNITS OF LOWER DIVISION OF PARMEENER SUPERGROUP

Unit Top of Sequence	Lithology	Approximate Thickness (m)	Postulated Environment of Deposition
Ferntree Mudstone	Light to dark grey, poorly sorted silty mudstone. Scattered quartz fragments and pebbles.	27	Marine with glacial dropstones.
Correlate of Risdon Sandstone	Very poorly sorted pebbly sandstone, pebbles composed of metamorphic rocks Glauconite 15-40% occasional conglomerate beds.	Decreases from 30m at the north end to 1m at the south end of Mt Elephant.	Marine
Berriedale Limestone	Calcareous shales and siltstones, limestone. Bryozoans and brachipods abundant. Scattered pebbles and cobbles.	43	Marine
Grey Siltstone and Sandstone	Yellow to grey brown, poorly sorted sandstones and siltstones. Pebbles consisting of Mathinna beds and quartz.	35	Marine
Mt Elephant Sandstone	Quartz sandstones with interbedded mudstone and shale. Few thin conglomerate beds composed of quartz and Mathinna beds. Cross bedding common.	30	Shallow, marine
Wardlaw Conglomerate	Very poorly sorted conglomerate and coarse sandstone. Composed Mathinna sediments, quartz and rare granite.	7	Non marine?
Base of sequence			

Carbonaceous and claystone pellets and lenses are common. The base of the unit is marked by a discontinuous lenticular granule conglomerate up to 12m thick.

McNeil (1965) was unable subdivide the coal measures into smaller units and instead collectively grouped the rocks into the Triassic system. Although he recorded the position of several coal outcrops, he did not provide any descriptions.

The coal measures were probably deposited in an upper flood plain environment. Seam washouts caused by stream channels are common in the Duncan Mine at Fingal, and have also been inferred from three drillholes at Mt Nicholas (Kind, 1979; Wollff et. al. 1981). It is probable that they may be encountered at Mt Elephant.

2.2.4 Dolerite

Two small outliers of dolerite cap Mt Elephant and the knoll to the north, and vary in thickness from 16 to 200m. The contact with the underlying coal measures appears to be slightly transgressive. There is apparently no evidence of dykes intruding the coal measures (McNeil, 1965).

In Tasmania the Mid Jurassic dolerite intrusives generally exhibit a sharp boundary and are associated with a narrow zone of thermal metamorphism (Leaman, 1975). It is unlikely that the dolerite has significantly affected the coal measures at Mt Elephant.

2.2.5 Talus

The upper slopes of Mt Elephant are covered in talus, composed of dolerite, and varying in size from pebbles to boulders 5m across, set in a clay matrix.

There is some disagreement over the distribution of the talus; McNeil believed it formed a continuous cover whereas later mapping (Sansom, 1979) showed the talus as discrete bodies. However it has been found from work at Mt Nicholas that it is very difficult to map distribution of talus accurately from outcrops without the evidence from a large number of drillholes.

2.3 Structure

Mathinna Beds are steeply dipping and tightly folded about a N-NW axis. A regional unconformity separates the Parmeener Supergroup sediments from the underlying granites and Mathinna Beds.

Measurements of dip and difference in elevation of the Berriedale Limestone indicates that the Parmeener Supergroup has a regional dip of about 4 degrees to the south. Locally, steep dips (30°) may be encountered in the vicinity of faults where drag movement has occurred.

Tensional faulting during the late Cretaceous and early Tertiary have formed several north-northwest trending normal faults. Evidence for faulting is based upon displacement of the marine sediments of the lower division, particularly the prominent limestone beds. The authors - Everard (1951), McNeil (1965), Sansom (1979) agree that Mt Elephant is an upthrown block bounded to the east and to the south by a major fault, the Cornwall fault (or termed Gray fault by McNeil), but differ over the detailed structure of the coal measures. Three alternative structural interpretations are illustrated in Fig. 5.

Drilling south of St Marys has shown that the Cornwall fault is downthrown 60m to the west. McNeil (1965) and Everard (1951) postulated a second fault lying parallel to the Cornwall fault crossing the Tasman Highway at the turnoff to Gray. Evidence for this fault was not recognised by the Department of Mines geologists (Sansom, 1979).

On the south and east sides of Mt Elephant, Everard (1951) showed five small faults striking north-northeast. McNeil (1965) reduced the number to two normal faults situated on the eastern side, and estimated their displacement as 16 and 30m. This interpretation was simplified further by the Department of Mines; the two faults were replaced by a single fault.

Smaller scale faulting (displacement up to 10m) probably exists in the prospect although it is very difficult to detect by field mapping. Where such faults have been encountered in the Dalmayne and Fingal Valley coal mines they rarely extend more than 500m laterally (Wollff et. al. 1981).

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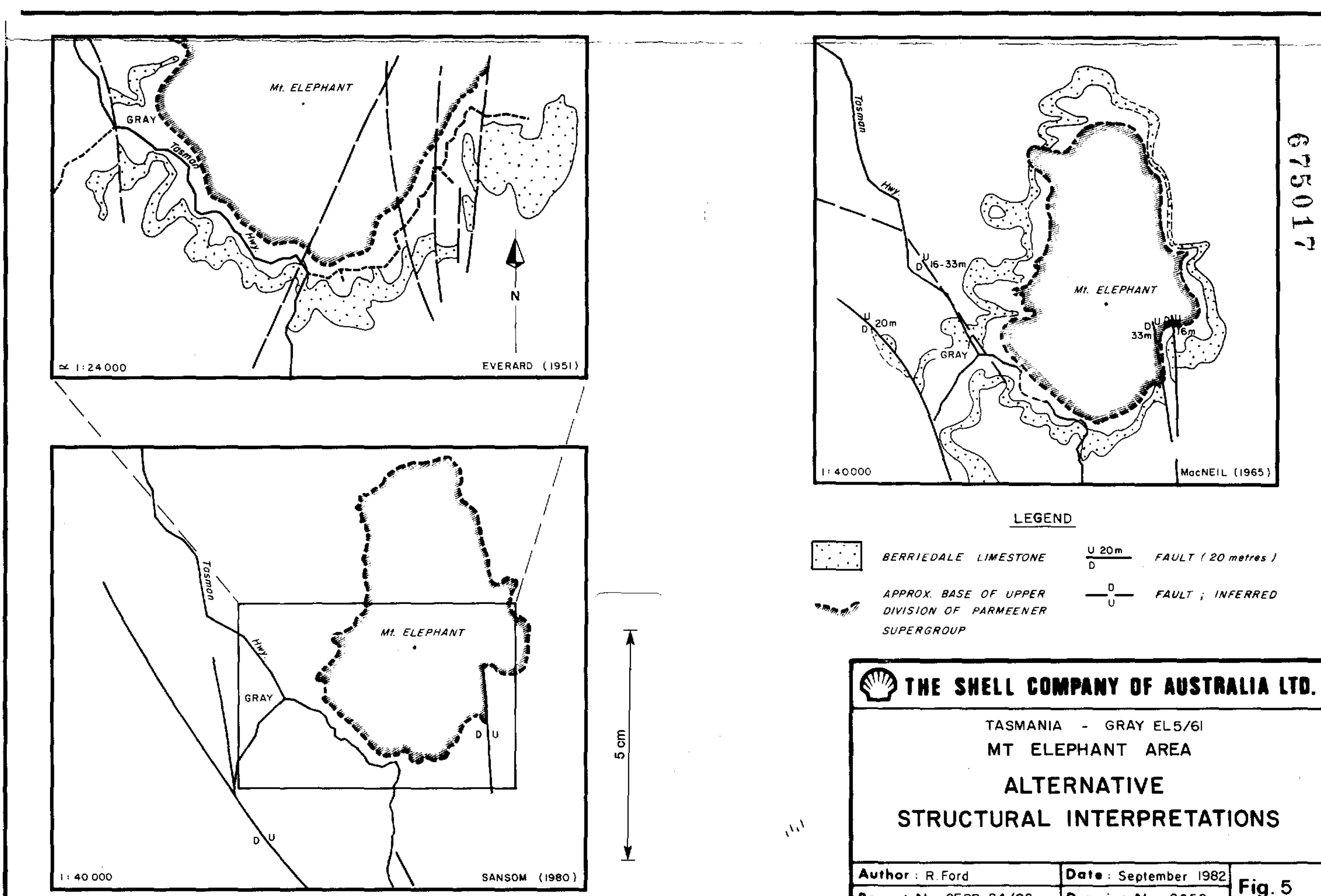

Mt. ELEPHANT
GRAY
Tasman
Hwy.
N
≃ 1:24000
EVERARD (1951)
Mt. ELEPHANT
GRAY
Tasman
Hwy.
D U
D U
1:40 000
SANSOM (1980)
5 cm
Tasman
Hwy.
U 16-33m D
U 20m D
GRAY
Mt. ELEPHANT
D U 33m
6m
1:40000
MacNEIL (1965)
LEGEND
BERRIEDALE LIMESTONE
APPROX. BASE OF UPPER DIVISION OF PARMEENER SUPERGROUP
U 20m / D FAULT (20 metres)
D / U FAULT ; INFERRED
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA - GRAY EL5/61
MT ELEPHANT AREA
ALTERNATIVE STRUCTURAL INTERPRETATIONS
Author: R. Ford
Date: September 1982
Report No: CEPR 24/82
Drawing No: 2659
Fig. 5

McNeil (1965) noted that the presence of minor faults was responsible for the cessation of mining operations on Mt Elephant. However the quoted angle (35°) in adit ME1 indicates that the structure encountered may have actually been a washout.

Three major joint trends are developed in the Parmeener Supergroup at 350, 35 and 75 degrees. The patterns are broadly similar to joint sets found at Mt Nicholas (Wollff et. al. 1981) and Roys Hill (Williams, 1969) which is believed to indicate an east-west tensional stress field.

3. COAL RESOURCES

3.1 Coal Outcrops and Mining History

McNeil (1965) in his survey noted only the position of coal outcrops, and provided no quantitative information or detailed description of the coal. During the 1982 exploration programme three of the five outcrops noted by McNeil were found, the exceptions being two on the north and west slopes. Another two outcrops (ME4 and ME5 Fig. 3) were found by Kuhn during his survey. Each outcrop was described, if possible a lithotype description was obtained, and the thickness and elevation of the beds was estimated. One channel sample (GY155R) and a strip sample comprising six plies (GY155) was obtained from the adit (ME1 Fig. 3) on the southern side. Only two streams draining Mt Elephant containing outcrops ME3 and ME4 had reasonably good exposure of the upper division sediments. The location of coal outcrops and adits are shown in Fig. 3, while Table 2 contains a descriptive summary of outcrops >1.0m thick. A more detailed description is contained in Appendix 1.

Most of the coal outcrops tend to be situated near the base of the upper division sequence. The elevation of the thickest outcrops varies from 450m a.s.l. to 490m a.s.l. or about 50-70m above the last outcrop of the Ferntree Mudstone. The upper part of the sequence appears to comprise lithic sandstone with very few coal outcrops.

Apart from the adits, four coal outcrops were located which appeared to represent seams > 1.0m thick although they were not fully excavated. The coal usually occurs in association with thin to medium bedded units of mudstone, carbonaceous mudstone and sandstone. There is insufficient evidence to correlate between the outcrops.

During the late 1940's, two small adits were driven in from outcrops ME1 and ME3 on the south and east sides of Mt Elephant. Two truckloads of coal were mined from GY155 and supplied to the Tasmanian Government Railways. Mining ceased after a sandstone 'wall' dipping 35° to the north was encountered 60 metres from the entrance (A. Royal 1982).

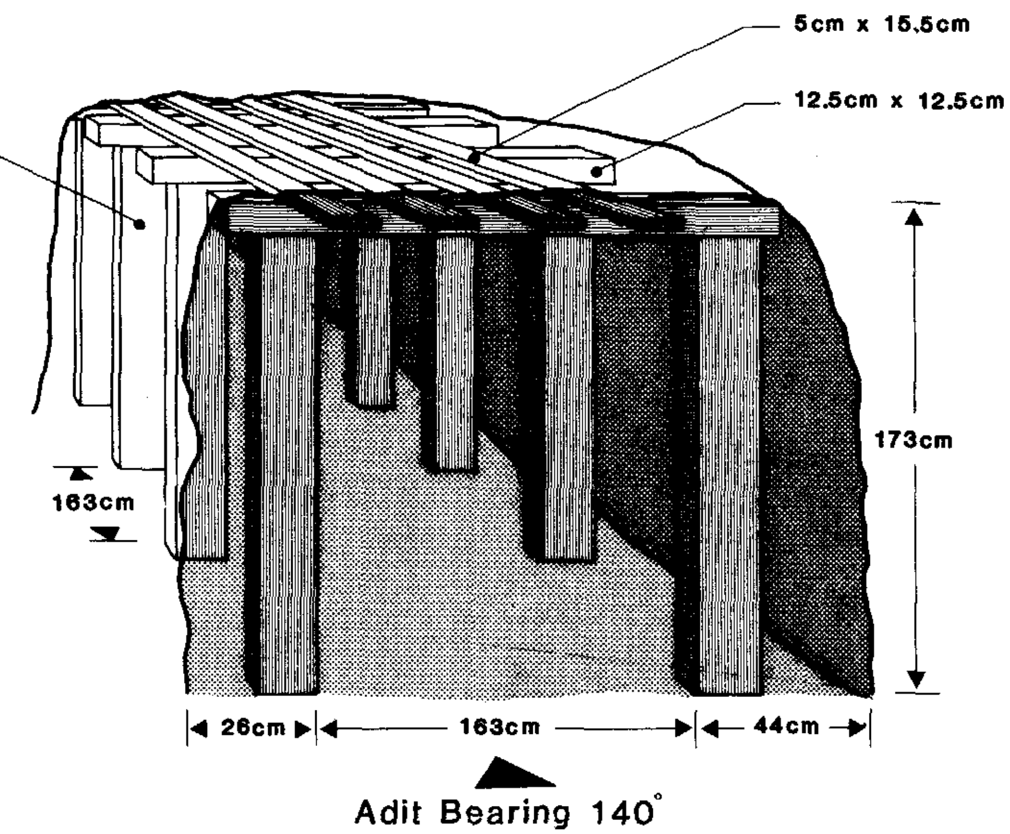
TABLE 2 - SUMMARY OF COAL OUTCROPS >1.0m THICK

Outcrop No:	M.E. 1 (GY155)	M.E. 2	M.E. 3	M.E. 4
Location:	602280 ME 539120 MN	604280 ME 5391680 ME	604560 ME 5391120 MN	609310 ME 5392680 MN
Elevation (a.s.l.; ± 20m)	450	470	480	450
Description:	Adit, 1.70m of dull coal with minor bright bands	(a) Dull coal containing bright band 1m thick. Base of seam is not exposed. Overlain by thin-medium beds of coal, mudstone, carbonaceous mudstone. (b) 17m above outcrops (a). Bright coal with dirt band, 1.2m thick. Base of seam obscured by talus. (c) 20m above outcrop (a). 1.9m of coal with 0.3m of mudstone band. Top of seam obscured by talus.	Adit, entrance has collapsed exposing carbonaceous mudstone roof 0.6m thick	Coal, 1.5m thick contains 0.15m 'dirt' band. Base of outcrop not exposed.

TASMANIA 675021

MT ELEPHANT E.L. 5/61

PERSPECTIVE VIEW OF MINE SUPPORTS IN ADIT ME 1



Author: R. Ford	Date: August 1982	Fig. 6
Report No: CEPR 24/82	Drawing No: 2648	

Both adits were visited to obtain information on potential mining conditions. Unfortunately the portal at ME3 had collapsed blocking the entrance, however, the adit at ME1 was found to be in good condition, with the props and wooden rails still in position.

The dimensions and spacing of the props is illustrated in Fig. 6. At the entrance, the roof is composed of a slightly weathered carbonaceous mudstone and mudstone. The absence of wall lagging or significant roof lagging indicate that the mining conditions were perceived to be stable. After 30 years, the good condition of the entrance, lack of overbreak, floor heave or rock falls implies that this assumption was well founded.

3.2 Coal Quality

Fig. 7 shows that the seam, at ME1 has a homogeneous appearance; the coal is dull with a few bright bands and no dirt bands.

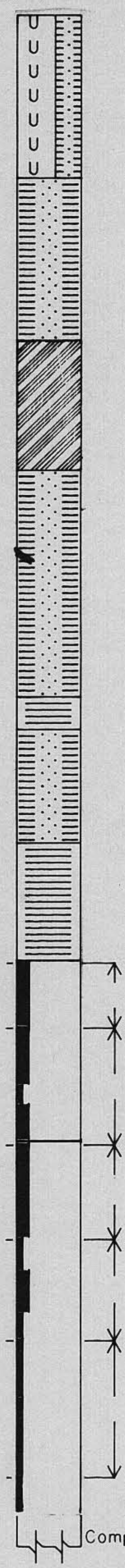
One channel sample (GY 155R) and a strip sample comprising six plies (GY155) were obtained from the adit. The purpose of ply sampling was twofold: Firstly to describe the vertical distribution of coal quality parameters, thus enabling an objective definition of the working section; and secondly to compare float/sink results with those of the channel sample as a check on sampling accuracy, and to assess the effect of sizing on ash liberation. The purpose of the channel sample was to simulate and assess the washability characteristics of a 'run of mine' product. The mass of the sample (7.33 kg) was smaller than the minimum mass recommended by Australian Standard (A.S. 1661). However, the results indicate that this would not constitute a significant shortcoming for this type of coal.

The analytical method is outlined in Appendix 2. The raw ash, proximate and relative density results are shown in Fig. 7. The results of the float/sink and size testing are summarised in Figs. 8, 9 and Table 4 whilst the detailed results are contained in Appendix 2 and Table 3.

It should be emphasised that the results and the conclusions are based on one sample point and may not be respresentative of that seam or other seams at Mt Elephant. At Mt Nicholas all individual seams show

GY155

COAL ANALYSIS



DEPTH M	SAMPLE NO	THICKNESS M	R.D.	MOISTURE %	ASH %	VOLATILE MATTER %	FIXED CARBON %	MASS
0.00								
2.91M	1	0.20	1.80		48.8			
3.11M	2	0.36	1.57	5.9	29.1	17.8	47.2	
3.47M	3	0.29	1.67		40.3			
3.76M	4	0.31	1.64		37.6			
4.07M	5	0.42	1.53	4.6	24.4	26.5	44.5	
4.49M	6	0.12	1.68		39.8			
4.60	Composite 1–6	1.70	1.70		34.9			
CHANNEL SAMPLE (GY155R)	1	1.70	1.67	4.6	34.5	19.6	41.3	7.33 kg

LEGEND

BRIGHTNESS PROFILE REFERENCE

- COAL - UNDIFFERENTIATED
- COAL - BRIGHT
- COAL - BRIGHT WITH DULL BANDS
- COAL - INTERBANDED DULL AND BRIGHT
- COAL - MAINLY DULL, FREQ. BRIGHT BANDS
- COAL - DULL WITH MINOR BRIGHT BANDS
- COAL - DULL
- COAL - WEATHERED
- COAL - CINDERED
- COAL - STONY

LITHOLOGY REFERENCE

- SOIL
- MUDSTONE
- COAL
- CARBONACEOUS MUDSTONE

VERTICAL SCALE
1:20

0.4 0.2 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

METRES

5 cm

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION

TASMANIA - GRAY E.L.5/61
MT ELEPHANT AREA

GY 155
DETAILED SEAM INTERVAL

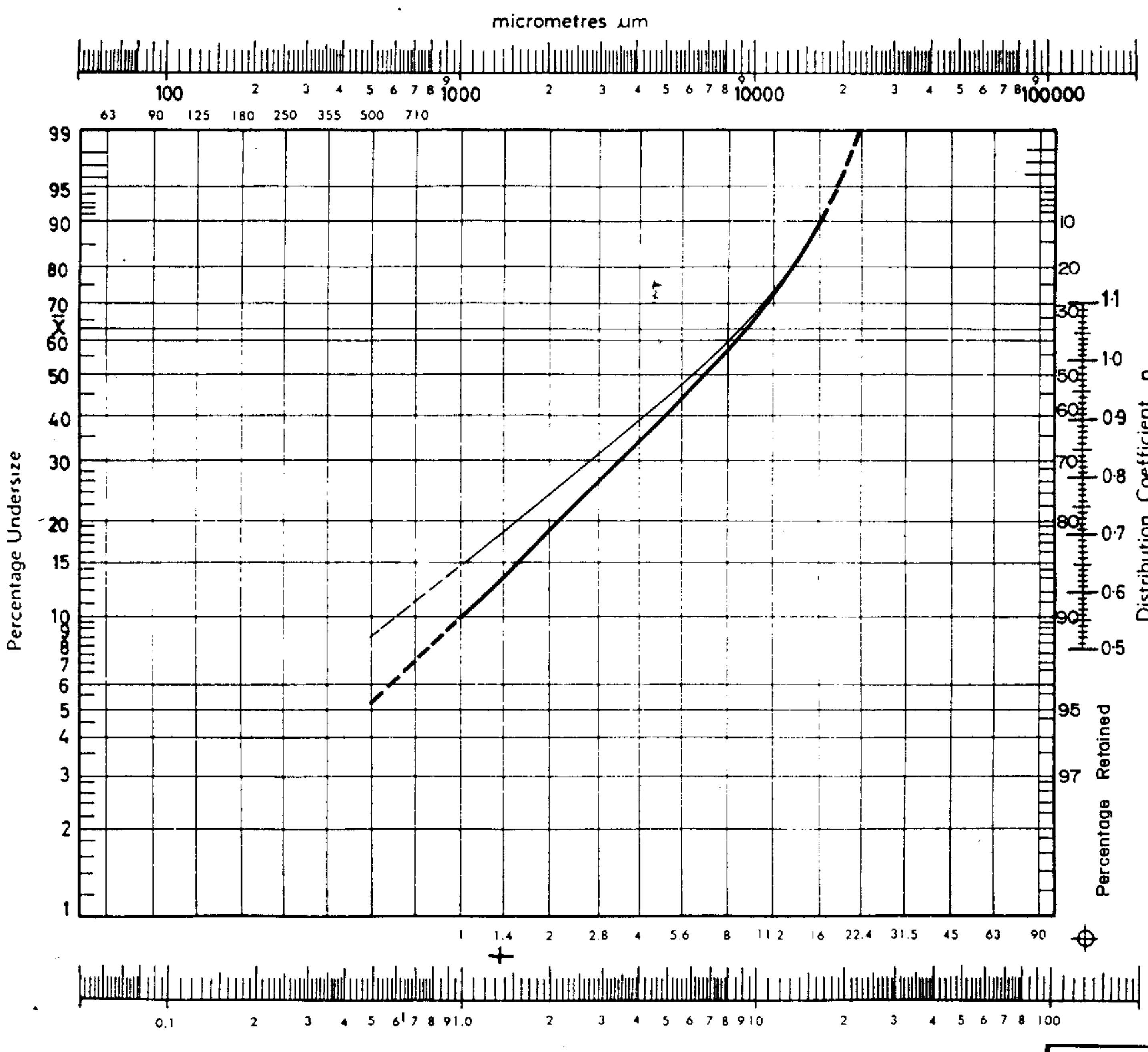
AUTHOR: R. Ford | DATE: September 1982
REPORT NO: CEPR 24/82 | DRAWING NO: 2660

Fig. 7

TABLE 3 - SIZE ANALYSIS

Sample	Depth to Base (m)	Thickness (m)	Sample State	Sample Size (mm)	Fractional Mass %	Fractional Ash %	Cumulative Mass Retained %	Cumulative Mass Undersize %
GY155R	4.61	1.70	Raw	-22.5 + 16.0	10.9	-	10.9	89.1
			Broken	-16.0 + 8.0	29.7	-	40.6	59.4
				- 8.0 + 4.0	23.5	-	64.1	35.9
				- 4.0 + 2.0	16.3	-	80.4	19.6
				- 2.0 + 1.0	9.5	-	89.9	10.1
				- 1.0	10.1	-	100.0	0
			Raw	-22.5 + 16.0	10.9	-	10.9	89.1
			Dry tumbled	-16.0 + 8.0	29.7	-	40.6	59.4
				- 8.0 + 4.0	19.8	-	60.4	39.6
				- 4.0 + 2.0	15.0	-	75.4	24.6
				- 2.0 + 1.0	10.4	-	85.8	14.2
				- 1.0	14.2	-	100.0	0
			Raw	-22.5 + 5.6	31.2	36.4	31.2	68.8
			Wet tumbled	- 5.6 + 0.5ww	47.2	35.3	78.4	21.6
				- 0.5ww	21.6	32.2	100.0	0

Measured mean Hardgrove Index = 76
Distribution Coefficient (as sized) = 0.82
Mass of sample = 7.33 kg



Sample Type:

Channel Sample (GY155R)
-22.5mm + 0.00mm

As Sampled (sized to -22.5 mm)
Distribution Coefficent n = 0.82

Dry Tumbled
Distribution Coefficent n = 0.79

MT ELEPHANT

ROSIN - RAMMLER

SIZE DISTRIBUTION CURVES

5 cm

Author: R. Ford	Date: September 1982	Fig. 8
Report No: CEPR 24/82	Drawing No: 2662	

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an improvement in quality from south to north and this may indicate a regional pattern.

The raw ash content of the ply samples is high varying from 24.4% (a.d.) to 48.8% (a.d.). The composite mean of 34.9% agrees well with the value of 34.5% obtained from the channel sample. The volatile matter content ranges from 27.4% (d.a.f.) to 37.3% (d.a.f.) and the coal can thus be classified as a high volatile bituminous coal. There is no apparent reason for the anomalously low volatile content of 27.4% (recorded near the top of the seam) however it may indicate the presence of a dyke, for which there is presently no other evidence.

The determined Hardgrove Grindability Index (H.G.I.) of 76 was considered anomalous for the area and possibly was caused by oxidation. Consequently the sample was sized according to A.S. 2519 on the basis of an H.G.I. of 50, this value being generally representative of other coals in the area. Consequently the duration of wet tumbling as recommended by A.S. 1661 was very short and resulted in very little further size degradation of the sample. The raw ash values of the size fractions are generally consistent and confirm the apparent homogenous nature of the coal (Fig. 8).

TABLE 4

SUMMARY OF FLOAT/SINK TESTS

	Composite of ply samples -5.6mm + 0		Channel Sample -22.5mm + 0.5ww	
	Cumulative		Cumulative	
R.D.	Mass %	Ash %	Mass %	Ash %
F 1.40	1.3	5.4	0.9	9.4
F 1.50	13.0	10.4	16.0	14.5
F 1.60	29.0	16.5	33.3	20.5
F 1.70	50.1	20.7	52.9	24.0
F 1.80	65.7	24.3	67.6	26.9
F 1.90	76.8	27.0	78.6	29.7
S 1.90	100.0	34.9	100.0	34.5

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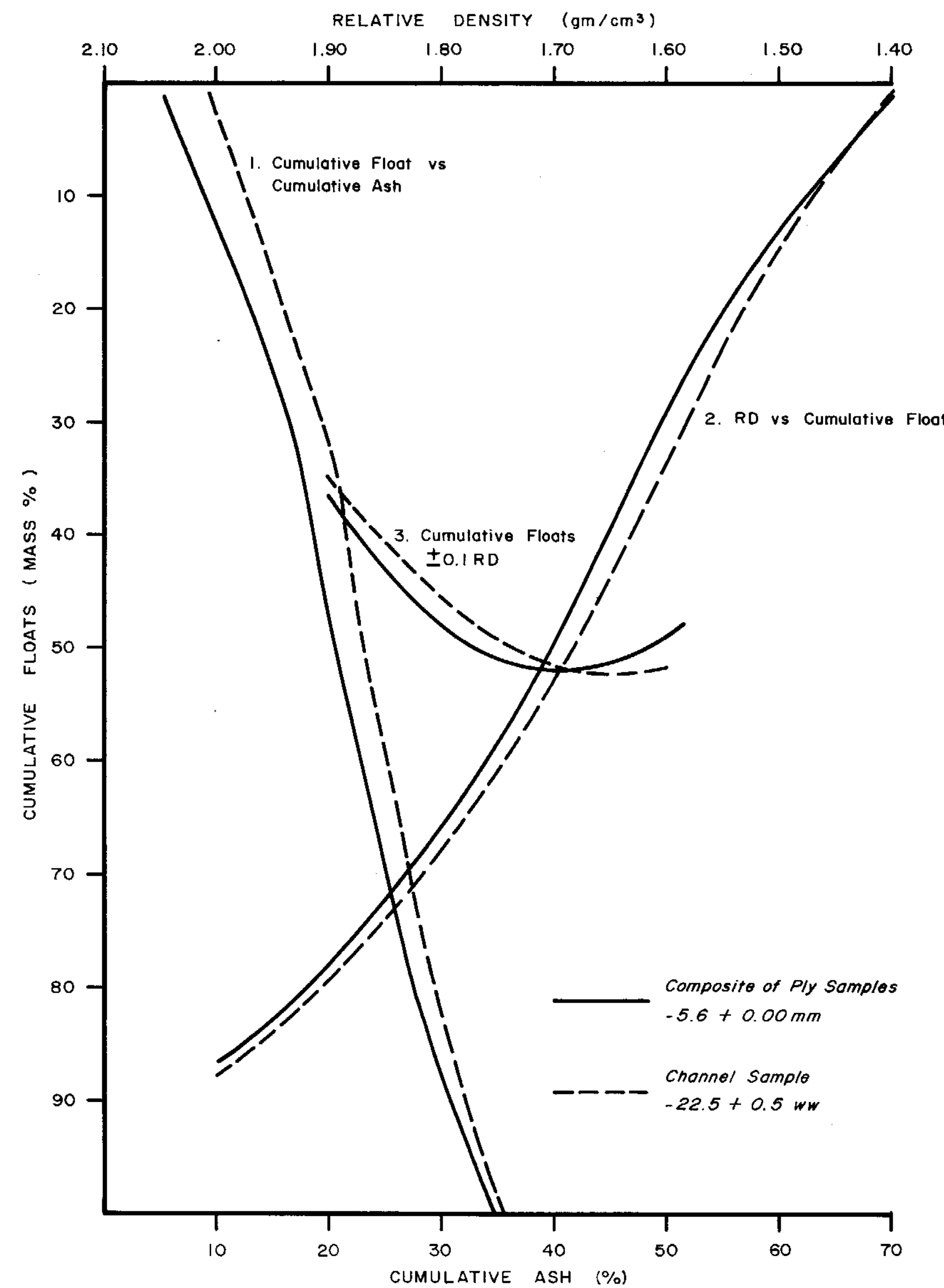
FLOAT - SINK CURVES FOR GY155 - MT ELEPHANT



Author: R. Ford	Date: September 1982	Fig. 9
Report No: CEPR 24/82	Drawing No: 2661	

Float/sink testing indicates low yields for an acceptable level of product (Fig. 9). The ash is distributed in finely disseminated form, and reducing the particle size from 22.5mm to 5.6mm does not significantly improve ash or coal liberation.

Graph 3 (Fig. 9) shows that the coal contains a very high percentage of near density material at ideal separation densities implying that it would be exceedingly difficult to efficiently separate the coal from the ash.

3.3 Potential Reserves

There is sufficient evidence from the distribution of coal outcrops and the analytical data from ME1 to estimate the size of the coal resource at Mt Elephant.

In order to calculate the size of the coal resource, a coal seam was assumed to have an elevation of 470m a.s.l. and to be continuous. The area was measured on a 1:20,000 map with a planimeter. The likely minimum and maximum volumes of the in situ resource were calculated by assuming alternate seam thicknesses of 1.5m and 2.0m respectively. An R.D. of 1.62 was used, based upon the result from the ply sample at GY155, to convert this to a tonnage.

Seam thickness (m)	1.5	2.0
Area (km^2)	5	5
In situ reserves (x 10^6 tonnes)	12	16
Assuming 60% recovery (x 10^6 tonnes)	7	10

The geological evidence is considered to be such that these reserves should not presently be classified. No allowance has been made for the possibility that reserves may exist in other seams.

4. REFERENCES

Anon, 1979. Float and sink testing of hard coal and presentation of results. Standards Association of Australia As. No. 1661.

Banks M.R., 1973 General Geology in 'The Lake Country of Tasmania'. Royal Society of Tasmania, pp 25-34.

Calver C., Castleden, R.H., 1981. Triassic basalts from Tasmania Search Vol. 12 (1-2) pp 40-41.

Dames and Moore,1981. Prefeasibility study : Proposed underground coal mine Mt Richards, Tasmania. 2 Vols. Unpublished report for Shell Company of Austra.

Davies J.L., 1962 Geomorphology and Glaciation in 'Geology of Tasmania' edited by Spry, A. and Banks M.R. Journal of the Geological Society of Australia Vol. 9 (2), p 362.

Everard G,, 1957 'Limestones in Tasmania' by Hughes T.D. Tasmania Department of Mines, Geological Survey - Mineral Resources No. 10.

Forsyth, C.M. et. al. 1973. Status and Subdivision of the Parmeener Supergroup.
Papers and Proceedings of the Royal Society of Tasmania, 108 : pp 107-109.

Hale, G.E., 1962. 'Triassic System' in Geology of Tasmania edited by Spry, A. and Banks, M.R.
Journal of the Geological Society of Australia, Vol. 9 (2), p 362.

Hills, L. et. al. 1922. The Coal Resources of Tasmania. Geological Survey of Tasmania, Mineral Resources No. 7.

675030

Kind, H.D., 1979 Sedimentation Pattern in the Triassic at Fingal Colliery, North Eastern Tasmania. Shell Company of Australia unpublished report.

Layton and Associates Pty Ltd., 1978. Notes to accompany photo-geological plans of exploration licences, E.L. 5/61 and E.L. 18/77. Unpublished report for the Shell Company of Australia.

Lands Department 1979., 'Break O'Day'. *Land Tenure Index Series*. 1:100,000, Hobart.

Leaman, D.F. 1975, Form, Mechanism, and Control of Dolerite Intrusion near Hobart, Tasmania Journal of the Geological Society of Australia Vol 22: 175-186.

Leaman, D.E. and Richardson, R.G., 1981. Gravity survey of the East Coast coalfields. Tasmania Department of Mines Geological Survey Bulletin No. 60, p 77.

MacKinnon K., et. al. 1980. Climate Survey, Tasmania. Region 3, Northern. Bureau of Meteorology, Department of Science and the Environment, Canberra, p 64.

McClenaghan, M.P., Baillie, P.W., 1974. Launceston. 1:250,000 Sheet 4, Geological Atlas Series, Department of Mines, Tasmania.

McNeil, R.D., 1965. The Geology of the Mt Elephant - Piccaninny Point Area, Tasmania. Papers and Proceedings of the Royal Society of Tasmania. Vol. 99, pp 27-49.

Patterson, C.L., 1982. Technical Appraisal of Tender Area, S.R. 32/81 - Fingal Tier. Unpublished memorandum, Shell Company of Australia.

Royal, A., 1982 "Yennif", Bicheno personal communication.

Sansom, P.W., 1979. Report on Geological Mapping in The Douglas and Denison Valleys, E.L. 5/61, Gray. Unpublished report no. CEPR 31/79, Shell Company of Australia.

Threader, V.M., 1968. Geology of the north-east Tasmanian Coalfields. Unpublished report, Department of Mines, Tasmania.

Townrow, J.A., 1962. Palaeontology of the Triassic System in 'Geology of Tasmania' edited by Spry, A. and Banks, M.R. Journal of the Geological Society of Australia, Vol. 9 (2), p 362.

Turner, N.J., 1980. A summary of the Geology of North Eastern Tasmania, pp 2-6. Abstracts from conference 'Coal, Tin Surficial Deposits and Geology of N.E. Tasmania' edited by Green, D.C. and Williams, P.R. Geological Society of Australia.

Williams, E., 1969. The repeated development of identical joint patterns, north-east Tasmania. Geological Magazine, Vol. 106 (4), pp 362-369.

Wollff, I.M., et. al. An assessment of the Mt. Nicholas Coal Deposit - Geology and Reserve estimation, Volume 1A. Unpublished report, no. CEPR 11/81 Shell Company of Australia.

APPENDIX 1 - DESCRIPTION OF OUTCROPS

Grid References estimated from 1:20,000 photogrammetric plots: Cornwall, Falmouth, Gray, Seymour.

Elevation: Estimated from maps ± 20m.

M.E.1 - (GY 155).

Location: An adit situated in a creek on southern slope of Mt. Elephant. Grid ref. 602280m E, 539120 m N.

Elevation: 450m.

A detailed seam section and analytical results from ply and bulk samples are shown in Fig. 7.

DEPTH TO BASE METRES	THICKNESS METRES	SAMPLE NUMBER	ROCK TYPE	GEOLOGICAL DESCRIPTION
0.05	0.50		60% soil 40% mudstone	Grey-brown. Screen, grey-brown. Weathered to soil, weakly cemented.
1.00	0.50		100% mudstone	Silty, carbonaceous, grey-brown, high weathered, weak rock, with plant remains, non slaking, non sticky.
1.40	0.40		100% coal	Black, slightly weathered, weak rock, non slaking, sticky.
2.10	0.70		100% mudstone	Silty, carbonaceous, dark brown, slightly weathered, weak rock, thick bedding, abrupt basal contact, beds dip 1 deg., with plant remains, non slaking, non sticky.

DEPTH TO BASE METRES	THICKNESS METRES	SAMPLE NUMBER	ROCK TYPE	GEOLOGICAL DESCRIPTION
2.20	0.10		100% carbonaceous mudstone	Silty, lenses, dark brown, slightly weathered, weak rock, moderately thick bedding, beds dip 1 deg., slow slaking non sticky.
2.55	0.35		100% mudstone	Silty, fossiliforrous, grey-brown, slightly weathered, weak rock, thick bedding, beds dip 1 deg., non slaking, non sticky.
2.91	0.36		100% carbonaceous mudstone	Silty, dark brown, slightly weathered, weak rock, thick bedding, abrupt basal contact, beds dip 1 deg., slow slaking, non sticky.
3.11	0.20	1	100% coal, dull with few bright bands	Black, unweathered, weak rock, thick bedding, beds dip 1 deg., non slaking, non sticky.
3.29	0.18	2	100% coal, dull with few bright bands	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.
3.35	0.06	2	100% coal, dull	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.
3.46	0.11	2	100% coal, dull with few bright bands	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.
3.47	0.01	2	1% coal, bright	Black, unweathered, weak rock, thin bedding, beds dip 1 deg., non slaking, non sticky.
3.76	0.29	3	100% coal, dull with few bright bands	Black, unweathered, weak rock, thick bedding, beds dip 1 deg., non slaking, non sticky.

DEPTH TO BASE METRES	THICKNESS METRES	SAMPLE NUMBER	ROCK TYPE	GEOLOGICAL DESCRIPTION
3.86	0.10	4	100% coal, mid lustrous dull	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.
3.99	0.13	4	100% coal, dull with few bright bands	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non salking, non sticky.
4.07	0.08	4	100% coal, mid lustrous - dull	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.
4.25	0.18	5	100% coal, dull	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.
4.49	0.25	5	100% coal, dull	Black, unweathered, weak rock, thick bedding, beds dip 1 deg., non slaking, non sticky.
4.61	0.12	6	100% coal, dull	Black, unweathered, weak rock, moderately thick bedding, beds dip 1 deg., non slaking, non sticky.

M.E. 2

Location: Section is situated in the creek which forms the southern boundary of Mt Elephant farm. Base of the section is the bridge on 4 wheel drive track. Grid ref. 604280m E, 5391680m N.

Elevation: Base of the section - 470m a.s.l.

TOP OF SECTION

DESCRIPTION OF OUTCROPS	VERTICAL THICKNESS (M)
Dolerite talus	
Sandstone exposed discontinuously over 100m of creek bed	
Mudstone	-
Coal	0.4
Sandstone exposed 20m in creek bed	
Coal	0.7
Mudstone	0.3
Coal	1.2
Outcrops obscured by dolerite scree for several metres	
Bright coal containing dirt band	1.2
Carbonaceous mudstone	15.0

TOP OF SECTION

DESCRIPTION OF OUTCROPS (cont'd)		VERTICAL THICKNESS (M)
Outcrop obscured for 2m along creek.		
Coal		0.2
Carbonaceous mudstone		0.1
Coal		0.15
Carbonaceous mudstone		0.5
Mudstone		0.1
Coal		0.3
Mudstone		0.1
Carbonaceous mudstone		0.6
Coal		0.3
Mudstone		0.6
Carbonaceous mudstone		1.0
Dull stony coal	)	
Bright coal	)	1.0
Dull coal	)	
Base of Section		

M.E. 3

Location: Adit situated adjacent to 4 wheel drive track leading to Mt. Elephant farm. Grid ref. 604560m E, 5391120m N.

Elevation: 480m a.s.l.

Description of Outcrop:

Entrance to the adit has collapsed, exposing the roof of the coal seam, a carbonaceous mudstone - 0.6m thick.

M.E. 4

Location: Unnamed creek on western side of Mt Elephant. Grid ref. 609310m E, 5392680m N.

Elevation: Base of section - 450m, a.s.l. approx. 50m above last visible outcrop of Ferntree Mudstone.

TOP OF SECTION

DESCRIPTION OF OUTCROPS	VERTICAL THICKNESS (M)
Dolerite	50.0 (680m a.s.l.)
Discontinuous outcrop of sandstone, contained in coal float 150m above last outcrop	
Coal	0.2
Outcrop obscured by talus	
Coal	0.2
Outcrop obscured by talus	
Coal with stone band - 0.15m thick sandstone	1.5
Outcrop obscured by talus	
Coal	
Sandstone	

Base of section

M.E. 5

Location: Unnamed creek on western side of Mt. Elephant and south of Mt. Elephant 4.
Grid ref. 603020m E, 5391860m N.

Elevation: 480m a.s.l. approx. 50m above last outcrop of Ferntree Mudstone.

TOP OF SECTION

DESCRIPTION OF OUTCROPS	VERTICAL THICKNESS (M)
Dolerite talus	
Sandstone	2.5
Coal	0.3
Carbonaceous mudstone	0.4
Coal	0.8
Carbonaceous mudstone	0.5
Coal	0.4
Carbonaceous mudstone	0.4
Coal	0.6
Sardstone, coaly	0.4
Carbonaceous mudstone	1.2
Sandstone, coaly	0.4

Base of section

APPENDIX 2 - FLOW DIAGRAM OF ANALYTICAL TESTS

Ply Sample

size to -5.6mm

split

Determine:
Relative Density
and ash of plies

Proximate analysis
if ash < 35%

Calculate
composite

Reconstitute
full seam

Float/sinks at
Relative Densities:
1.40, 1.60, 1.70,
1.80, 2.00

Channel Sample

size to 22.5mm

Determine: Hardgrove Grindability Index
Relative Density
Proximate Analysis

Size according to A.S. 2519 by dry tumbling
Wet tumble according to A.S. 1661.

22.5 x 0.5mm ww
Float/sink at Relative Density
1.40, 1.60, 1.70, 1.80, 2.00
calculate: 22.4 x 0.5mm ww
float/sink composite

Yields were considered
insufficient to warrant
further testing of product
coal.

-0.5mm ww
Froth Flotation Test

SAMPLE	DEPTH TO BASE (M)	THICKNESS (M)	SAMPLE SIZE (MM)	SAMPLE STATE	FRACTIONAL MASS %	FRACTIONAL ASH %	CUMULATIVE MASS %	CUMULATIVE ASH %
GY 155	4.61	1.70	- 5.6+0.00	Broken				
composite of				F1.40	1.3	5.4	1.3	5.4
samples				S1.40 - F1.60	27.7	17.0	29.0	16.5
01-06				S1.60 - F1.70	21.1	26.6	50.1	20.7
(ply)				S1.70 - F1.80	15.6	35.7	65.7	24.3
				S1.80 - F2.00	20.8	46.9	86.5	29.7
				S2.00	13.5	66.7	100.0	34.7
GY 155R								
sample 01	4.61	1.70	-22.5+0.5WW	Wet tumbled				
(channel)				F1.40	0.9	9.4	0.9	9.4
				S1.40 - F1.60	32.4	20.8	33.3	20.5
				S1.60 - F1.70	19.6	29.9	52.8	24.0
				S1.70 - F1.80	14.7	37.4	67.6	26.9
				S1.80 - F2.00	20.1	48.8	87.7	31.9
				S2.00	12.3	63.3	100.0	35.8
			-0.5WW	Concentrates	14.5	20.7	14.5	20.7
				Tailings	85.5	34.1	100.0	32.2