

INTERIM REPORT ON THE
GEOLOGY AND COAL RESOURCES
OF THE NORTHEAST COALFIELDS OF TASMANIA.

by

V. M. THREADER

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Abstract

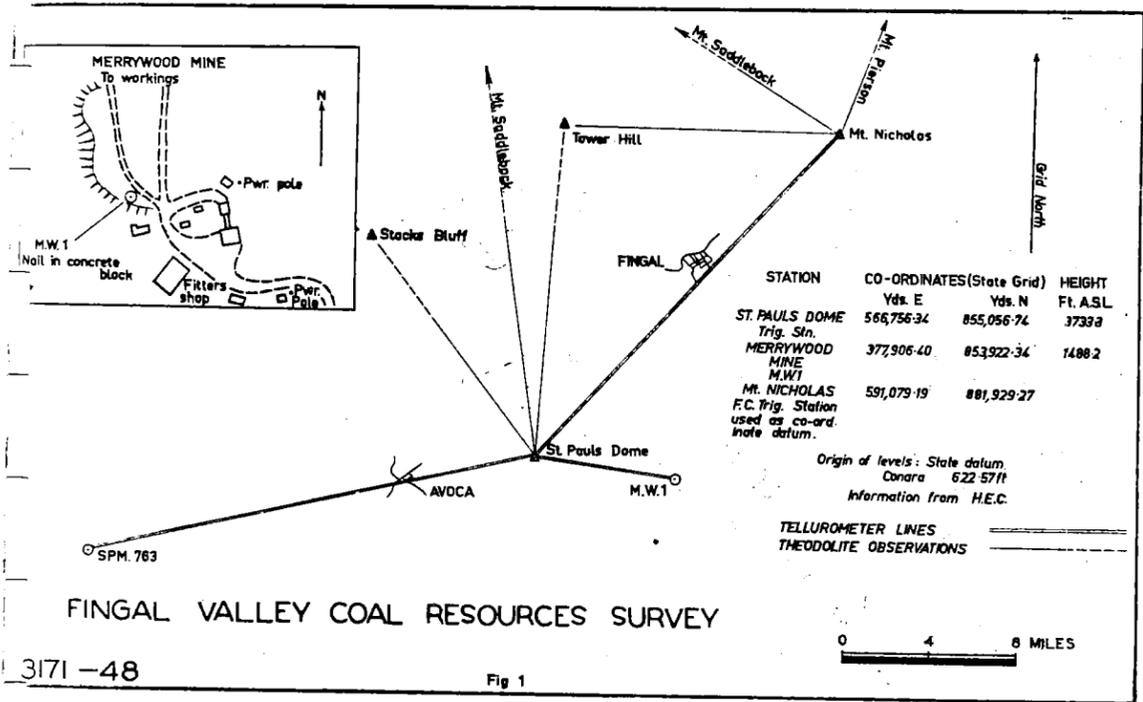
An area of approximately 300 square miles embracing the coalfields of northeastern Tasmania has been geologically mapped and a selected area in the Ringal district has been diamond drilled.

One thousand feet of Triassic sediments have been proved by diamond drilling and one hole (D.W. No. 6) has been logged by radio-activity and electric methods.

Cyclicity of the Triassic sediments is suggested and it is recommended that the techniques be reapplied to succeeding holes in order to arrive at a better understanding of the sedimentary succession.

Diamond drilling and mapping of coal workings is still proceeding and no revised estimate of coal resources is yet warranted.

The records of all drilling and coal assays, etc., are appended.



1.

INTRODUCTION

This report sets out the results of an investigation into the coal mining potential of the South Esk Valley and neighbouring areas (see locality map inset on Fig. 3). It consists of a geological map and report, the results of diamond drilling, a compilation of all relevant existing data and discussion of results and future work to be undertaken and of favourable areas for further diamond drilling.

The base map has been prepared from air photographs by the Mines Department drawing office using a tellurometer and theodolite survey by the H.S.C. for ground control (Figure 1). The positions of all boreholes and mine workings were fixed by closed theodolite and level traverses by Department of Mines Survey, B. Knox and assistant G. James.

The area covered by the geological map is approximately 200 square miles, made up as follows:-

- i. South Esk and St. Pauls Valleys mapped by the writer directly on to air photographs and transferred to the base map. Acknowledgement is made to F. Blake for preliminary mapping in the Snow Hill quadrangle part of which was utilised to cover the area south of St. Pauls River, and to H.G.W. Reid for preliminary mapping in the valley between St. Marys and Fingal.
- ii. North of Avoca, mapped by A.H. Blissett - The Geology of the Rossarden-Storeys Creek district (Bulletin No. 46 Department of Mines Tasmania, 1959).
- iii. North of Fingal mapped by the writer - The Mangana-Waterhouse Goldfields (Thesis Geol. Dep. Univ. Tas. unpubl. 1966).
- iv. Southeast of St. Marys mapped by R.D. McNeil - The Geology of the St. Elephant, Piccaninny Point area (Pap. Proc. Roy. Soc. Tas. Vol. 109, 1965).
- v. East coast coalfields mapped by H.G.W. Reid in The Coal Resources of Tasmania (Mineral Resources of Tasmania No. 7 Dept. Mines Tas. 1962).

With the exception of the boreholes and mine workings, all elevations used in preparation of the geological cross sections were determined by aneroid barometer.

Annual rainfall in the area ranges from 26 inches at Avoca and 27 inches at Richens to 39 inches at St. Marys and considerably more on the dolerite plateau which is mostly above 2000 feet A.S.L. Clearing and cultivation is restricted to the valleys of the South Esk, Break O'Day and St. Pauls Rivers, and to the coastal plain. The coal mining area is principally on the flanks of the dolerite plateau except in the Seymour-Richens area where coal was mined at and below sea level.

HISTORY OF COAL MINING IN TASMANIA

The first recorded discovery of coal in the State was in the South East Cape area by a party of French explorers in 1793. The second and more significant discovery was in 1803-4 on the banks of Coal River at Pittwater.

Coal Mining in Tasmania dates from 1834 when seams in the Tasman Peninsula were worked with convict labour. Coal Mining in the Fingal-St. Marys area began when the Genara (Corners) to St. Marys railway was opened up in 1886. Although this field was late in commencing coal production it has furnished the bulk of the States output, 7,614,060 tons out of a total of 9,409,453 tons, up to the end of 1956.

ACKNOWLEDGEMENTS

The author wishes to thank Mr. W. Tindal, Inspector of Mines of this Department for information given in relation to coal mining in Fingal and neighbouring areas, and to Mr. M. B. Banks, Senior Reader in Geology at the University of Tasmania for identification of fossils. Appreciation is also expressed to Mr. I. B. Jennings, Chief Geologist, and Mr. A. J. Holdart, Senior Geologist (Economic Section), Department of Mines for criticism of the manuscript and helpful advice.

Nathinna Beds

Lower Palaeozoic sediments consisting of slate and phyllite with interbedded siltstone layers and overlain by an interbedded sequence of sandstone and mudstone, known collectively as the Nathinna Beds, form the bedrock of the area. They are folded on NW-SE axes and are intruded by Middle-Upper Devonian granitic rocks. The Nathinna Beds were unconformably overlain in Upper Palaeozoic times and are unconformably overlain by Permian beds. The Nathinna Beds outcrop in the South Esk and St. Pauls valleys and on the E coast but do not occur in the Break O'Day Valley except near the South Esk-Break O'Day confluence and E of the Cornwall fault.

Permian System

Detailed sections of the Permian succession have been compiled by Walker (1957) at Bays Hill N of St. Marys, Baskin (1958) St. Pauls Dome, Blissett (1959) Rossarden - Storeys Creek, and McNeil (1955) Mt. Elephant. A summary of these sections is given in the accompanying table together with sections deduced from the 1890 drilling at Harefield and Killymoon and the thickness of the Fernree formation penetrated in Department of Mines B.H. No. 4. There are no complete sections in the Signal area and composite sections would not be very useful as the various members of the succession are of variable thickness. There is a suggestion of a thinning of Permian beds N of the Break O'Day River in Walker's section at the eastern end of the area mapped and also in the area NE of the South Esk - Break O'Day confluence.

In general, in this area, the section commences with a basal conglomerate approximately 20 feet thick and is followed by freshwater sediments correlated with the Harcey Group of North Western Tasmania. There are no equivalents of the Quashy or Golden Valley Group beds in the area. In the Rossarden-Storeys Creek section, Blissett distinguished between basal beds developed on granitic rocks and those developed on

Locality	Section						Researched
	St. Elephant	Rays Hill	Harefield	Millynoon	D.M. E.H. 4	St. Pauls Pass	
Upper section	90	70	91	80	181	95	200+
Lower section	3-60	Nil	(12)	(4)	(19)	(20)	(40)
Trilobites	140	60	146	133		143	10
Graptolites	115	120	10	85		67	120
Shale	100	90 Rays Hill arkose	129	126		61	150 Aberfoyle formation
Local conglomerate	22	Nil	27	32		15	
Total	420+	340	415	460		406	520

Mathinna Beds. The former is a granite derived arkose whereas the latter is a fresh water sediment typical of Mersey Group sandstone. Both types of sandstone are present in this Aberfoyle formation. Walker also noted arkosic sediments on granitic rocks at the base of the succession at Ray's Hill. In parts of the St. Pauls Valley there are only 20 feet of pebbly sandstone between Triassic beds and granite, this may be due to non deposition caused by topographic high points in the pre-Permian topography or erosion following the Permian sedimentation. The next member in the succession is the Cascades Group, consisting of mudstone and overlying limestone. This is overlain by the Ferntree Group with the Biddon sandstone at the base. The Malbina Formation and Grange Mudstone of the Cascades Group have not been recognised in this area. In D.M. E.H. 4 the base of the Biddon sandstone and the top few inches of the underlying limestone were glauconitic. This borehole penetrated 181 feet of Ferntree Group beds. These sediments were a dark grey siltstone with scattered $\frac{1}{8}$ to $\frac{1}{2}$ in. quartz grains. No glacial erratics were encountered in the borehole but the flanks of the Break O' Day Valley are strewn with pebbles of rounded quartzite and schist presumably of glacial origin as these rock types are foreign to the district. The range in size up to 6 in. and occur most

plentifully at the base of the slope below the Permian/
Triassic contact on either side of the valley.

The Triassic System

Hills *et al* (1922) proposed the following subdivision
of Triassic sediments in the Nicholas coalfield.

Upper Sandstone	200 ft.+
Feldspathic Sandstone	400-900 ft.
Ross Sandstone	200-1350 ft.
Basal Grits	1-50 ft.

In this he closely followed a section by Nye (1921)
but the Upper Sandstone member is not now recognized
and Ross Sandstone is considerably thinner than the
thickness proposed while in many sections basal grits
are absent. Hills and Carey (1949) proposed two new
subdivisions for the lower portion of the Feldspathic
Sandstone. The Newtown Coal Measures and the
underlying Knocklofty Sandstone and Shale. Banks
(1952) and Jennings (1955) reincorporated the Coal
Measures in the Feldspathic Sandstone member.

The thickest Triassic section so far described
is that by McKellar (1957) for portion of the western
Tiers. The thickest Triassic section so far recorded
in the area under review is that in D.M. E.H. 6 which
passed through dolerite outcrop into Triassic beds at
425 feet and into Permian beds at 1,480 feet, giving
a total of 1,055 feet. The Pingal section is given
below with the McKellar and Jennings sections for
comparison.

	feet		feet		feet
Brady Formation sandstone, siltstone, shale and coal seams.	540	Feldspathic Sandstone including the Newton Coal measures.	260-360	Feldspathic Sandstone including coal measures.	600
Tiers Formation Thinly bedded sand- stone, siltstone and shale, with plant remains but no coal seams.	200	Knocklofty Sandstone and shale with plant remains but no coal seams.	500	Siltstone, carbonaceous sandstone, coal seams and subord- inate sand- stone.	120
Cluan Formation Irregularly sandstone at base to predominantly shale at top.	460			Sandstone, siltstone and laminated siltstone.	200
Ross Sandstone massive sandstone.	650	Ross Sandstone	300	Ross sand- stone usually becoming coarse toward base but occasionally gradational into carbon.	13-7!
	<u>1930</u>	(Max)	<u>1160</u>		<u>1055</u>

There are considerable differences in thickness and lithology between corresponding members in these sections which precludes correlation, but as the end members of these sections appear to match, it is probable that the implied correlation of the remainder of the sections is correct. Although the Singal section is the smallest of these, there is evidence that it encompasses the complete Triassic period as Jurassic plant zones have been recognized in specimens from Mt. Nicholas (Hale, 1962) *ibid* and in two boreholes D.M. Nos. 4 and 6, the Triassic beds are conformable with the apparently complete Permian.

classification of beds within the Triassic system. Smith (1957) stated that the formation names: Feldspathic Sandstone and Newtown Coal Measures were unacceptable under the Australian Code of Stratigraphic Nomenclature. He recommended that the use of these terms and Knocklofty Sandstone and Shale be discontinued and that in all new sections formations be given local names.

The term feldspathic sandstone has come, by loose usage to be used as a rock type for the salt and pepper type sandstone of the coal measures. This term was used for convenience in the bore logs accompanying this report but several sandstone specimens from B.N. 6 have been described by Everard and identified as lithic sandstone and sub-greywacke. Other rock types identified by Everard were: limestone from the coal measures and quartz sandstone from near the base of the Triassic succession. The descriptions are given in full in Appendix 6.

Cenozoic Sediments

Fluvial sediments of unknown thickness occupy the valleys of the South Esk River and its tributaries. These sediments occur both under the basalt of probably Miocene age (Richards, 1939) and above it and therefore both Tertiary and Recent sediments are present. A borehole drilled in the bed of the South Esk River at Tallechgerua failed to reach bedrock and stopped at 270 feet still in alluvium (Krause, 1930).

The coastal plain on the east coast has only a few feet of weathered rock and soil over bedrock. This surface is therefore a plain of denudation and probably owes its origin to the effects of Marine erosion.

Dolerite scree is widespread along the slopes of the dolerite masses. The

following thicknesses have been recorded from boreholes in the area.

H.B.C.	C1	300 ft.
	C8	205
	C9	125
D.H.	1	89
	2	193
	3	290

Scree particles range in size from clay derived from weathered dolerite to boulders of 15 feet in diameter. This mantle of dolerite scree on the slopes and "rock streams" in the intervening gullies marks the dolerite/Triassic contact and much of the outcrop of the sediments below the contact. This causes considerable difficulty in determining the form of the dolerite intrusions and in locating coal outcrop.

Igneous Rocks

(1) Devonian Granite

Devonian granitic rocks occur in the St. Pauls Valley and in the St. Marys-Richens areas on the east coast. These rocks were not studied in this project.

(2) Jurassic Dolerite

This occurs extensively in the area mapped as monadnocks such as St. Pauls Dome, Avoca and St. Patricks Head, St. Marys; as a capping on the Nicholas Range; and as a plateau extending from the Mingal Tier in an almost unbroken sheet to the Tasman Peninsula in the south; as transgressive bodies extending down into the valleys from the plateau such as between Mingal and the Duncan Colliery and others further east projecting into the Brock O'By Valley and finally as numerous isolated occurrences in the valley floor many of which intrude Bathurst Beds and are probably separate dykes or pipes stemming from a larger body below.

The form of the dolerite intrusions is relevant to

the estimation of coal reserves. There were no actual contacts seen between dolerite and sedimentary rocks but with regard to the main dolerite sheet the following relationships were inferred: At St. Pauls Home near Avoca the dolerite is in contact with lower Triassic beds and proceeding eastwards towards Pingal the contact remains at this stratigraphic level or lower. Coal outcrops have been reported from the headwaters of Tullochgorum Creek but this is not confirmed by the writer. Decomposed feldspathic sandstone fragments were found in the area, but coal if present, is probably one of the many, uneconomic, thin seams which occur in the Triassic succession down to within 100 feet of the Permian contact. Beyond Pingal the dolerite is in contact with Triassic beds above the economic coal horizons. This relationship also occurs on the Mt. Nicholas Range where the range consists of four separate outcrops. The two westernmost and smallest outcrops of dolerite are in contact with lower Triassic beds and the two easternmost outcrops are in contact with upper Triassic beds, these comprise the Silketone, Mt. Nicholas and Cornwall Coal Mines. This condition also appertains in the area from St. Marys to Bicheno and from Bicheno to Merrywood near Royal George on the St. Pauls River.

The main dolerite sheet therefore shelves to the west with respect to the Triassic beds. The sheet also has a dip to the southeast roughly conformable with the sediments. There are several transgressive bodies of dolerite which are probably dykes stemming from the main mass and protruding into the Break O'Bay Valley.

The numerous isolated dolerite outcrops which occur on the flanks of the main slopes and in the valley floor have not been recorded from any of the borings drilled in this area. Their relationship to the main dolerite mass is not known; the interpretation given in

The accompanying cross sections is that they are part of the main mass. This suggestion if correct, would indicate that the South Nek - Break O'Day lineament is a dolerite feeder but in the absence of further evidence this is conjectural.

Basalt

Basalt occurs at Gernantown and Irishtown north of St. Marys; at the western approach to St. Marys and extending one and a half miles north; at Shebak Hill northwest of Mt. Nicholas and in the Avoca-Royal George area. Basalt occurs as valley infillings, hill top residuals and in one locality as a dyke. These occurrences will form the subject of a separate report and are not further discussed here. They do not occur in the coal bearing areas.

GEOLOGICAL STRUCTURE

The Permian sediments rest unconformably on the Mathinna Beds. The pre-Permian (pre-Marsden Group in this area as Wynyard Tillite, Quamby and Golden Valley Groups sediments are absent) surface appears to be nearly planar and to dip at 1° or less to the south. This was determined on the exposed erosion surface between Ringarooma and Pingal where Mathinna Beds are exposed. There is greater irregularity of the old surface in granitic areas.

The Permian-Triassic contact is, in this area, mainly disconformable and the two systems are separated by a conglomerate of a few inches in thickness which grades upwards into the lowermost member of the Triassic system, a clean creamy quartz sandstone.

The dip of the Triassic beds has been determined by level traverses carried out by B. Knox in two collieries. The results obtained were: Valley Mine - dip 2° in direction 120° and Yates Mine - dip $1\frac{1}{2}^{\circ}$ in direction 090° . Local variation is considerable and dips of 10° to 15° have been observed in some areas. A compromise between these two figures has been employed in the construction of the cross

using the H.E.C. tellurometer survey and the surveyed borehole positions as check points. The difficulty of estimating fault movements by this means is that very slight variations of dip over the projected distances could cause apparent displacements of several hundreds of feet. For this reason 9 sections were constructed to allow cross checks on the interpretation. In figure 2 the fault pattern for the area, together with those deduced by Blissett (1959) and McNeil (1965) are shown in relation to the main coal mining areas.

The area is bounded on the E by the Castle Carey Fault which has a minimum displacement of 1400 feet down on the E side. The New Stanhope colliery is working a small segment of Triassic coal in the down-faulted block but is encountering very broken ground and abnormally steep dips probably due to its proximity to this fault. The eastern boundary is the Cornwall fault with variable displacement of approximately 500 feet down on the west side.

Several other large faults have been recognised by various workers; McNeil considered that the Cornwall fault lay to the west of Dalmaine and not to the east as originally shown by Reid. McNeil showed a second fault, the Lagoona fault, as following the coast down to Bicheno. The Douglas River fault and Silkstone fault are omitted in figure 2, both appear on Reid's 1922 map but both are based on dubious coal seam correlations and neither appear necessary in the cross sections. The location of the Killymoon borehole, drilled in 1878, is shown on the geological map, figure 3, and is one and a half miles NE of the position shown on Reid's map. This is based on personal recollection by the owner of the Killymoon property and confirmed by the finding of scattered pieces of drill core in the vicinity. If there is a 200 feet fault lying between the Silkstone and Mt. Nicholas collieries it must therefore lie at least one and a half miles further to

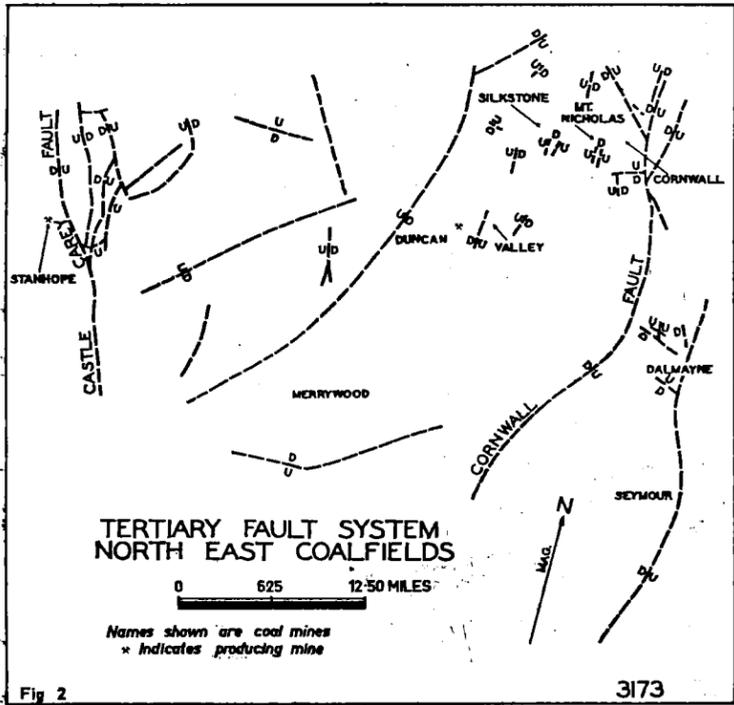
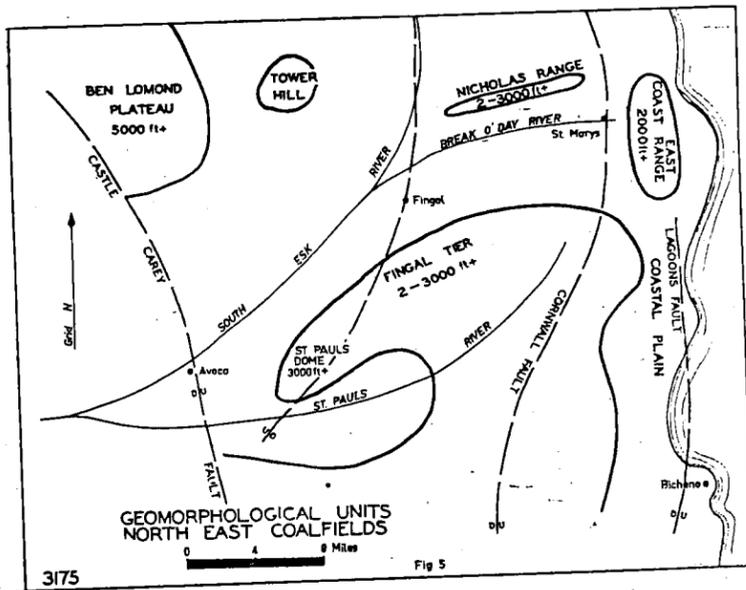


Fig 2



the NS on the southern side of the valley. The presence of Permian sediments in the Break O'Day Valley as far east as the Cornwall turnoff places the fault even further to the east. Such a fault would probably have no relationship with the one plotted by Reid.

Sections across the South Esk River between Fingal and Avoca indicate from 300 to 500 feet displacement (south side down). This could be due to Tertiary fault movement on the South Esk lineament but this presupposes a constant dip of Permian beds across the valley which is, in places, 2 miles wide. There is no evidence for faulting of any magnitude between the coal fields on either side, of the Break O'Day Valley.

The form of the dolerite intrusions has already been discussed in this report. The main mass has been interpreted as a roughly concordant sheet with some significant transgressions but with no major intrusions of dolerite into Triassic sediments resulting in dilatation faults.

GEO MORPHOLOGY

The geomorphological units are:

1. Dolerite plateaux and monadnocks.
2. The East Coast Range.
3. South Esk Valley and tributaries.
4. Coastal Plain.

The topography is dominated by the Ben Lomond Plateau, Tower Hill, Nicholas Range, Fingal Tier and St. Pauls Dome which are all dolerite plateaux or monadnocks and the East Coast Range which is composed of granitic rocks. The structural positions of the Ben Lomond Plateau and St. Pauls Dome appear to have been determined by the Castle Carey Fault and that of the East Coast Range by the Cornwall Fault. At present it is not known whether the prominence of these masses is the direct effect of faulting or of differential erosion along a fault line scarp.

The South Esk Valley north of Fingal lies along a

tertiary fault (figures 3 and 5), between Avoea and Singal a northeast striking lineament has probably determined the line of the valley. This has been suggested as an ancient structure (Broadner 1966) and there is evidence for tertiary movement on this line also (figure 4). The Break O'Day Valley may now occupy an older South Esk River Valley during a period when it flowed eastwards. This is suggested by the widening of the alluvial plain in an easterly direction.

The Coastal Plain lying south of the East Coast Range and east of the dolerite plateau, being devoid of superficial deposits, is probably of marine erosion origin.

THE COAL SEAMS

Bituminous Coal in Tasmania occurs at three levels:

1. Torrey Group sediments of Permian age - correlated with the Greta coal measures of N.S.W. (Lower Coal Measures). (Hanks 1962, p. 205)
2. Cygnet Coal Measures of Upper Permian age correlated with the Temago coal measures of N.S.W. (Upper Coal Measures). (Hanks 1962, p. 211)
3. Triassic coal measures associated with feldspathic sandstone, which are probably correlated with the Humboldt coal seams of N.S.W. and the Ipswich stage of Southern Queensland.

Coals of types 1 and 2 are not known in the area studied but traces of them were found in the Lillymoon and Harfield bore cores. Tasmanian Triassic coals are all non-coking bituminous coals with a high ash content and an average calorific value of 10,000 BTU/lb. They are principally used as domestic fuel and for steam raising. Some analyses of coal from the principal workings in the district are given in Appendix 1.

Eight Triassic coal seams were identified by Hills (1952) and named: Alpha, Beta, Gamma, Delta, Eta, Theta, Iota and Kappa. He stated that they were associated with a zone occupying about the middle of the Feldspathic sandstone. The

delta or main seam was stated to have a sandstone roof and to be separated from the underlying eta seam by 10-30 feet of shale. Using this as a datum he identified the remaining seams in the sequence.

Hills (1932) states that the main coal seam in the Nicholas Range, Pingal, Kalsayne, Seymour and Douglas River coalfields is the Delta seam and the main seam worked in the St. Christie and Merrywood areas is the Beta seam.

The character of individual seams is variable over quite short distances and consequently correlations based on seam characteristics are invalid. In this report, therefore, all coal seams are referred to using local names.

The composite section figure 7, shows how variable is the Luncheon seam which is barely recognizable in bore core east of B.N. 5 and the East Pingal seam is barely recognizable west of B.N. 5.

The two seams with intervening shale appears to be a reliable marker over most of the area and has been recorded from the St. Nicholas and Cornwall Mines and was intersected in the 2 Cornwall boreholes. In the vicinity of both the Valley and Luncheon collieries there are adits at an elevation of approximately 40-50 feet below the main workings and a borehole from the floor of Yates adit intersected a poor coal seam 54 feet below the Luncheon seam. It appears therefore that the two seams are present on the south side of the valley but are further apart than they are on the north side.

A proximate analysis of the lower seam at the Valley mine is given in (Appendix 1 Assay No. 3027). At the Cornwall Coal Mine there are three seams. The main seam is the Hitit (4'9") with the Fenton (8') approximately 100 feet below it and the Blue (11') approximately 30-40 feet above it. These three seams are present in the Cornwall surface bore holes (Appendix 1). The groups of coal seams and interbedded sandstones approximately 270-300 feet above the Hitit seam in these boreholes may correspond to Hill's Beta seam.

is

At Duncan and Yates Mines the main seam/correlated with the Nitit, and is 7 feet thick. It is present in B.M. 2-3 and 6, and splits into 2 seams in B.M. 5, an upper 3 feet and a lower 6 feet with 8 feet of mudstone between them. Further E these seams deteriorate into a mudstone-coal sequence. It appears that for at least a mile and a half east of B.M. 5, this seam is unworkable but the presence of a 13-16 foot seam at Dalwayne, a further 6 miles E and regarded as the Delta Seam by Reid, suggests that the seam improves in quality beyond the eastern limits of the drilled area.

Very little is known of seams below the Duncan seam on the southern side of the valley. Drilling by N.S.C. revealed a thick mudstone-coal sequence commencing at approximately 190 feet below the Valley seam. An assay of this material by the Joint Coal Board gave the following result: 7 feet 6 inches thickness, calorific value 9230 BTU/lb and ash content 29.5%. None of the intersections of this seam in the other N.S.C. boreholes were sampled but 4 samples from B.M. 5 at 519 and 619 gave even poorer results. This seam probably corresponds with the Fenton seam of the Nicholas Range.

Correlation of coal seams based on thickness, distance apart and nature of, roof and floor rock is invalid due to the variability of these factors. Palynological studies by Playford (1966) indicated a typical microfloral assemblage for Upper Triassic sediments (Appendix 2) and indicated that spore studies are unlikely to provide a useful correlative index. There is at present no satisfactory basis for the correlation of these coal seams as the individual seams have no special characteristics and there are no known marker horizons in the sedimentary succession. This fact is strongly suggestive of cyclic sedimentation. In such a series of rocks in which units are deposited in ABC or ABCB order, correlations are extremely difficult because different cyclic units are easily mistaken

for each other.

CYCLIC SEDIMENTATION

In the Carboniferous coalfields of the Northern Hemisphere, coal seams are considered to have formed during a cycle of sedimentation which consists of freshwater shales, followed by sandstone and finally coal resting on a bed of fireclay (peat earth). This fireclay is usually interpreted as a fossil soil and the frequent occurrence of rooted plants embedded in it is taken as evidence for the in situ formation of coal.

The necessary environment for the accumulation of plant material to ultimately form coal is a body of stagnant water such as would be found on the outer edge of a coastal plain. During coal formation it is assumed that subsidence of the area is very slight and is just sufficient to balance the accumulation of material in the basin. If this balance is disturbed by increased subsidence, the area becomes flooded by the sea and the accumulation of coal-forming debris ceases. The cycle is completed by a marine series of limestone and shale. This is the classical cyclothem (a series of beds deposited during a sedimentary cycle) of the Appalachian coalfields of U.S.A. and the coalfields of U.K., etc. The transgression of waters over the basin may be marine or freshwater.

Cyclic sedimentation was also noted in the coalfields of peninsular India, but of a different nature from the northern hemisphere type. These coal measures are of Permian age (Bordwana series) and consist of sandstone, shale, clay carbonaceous shale and coal in ascending order. Peat earths and traces of rooted vegetation are usually absent. A drift theory of origin was formulated to account for the formation of these coals (Fox 1931). The Permian coal measures of U.S.A. and the Permian Triassic coals are similar to these coals in many respects. The absence of peat earth has been suggested

(Ruff 1967) as due to the deciduous nature of the vegetation. The seams formed on a layer of vegetable case and the lack of root evidence is thus explained. Ruff also suggests that the immature nature of the detritus is evidence for cold climate conditions which may also account for the lack of weathering products to build up a soil. The type of cycle characteristic of these fields (a fining upwards) is explained by him as a product of an alluvial plain environment. This may account for the prevalence of dirt bands in most Australian coals. These indicate frequent flooding of the coal forming area, a more likely event in an alluvial plain environment than in a deltaic one.

The prevalence of clay pellet conglomerate bands in the sandstone overlying the coal seams is another point of difference between the northern and southern hemisphere coal fields. These bands are a type of intraformational conglomerate thought to be due to contemporaneous fragmentation and redeposition (Pettijohn 276-8). The debris from which they are made is considered to be of local origin and to have undergone little or no transportation. The fragmentation was probably effected by temporary withdrawal of water from the area followed by desiccation and mud cracking. The pellet horizons may not all be of this origin and some disorientated ones were noted, these are shown in the composite borehole section as mudstone and sandstone fragments (poorly bedded) and some of these may owe their disrupted framework to the action of turbidity currents. On the whole these beds show a lateral persistence at least equal to that of the coal seams and were utilized for correlative purposes in drawing up the composite borehole section. The cyclic nature of the succession was first noted by the writer during logging of the Department of Mines drill core. Subsequent confirmation of this was obtained by bore logging (resistivity, self potential and gamma ray) carried out by N. Longman of this Department. In figure 8 the three logs are plotted alongside the core log. It can be

seen that: (i) graded sequences are reflected in all logs, (ii) cyclicity is reflected in all logs with the resistivity log giving the best results, (iii) the rock type "foidopathic sandstone" shows considerable variation in all logs and is probably made up of lithic sandstone and clean fine grained quartzose sandstone, although the possibility of other rock types as well is not precluded, (iv) the nodal cycle is a sandstone fining upwards and passing into a siltstone and finally mudstone. A carbonaceous bed or coal seam is the end member of a cycle but not invariably as some of the earlier cycles are incomplete. The end of a complete cycle is marked by the top of a mudstone - coal sequence rather than a coal seam, in such cases the cycle may be the symmetrical unit (ASCB) rather than the asymmetrical unit (ASC). Some reverse gradings (fining downwards) were observed which suggests that this may be so. Duff considers that asymmetrical cycles typify the alluvial plane environment and symmetric cycles typifies the deltaic environment.

Sedimentary Cycles in T.M. S.H. 6

Cycle	Depth ft.	Thickness ft.	End Member
16	481-542	61	6 ins. of black shale
15	542-615'3"	73	20 ft. of coal, carbonaceous mudstone, and clay
14	615'3"-721	106	2 ft. of black shale
13	721-809	88	6 ft. of coal & mudstone
12	809-855	46	6'0 5'6" seam 7'1 E m.s.
11	855-918'4"	63	2 ft. coal and 7 ft. mudstone.
10	918'4-1000	82	2 ft. coal & 4 ft. mudstone/siltstone.
9	1000-1043'9	44	10 ft. coal (thin seam)
8	1043'9-1102'11	60	4 ft. carbonaceous mudstone, siltstone & an 8 in. coal seam.

Cycle	Depth ft.	Thickness ft.	End Member
7	1102'11"-1163	60	31 ft. sequence of bedded mudstone and coal. Coal seams of 3 ins. & 5 ft. 0 in (East Fossil Seam).
6	1163-1200	37	1 ft. 4 ins. of coal and shale
5	1200-1220	20	4 ft. 6 ins. of carbonaceous mudstone, and coal.
4	1220-1256'6	36	4 ft. of carbonaceous mudstone.
3	1256'6"-1319	61	26 ft. of slightly carbonaceous mudstone.
2.	1319-1394	75	7 ft. of mudstone, carbonaceous at base.
1	1394-1430	36	22 ft. of mudstone.

These wholly freshwater sedimentary cycles succeed the Permian sedimentation during which cycles of alternating marine and fresh water beds were deposited. The Morney and Cognet coal measures are probably end members of cycles of similar type to those of the northern hemisphere with the main difference being in the scale. These Australian cyclotheses are of the order of hundreds of feet thick instead of the more usual tens of feet. The presence of spore beds in the Quarty Group may indicate another earlier cycle in the Tasmanian succession.

Wholly freshwater cycles occur within the U.S.A. Permian coal measures, these are comparable in size to the northern hemisphere cyclotheses. Cycles within the Tasmanian Permian coal measures have been suggested by McKellar (1957 p. 3)

EXPLORATION

Prior to the present programme, diamond drilling was carried out in the floor of the Brook O'Bay Valley. Two holes were drilled; the Killynnon and Harrofield holes, in 1878 and the logs are appended to this report. Briefly the results were as follows: The Killynnon hole penetrated Permian beds and bottomed in Bathina Beds. The Harrofield hole drilled through 270 feet of Triassic beds before passing into Permian beds. Neither hole passed through any economic coal seams. Two holes were drilled by Cornwall Coal Company on their Cornwall property; these holes passed through 585 and 655 feet of Triassic beds with coal seams (see Appendix 7 for core logs and assay results). The same company recently drilled a short hole from the floor of Yates adit to test for underlying seams (see also Appendix 7).

In the current investigation 9 holes were drilled by the U.S.G. and 6 by the Department of Mines with a seventh being drilled at the time of writing. (Figure 6). The U.S.G. holes were all drilled east of Spion Kop and 4 (01, 02, 03 and 04) passed through the expected main seam horizon without intersecting a workable seam. The remainder of the holes (05, 06, 07, 08) were drilled at a lower level to intersect the East Ringal seam. This seam has nowhere proved to be of sufficient quality to be considered workable. The Department of Mines holes 1, 2, 3 and 6 were drilled west of Spion Kop to the south of the Duncan colliery workings and all intersected the main seam but in hole No. 1 the seam was broken into 6 partings none of which was sufficiently large to constitute a workable seam. Numbers 4 and 5 were drilled east of Spion Kop and both indicate a breaking up of the main seam although in No. 5 the lower portion of the seam was of workable thickness (6 ft. 6 ins.) No. 7 currently being drilled is located in the headwaters of Ringal Rivulet approximately half a mile south of No. 6.

From the records of past mining and drilling results it is evident that the Hitit-Muncan seam is the only one of sufficient quality, thickness and persistence to merit further investigation. This seam, moreover, usually has a sandstone roof which holds up well during mining and thus allows cleaner and cheaper coal winning. In the area east of Spion Kop this seam lacks a sandstone roof and has split into two or more thin seams and thus is uneconomic. This is assumed to be a local effect for the seam is of workable size and quality at Malmagoe, it can be expected therefore to improve east of G1 (towards St. Marys). There is a large dolerite mass covering most of this area, which is presumed to be a dyke and therefore further coal search would have to commence in the Marefield area where Triassic sediments again occur and where several coal outcrops have been reported.

West of Spion Kop in the vicinity of the Cornwall Coal Company lease most of the diamond drill holes have revealed satisfactory thicknesses of the main seam. Although B.H. D.M. 1 indicates that even here there are places where the seam is unworkable.

The area stretching to the south and covered by the dolerite sheet exceeds 11 miles by 19 miles (1000 s.m.). The whole area is fringed by coal workings and is presumably coal bearing beneath the dolerite if the dolerite is a roughly concordant sheet. The dolerite may be as much as 1000 feet in thickness but much of the coal would be accessible from adits if diamond drilling indicated workable coal seams.

Finally, the Nicholas Range which has been productive over a distance of 5 miles merits further investigation. Coal mining has only been carried out from the south side of the range but a tunnel was put through the range at the Cornwall Mine and proved that the main seam was present on the northern slopes. Several coal outcrops are shown on Reid's map on the northern slopes and the Forestry Commission road through the

St. Nicholas gap has revealed a coal seam near the highest point. The geological map shows the areas already worked out and indicates suitable drilling sites to further investigate the coal bearing areas.

RECOMMENDATIONS

Diamond drilling is recommended in the three areas discussed in the preceding section viz:-

1. The Forestry Commission, St. Nicholas Road.
2. The Forestry Commission, Tullochgerun-Harrywood Road.
3. Harrofield

Initially one hole in each of these localities is proposed with additional bores to be sited according to the results obtained.

These three holes are all estimated to pass through 5-700 feet of Triassic sediments. In the case of No. 2 there could be as much as 7-800 feet of dolomite overlying the Triassic. There should not be any scree at the sites 1 and 2 but some could be expected at site 3. These localities are shown in Figure 3.

With regard to well logging, the results obtained in S.H. 6 were encouraging and the technique should be applied to all future drill holes in an endeavour to establish a correlative index for the succession.

CONCLUSION

Some attempts have previously been made to assess the coal reserves of this and other areas in the State. (Appendix 3). It is felt that even with the additional information obtained by diamond drilling a revised estimate is not warranted. Much of the area drilled has proved to be devoid of economically workable coal seams for all but small operators. This may well be true of the whole field and the future of the field may lie in the operation of a number of small coal mines rather than in a few large ones.

This would substantially increase reserves as it would allow exploitation of some of the other coal seams in the succession as well as some of the areas too small to be opened up as major collieries.

Another factor making it difficult to assess reserves is the ultimate uses of the coal and the distance it has to be transported which bear directly on men tolerance. A local use for the product would allow a considerable increase in reserves over one based on the present practice of coal washing and rail transport.

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APPENDIX 1

Some coal assays extracted from the Coal Resources
of Tasmania, Department of Mines Mineral Resources
No. 7.

Coal assays from collieries in the Cornwall and
Fingal areas.

CHARACTER, ANALYSES, AND HEAT VALUES OF COAL SAMPLES

Reg. No.	Name of Mine or Locality of Exposure	Mis- ture 105° C	Vola- tile matter	Fixed Carbon	Ash	Sulphur	Hydro- gen	Carbon	Oxygen	Nitro- gen	Calories	B. T. U.	Evap. lower	Spec. Grav.
319	Cardiff	3.20	28.98	48.90	18.92	0.56								
320	"	4.30	27.08	51.42	17.20	0.47								
322	"	3.88	26.70	50.51	18.91	0.60	4.46	55.03	19.77	1.23	5486	9874	10.20	1.37
323	Jubilee	5.00	22.18	50.51	22.31	0.40								
325	"	3.92	28.52	47.46	20.10	0.60	4.50	55.69	17.78	1.33	5363	9653	9.98	1.47
382	Cornwall	3.72	23.16	56.76	16.36	0.41								
383	"	3.00	24.80	55.75	16.45	0.38								
629	"	3.80	21.74	54.38	20.18	0.36	4.02	58.63	15.66	.15	5560	10,007	10.34	1.43
630	"	3.98	22.48	55.22	18.32	0.36								
384	Mt. Nicholas	4.40	27.78	46.01	21.81	0.44								
385	"	4.20	26.64	45.96	23.20	0.40								
627	"	4.54	27.52	50.04	17.90	0.45								
628	"	4.88	26.82	47.68	20.62	0.48	4.46	50.59	22.75	1.10	5412	9742	10.07	1.52
387	Silkstone	4.90	23.38	51.44	20.28	0.33								
388	"	3.30	23.48	48.52	24.70	0.48								
492	Fingal	2.70	26.82	48.18	22.30	0.03								
493	"	2.40	16.10	48.29	23.21	0.37								
494	"	1.00	24.00	48.80	26.20	0.24	3.85	57.83	10.80	1.08	5068	9122	9.43	
495	"	2.54	26.36	42.00	29.10	0.41								
513	"	4.69	27.81	52.30	15.20	0.50								
411	Dalmayne	4.46	22.22	55.30	18.02	0.69								
412	"	3.56	21.14	54.76	20.54	0.41	4.17	52.50	21.47	0.91	5240	9431	9.74	1.60
413	"	4.81	20.47	50.53	24.19	0.41								
414	"	4.50	18.68	51.40	25.42	0.33								
415	"	5.10	18.52	49.04	27.34	0.34	3.94	49.06	18.42	0.90	5191	9243	9.55	
417	Douglas Riv.	3.40	24.08	42.22	30.30	0.48	4.11	49.49	14.56	1.06	4722	8500	8.79	1.4
418	"	4.26	23.58	48.51	23.65	0.56	4.24	54.00	16.51	1.04	5314	9564	9.89	1.4
419	Denison Riv.	4.40	24.80	53.50	17.30	0.62	4.36	60.66	16.83	1.23	5707	10273	10.62	1.4
624	Seymour	3.14	22.91	50.55	23.40	0.56	4.33	47.84	22.74	1.13	5510	9919	10.25	
625	"	3.14	19.10	49.86	27.90	0.49								
626	"	3.14	26.40	54.34	16.12	0.59								
693	Merrywood	2.66	25.10	53.88	18.36	0.44	4.59	57.76	17.69	1.16	6052	10,893	11.26	1.4

COAL ANALYSES - CORNHILL COAL MINE

(Western Workings)

Thickness Inch.	Moist.	Volatiles	Fixed Carbon	Ash	S.	BTU/lb.	Description
10	4.0	23.3	50.2	22.5	0.20	10,060	Coal
6	3.6	-	-	73.9	-	-	Brown stone with 3" coal.
10 1/2	3.3	26.4	51.3	19.0	0.38	10,590	Coal.
16 1/2	3.1	-	-	58.6	-	-	2" coal & stone 2" coal 6" gray stone 4" coal 23" gray stone 27" coal
39 1/2	3.4	25.2	49.1	22.5	0.46	10,060	2" stone with 1" coal 10 1/2" coal

4' 1 1/2"

(Shale floor)

(Eastern Workings)

25	3.7	25.7	50.4	20.2	0.25	10,590	Coal with mud- stone roof
11 1/2	3.3	-	-	61.2	-	-	2 1/2" coal and shale 2" coal 3 1/2" sandstone 2" coal 1" stone
42	3.9	26.2	50.5	19.4	0.36	10,480	

6' 6"

(Shale floor and mudstone roof)

(Western Section)

30	3.3	25.8	43.3	27.6	0.29	9,220	Coal
8	3.0	-	-	69.3	-	-	Coal and mud- stone bands
10	3.4	25.2	39.4	32.6	0.25	8,570	1" coal Fanny band (stone) 6" coal 1" stone 2 1/2" coal
54 1/2	3.8	23.8	52.5	19.9	0.31	10,480	

3' 10"

(Sandstone floor and sandstone roof)

Below Hitit (Gully Section)

Sample No.	Thickness Inch.	Moist. Volatiles	Mixed Carbon	Ash	S.	Btu/lb	Description
15	2.7	22.9	36.7	37.7	0.20	7,552	12" coal 1" stone 22" coal
67	2.9	26.7	47.0	23.4	0.23	9,942	14 1/2" coal 3 1/2" stone with 2 1/2" coal bands 44" coal Full coal
<u>6' 10"</u>							

Below Hitit (Gully Section)

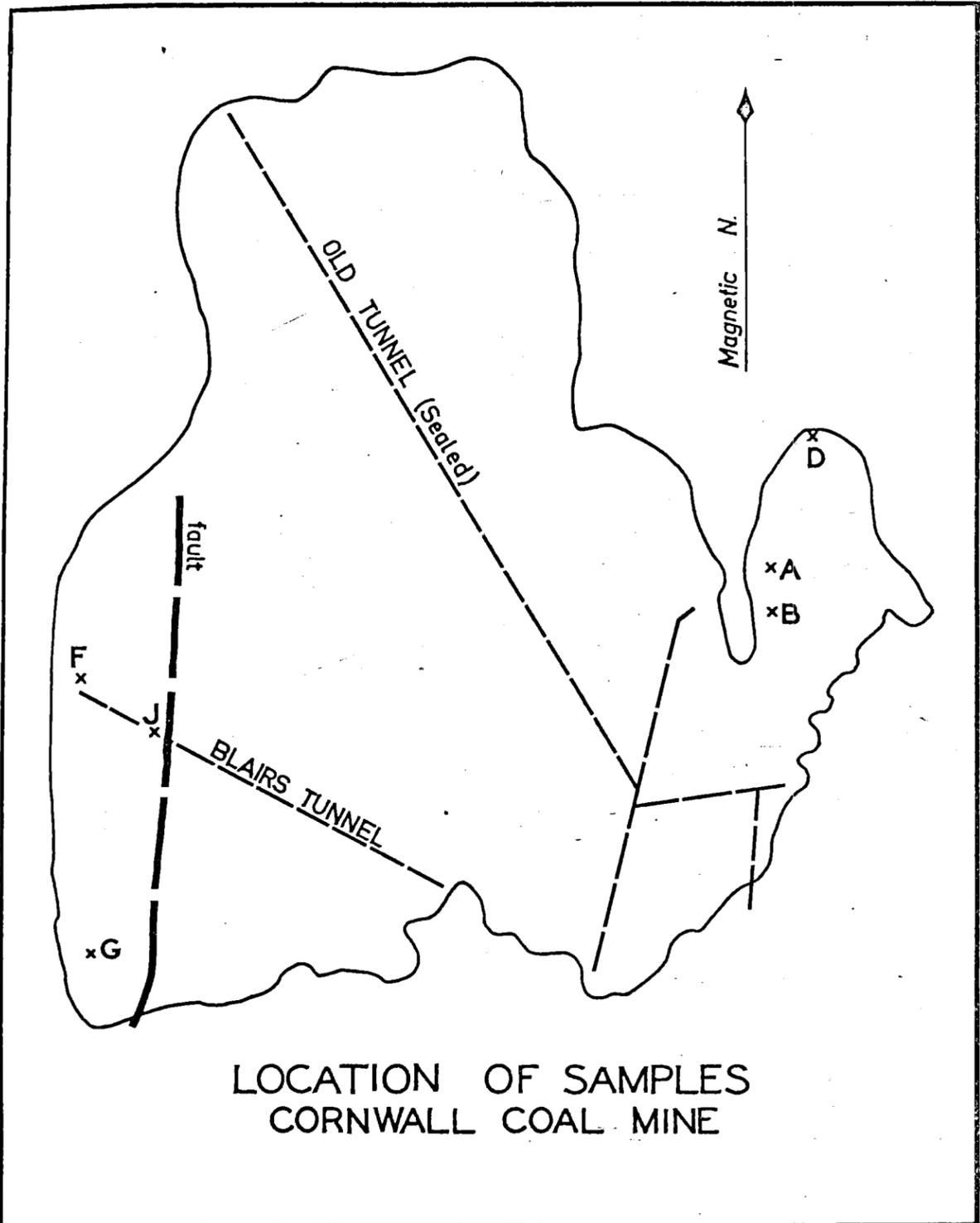
32	4.1	25.6	55.0	15.3	0.32	11,140	Coal
15 1/2	3.5	22.6	38.4	35.5	0.23	8,100	12" coal 1" stone 22" stony coal
70 1/2	3.2	26.3	46.2	24.3	0.23	9,300	25 1/2" coal 1" stone 12" coal 5" penny stone band 2 1/2" coal 5" stone 22 1/2" coal 5" stony coal
<u>9' 10"</u>							

(Mudstone floor and a 1" stone band on roof separating the Hitit zone from Sample H1.)

Above Hitit (possibly split off it) Gully Section

46	4.2	26.6	48.9	20.3	0.33	10,430	Coal
18	3.8	-	-	70.0	-	-	Stone with a few coal bands
20	3.7	31.3	51.4	13.8	0.33	11,430	16" coal 8" stone 32" coal 3" sawn shale not sampled.
21	4.1	25.4	52.4	18.1	0.24	10,790	7" coal 2" stone band 13 1/2" coal
<u>5' 9"</u>							

(Mudstone roof and floor)



3176 - 49

Proximate Analysis of 50lb. channel samples from Coal workings.

ANALY
No.

<u>No.</u>	<u>Locality</u>	<u>Moisture</u>	<u>Volatiles</u>	<u>F.C.</u>	<u>Ash</u>	<u>S</u>	<u>BTU/lb.</u>
3027	Valley Mine minor seam 50ft. below main seam	4.20	18.7	33.42	43.6	-	-
	Valley mine main seam (near portal)	4.37	23.9	50.13	21.6	0.21	10,110
	Valley mine main seam (near face)	4.27	23.5	51.13	21.1	0.24	10,039
	Yates Colliery (main seam)	4.38	23.7	49.52	22.3	0.30	10,070

APPENDIX 2

Palynological Report on some Triassic coal seams
by Mary Playford. Samples collected by Department
of Mines, Tasmania.

RESULTS

The samples examined comprised roof, seam, and floor of the following coal seams:

Lunden Mine
Cornwall Mine, Blue Seam
Cornwall Mine, Nitit Seam
Valley Mine
Jubilee Mine
Mt. Nicholas, 6' Seam
Mt. Nicholas, 4'9" Seam
Mt. Nicholas, 8' Seam

METHOD

Plant microfossils were extracted from the samples by means of conventional maceration procedures. These entailed removal of mineralogical material with boiling 50-60% hydrofluoric acid and of resultant insoluble fluorides with warm dilute hydrochloric acid. The residues were then treated with Schultz solution (for between 10 minutes and 3 hours, depending on the particular sample); and subsequently with a very weak (less than 0.25%) solution of ammonium hydroxide. Some of the ultimate residues were subjected to a brief (5 seconds) treatment in a bath-type ultrasonic disintegrator; this disaggregated clumps of fine mineralogical and carbonaceous matter that tended to obscure the spores and pollen grains. All residues were finally mounted on straw slides in glycerine jelly.

In general, the samples did not yield either prolific or well-preserved assemblages of spores and pollen grains. Floor horizons of the seams were usually the most satisfactory and most of the palynological information derives from these. The actual coals provided disappointing results despite repeated attempts in their laboratory preparation using varying procedures. Only two of the coals yielded any plant microfossils at all, and the preservation of these was extremely poor, thus

precluding accurate identification.

CONTENTS OF THE SPECIMENS

Species of spores and pollen grains recognized in each of the coal beds are listed below:

Upper Mine (floor)

Alisporites australis de Jersey

Alisporites parvus de Jersey

Alisporites spp.

Annulipora micromanulata de Jersey

Aratriosporites bankii Playford

Aratriosporites parvisaccatus Leschik

Aratriosporites sp.

Stenotriposporites sp.

Circulium sp.

Circuliosporites parvus de Jersey

Saccodites nitidus (Salze)

Microsphyllidites martini (de Jersey)

Microporites varicosus de Jersey

Anthracosporites cancellatus Playford and Wettmann

Levinsporites sp.

Conusoidites parvus de Jersey

Conusoidites wellmanii Couper

Platanusca australis de Jersey

Stereosporites antiaustralis (Wilson and Webster)

Stereosporites perforatus Leschik

Lower Mine, Blue Seam (Floor sample)

Alisporites australis de Jersey

Alisporites parvus de Jersey

Alisporites spp.

Aratriosporites bankii Playford

Aratriosporites parvisaccatus Leschik

Salmaspora imana Playford

Circuliosporites parvus de Jersey

Conusoidites parvus (de Jersey)

Quadrantia nitida (Salma)

Microrhynchites harrisi Couper

Microrhynchites montani (de Jersey)

Leptocarpites sp.

Leptocarpites sp.

Leptocarpites carleri Playford and Bettman

Leptocarpites parvus de Jersey

Leptocarpites sp.

Leptocarpites antiquior (Wilson and Webster)

Leptocarpites confertus Leschik

Leptocarpites nitida (roof sample)

Alloporites australis de Jersey

Alloporites parvus de Jersey

Alloporites spp.

Annulicera folliculosa (Kogalaka)

Annulicera microannulata de Jersey

Arctocarpites parviusculus Leschik

Chordocarpites australis de Jersey

Circulicarpites parvus de Jersey

Quadrantia nitida (Salma)

Microrhynchites harrisi Couper

Microrhynchites montani (de Jersey)

Microrhynchites verrucosus de Jersey

Microrhynchites sp.

Autocarpites cancellosus Playford and Bettman

Keller Mine (floor)

Alloporites australis de Jersey

Alloporites parvus de Jersey

Alloporites spp.

Annulicera folliculosa (Kogalaka)

Annulicera microannulata de Jersey

Circulicarpites parvus de Jersey

Concavicarpites sp.

Quadrantia nitida (Salma)

Microrhynchites harrisi Couper

Dictyoerythraea bartoni de Jersey

Dictyoerythraea cancellata Playford and Pottman

Dictyoerythraea sp.

Dictyoerythraea succulandi de Jersey

Dictyoerythraea sp.

Dictyoerythraea militum (Reisinger)

Sabicea (floor sample)

Alloerithia australis de Jersey

Alloerithia curvata de Jersey

Alloerithia spp.

Annulirota folliculata (Hogaloka)

Circulina sp.

Crescentina nitida (Balme)

Dictyoerythraea bartoni (de Jersey)

Emundocidites curvata de Jersey

Emundocidites wallmani Couper

Platysacca succulandi de Jersey

St. Nicholas, 5' Seam (floor sample)

Alloerithia australis de Jersey

Alloerithia curvata de Jersey

Alloerithia spp.

Asiculatirota globosa (Leschik)

Asiculatirota sp.

Calamocera sp.

Crescentina nitida (Balme)

Dictyoerythraea cancellata Playford and Pottman

Emundocidites curvata de Jersey

Emundocidites wallmani Couper

Platysacca succulandi de Jersey

St. Nicholas, 4' Seam (roof and floor samples)

Alloerithia australis de Jersey

Alloerithia curvata de Jersey

Alloerithia spp.

Annulirota folliculata (Hogaloka)

Annulirota sp.

Austroripites sarvianus (Leschik)
Exochites nitidus (Palae)
Dicrorhynchites harrisi Couper
Dicrorhynchites mortoni (de Jersey)
Dicroripites varuosus de Jersey
Eurocladocera denardi (de Jersey)
Exochites ripites australis (Cookson)
Exochites parvus de Jersey
Exochites senecus Palae
Exochites antiquissimus (Wilson and Webster)
St. Nicholas, St. Jean (floor sample)
Alipites australis de Jersey
Alipites parvus de Jersey
Alipites sp.
Amulicera folliculosa (Bogalska)
Amulicera microamulica de Jersey
Aratropites herki Playford
Aratropites flexilis Playford and Bettmann
Aratropites granulatus (Klaus)
Aratropites sarvianus Leschik
Chondropites sp.
Conyrocopites cameroni (de Jersey)
Cynthites sp.
Exochites nitidus (Palae)
Exochites sp.
Dicroripites varuosus de Jersey
Eurocladocera senecus Playford and Bettmann
Eurocladocera denardi (de Jersey)
Exochites kuzneri Klaus
Exochites taylori Playford and Bettmann
Exochites parvus de Jersey
Exochites wellmani Couper
Exochites leichenale Playford and Bettmann
Exochites sp.
Exochites unmani de Jersey

Microlepidodermis sp.

Microlepidodermis australiana (Wilson and Webster)

Microlepidodermis conformis Leach

DISCUSSION

All of the microfloras are conformable with those known previously from the late Triassic of Australia. In particular they show close affiliation with those recorded and described recently by G. Mayford (J. Geol. Soc. Aust. 14 (2): 173-210) from the Brady Formation and the 'Seldinathic Sandstone' of Tasmania. On the basis of material examined, no significant qualitative disparity is evident between the various samples. It is however possible that a statistical quantitative study of the microfloral content of the coal seams and associated sediments could lead to the recognition of distinctive spore-pollen profiles (histograms) characteristic of each of the beds. Such an investigation would necessarily be based upon very closely sampled sections. On the other hand, from present indications, this possible avenue of research would be severely hampered by the generally poor preservation of the coal microfloras which scarcely allows a meaningful statistical count of the plant microfossils.

APPENDIX 3

Coal Reserves in the Northeast Coalfields from previous reports.

<u>Locality</u>	<u>Coal Reserves in millions of tons.</u>		
	<u>1932</u>	<u>1961</u>	
		<u>indicated</u>	<u>infernal</u>
Finzel	27	3	32
Harrywood	-	2	2
Stanhope	2	2	10
Corwall	55	16	34
Mt. Nicholas			
	<u>84</u>	<u>20</u>	<u>65</u>

The 1932 figures are given in metric tons and should be reduced by 10% to convert to long tons.

The 1961 estimate is stated to be 75% recoverable.

APPENDIX 4

Coal Production in the Northeast Coalfields
(to December, 1966).

<u>Mine</u>	<u>Out-stand</u>
Cornwall	3,983,276
Jubilee	665,142
Mt. Nicholas	1,721,972
Flagal	453,521
Bancan	915,445*
Valley	54,624
Stashope	385,603
Mt. Christie	13,603
Herrymood	416,806
Balmayne	36,473
Coynour	23,807
	<u>8,680,781</u>

Total State production for the same period:

3,402,458 tons

* denotes producing mine.

APPENDIX 5

Palaeontological Report by W.R. Banks
on some fossils collected by V.H. Threader from
Permian limestone and underlying beds in the
vicinity of Fingal.

- Spec. 1: Stenopora, Strochhalonia cf. arcevalis
 Maxwell, sp., Anidanthus springarensis
 (Booker) and Gaerleinella farlevensis
 (Etheridge and Dun).
- 2: S. farlevensis (Etheridge and Dun),
Trisactinata stokesii Koenig.
- 3: Polysera sp., Stenopora sp., Strochhalonia
 cf. arcevalis Maxwell.
- 4: Stenopora spp., fenestellids, Strochhalonia
 cf. arcevalis Maxwell, Toniopsis sp.
- 5: ? Beltonecton lineiferus (Morris)
- 6: Stenopora probably culcita, Stenopora spp.,
 ? Gaerleinella.
- 7: Strochhalonia cf. arcevalis Maxwell,
Gaerleinella farlevensis (Etheridge and
 Dun)
- 8: Stenopora cf. grantonensis, Crockford,
Polysera, sp., other fenestellids.
- 9: Anidanthus springarensis (Booker),
Toniopsis sp.

Anidanthus springarensis (Booker) and Gaerleinella farlevensis (Etheridge and Dun) are restricted in Tasmania to the Casades Group or equivalent units. Stenopora grantonensis Crockford has been recorded only from the Berridale Limestone previously but this is probably not significant. Trisactinata stokesii Koenig is best developed in the Berridale Limestone but ranges beyond that formation. Strochhalonia cf. arcevalis Maxwell occurs in the Hesseu Siltstone in its type area but probably not in the Berridale Limestone at Mathemes Quarry, in which the dominant Strochhalonia is S. jukei Etheridge, not present in this collection.

On the balance of evidence, all collections come from the Casades Group or its equivalents and thus² specimens containing Strochhalonia cf. arcevalis Maxwell

from an horizon low in the Cascades Group, probably
below the Lyraroralla and Phonothaerus zones.

APPENDIX 6

Petrological Description by G. Everard
of some sedimentary rocks intersected in
Department of Mines Borehole No. 6, Pingal area.

No.	Depth	Description	Rock Type
123 B	600'	<p>Pale grey, fine grained, friable rock with black, grey and white grains close to limits of visibility with the naked eye. Bedding is indicated by discontinuous thin black carbonaceous veinlets.</p> <p>In thin section the rock consists of distinct angular to sub-rounded fragments, averaging .2mm. across, with orientation of the flattened and elongated particles. The grains form a mosaic with a little intergranular siliceous cement and a minimum of matrix. They comprise: 45% lithics 40% quartz and quartzite 10% feldspar 3% calcite 2% chlorite, biotite.</p> <p>Quartz grains are clear and angular but may show peripheral corrosion. Feldspar is usually clear and angular but sometimes so altered that the twinning is difficult to see and some feldspar may be so altered as to be unrecognizable. Microcline and albite have been identified. Mudstones tend to be opaque with rounded grains whereas quartzites are clear and angular. Some grains, however, have intermediate qualities. These are also grains of dark basaltic rock, fragments of hornblende, chlorite, biotite and authigenic calcite.</p>	Sub-greywacke or lithic sandstone.
123 C	775'	<p>The hand specimen is a fine grained, friable, pale grey rock with a faint tinge of yellowish green. It shows fine disturbed depositional banding. Sprinkled flakes of colourless to brownish mica about .5mm. across appear on cleavage planes.</p> <p>In thin section the rock is a mosaic of quartzose, lithic and feldspathic angular grains averaging about 0.1mm. across. The grains are angular and there is little interstitial cement, and the rock is quite porous. Proportions are quartz 40% lithics 35%</p>	Lithic sandstone or sub-greywacke.

Serial No.	Depth	Description	Rock Type
		feldspar 29%. Much of the feldspar is unstrained but can be recognized by cleavage. Where twinning is present the feldspar is in the oligoclase-andesine range.	
60 - 123 W	951'	The hand specimen is a dense, pale grey, fine grained rock with visible dark grains in a white matrix. The rock is rather porous and bedding is indicated by a few thin white veinlets. In thin section it consists mainly of cryptocrystalline calcite showing a wavy aggregate extinction, suggesting a subradiating texture. Fragments of quartz, feldspar, muscovite and biotite are common with ilmenite largely altered to leucokene and lithic fragments almost completely replaced by calcite. The clastic material which averages about .1mm. across is often surrounded by haloes of parallel short needles of calcite.	Limestone
60 - 123 E	918'	The hand specimen is a fine grained rock consisting of black, white and greyish grains averaging .5mm. across. There is a tendency towards orientation of grains and a suggestion of bedding given by platy masses and veinlets of black carbonaceous material. In thin section the grains are angular to subrounded and are merely pressed together with only the faintest evidence of siliceous cement on some of the grains. Grains consist of quartz, schistose quartzite, quartzite, feldspar (albite-oligoclase), and lithics including many dark volcanic fragments. The proportions are quartz and quartzite 30%, feldspar 15%, lithics 55% and the rock is therefore a lithic sandstone.	Lithic sandstone
60 - 123 E	921'	The hand specimen is a fine grained pale grey rock with a greenish tinge. It is rather friable and porous and consists of dark and light and intermediate coloured grains.	Sub-greywacke.

In thin section it consists of angular and sub-angular grains, averaging .2mm. across, of quartz, feldspar, lithic, black carbonaceous and green chloritic and sericitic material. The grains are enclosed in a sparse matrix of very fine grained argillaceous material. Approximate proportions are matrix 8%, quartz and quartzite 20%, feldspar 13%, lithics 50% biotite, chlorite and sericite 10%, traces of zircon, apatite, topaz etc.

60 - 123 G 1514' The rock in hand specimen is a fine-grained aggregate of black white and grayish grains. Lithic sandstone

In thin section it consists of a mass of angular to sub-rounded grains averaging .35mm. across pressed together with only occasional indications of a thin siliceous cement on some grain surfaces. The grains comprise quartz and quartzite 35%, feldspar 15%, lithics 50% including some volcanic material.

60 - 123 H 1454' The hand specimen is a creamy-white, fine-grained siliceous rock showing minute sparkling crystal faces. Quartz sandstone

In thin section the rock consists of quartz grains averaging .3mm. across with about 6% of feldspar grains and 4% of lithic fragments.

There is some microcrystalline quartz between the quartz grains in places. This siliceous cement seems to have been responsible for a regrowth on the original grains to give sharp crystalline outlines which produce the sparkle seen in hand-specimen.

Appendix 7.

Searchhole Logs

i. D.M. 1-6

ii. H.F.C. 61-69

iii. Cornwall Coal Co.

 Cornwall 1 and 2

 Jubilee 1

 Yates 1

iv. 1880 Grilling Marsfield and Millington

PLING TARGET:—

MARKS:— Average recovery 95%

SURVEY DATA			ASSAY DATA													
DEPTH ft.	Bearing mag.	Inclin. degs.	SAMPLE No.	FROM		TO		RECOVERY			%		ASSAY RESULT		%	
				ft.	ins.	ft.	ins.	ft.	ins.	%	Moist.	Vol.	Ash	S	F.C.	B.T.U.
			3640	513	0	515	0	1	10	95	4.7	27.5	24.5	0.40	43.5	10,120
			3641	615	1	617	6	2	0	95	5.1		56.0			
			3642	689	8	694	1	4	2	95	4.3	25.2	22.7	0.36	47.8	10,260
			3643	694	1	695	3	1	0	95	3.3	27.6	41.4	0.27	27.7	7,380
			3644	695	3	697	4	1	5	67	3.5	21.8	46.5	0.27	28.8	6,450

GEOLOGICAL LOG

Logged by:—

DEPTH ft.	TO		RECOVERY		DESCRIPTION	SECTION	
	ft.	ins.	ft.	ins.		Core	Sample
290					Dolerite		
0 290	6				Weathered coaly mudstone		
6 297	0				Weathered grey mudstone		
0 311	3				Grey mudstone with thin light & dark bands.		
5 318	9				Feldspathic sandstone		
3 319	3				Flecks of coaly shale in feldspathic sandstone		
3 319	9				Vitreous coal band		*
9 331	8				Dark grey mudstone, a few bands of coaly shale at top & a band of 6" feldspathic sandstone at 327'0"		
8 422	7				Feldspathic sandstone with occasional coaly bands; a 2' band of current bedded siltstone at 405'3"		
7 423	1				6" coal		
1 425	5				Coal and coaly shale		
5 439	9				Dark shale		
9 466	6				Fine grained feldspathic sandstone.		
6 471	1				Coaly shale		
1 473	10				Grey mudstone.		
10 498	10				Medium grained feldspathic sandstone.		
10 499	3				Coaly shale		
3 513	0				Coarse feldspathic sandstone with few thin coal and coaly bands.		

Continued over:—

DEPARTMENT OF MINES — TASMANIA
DIAMOND DRILL CORE RECORD

No.— 3	MAP SHEET No.49	DISTRICT Fingal	LOCATION OF SITE:—
Drilled on Crown Land 12 chains from NE corner of lease 26M/49 (Yeat's Colliery) on bearing 293°M			
OF SITE:— 2106.0 (Mines Dept. Survey 1966)	SITE SURVEY ON MAP No.:—	CORE SIZE:—	
ING OF HOLE:—	AIR PHOTO No.:—	COMMENCED:— 11-10-61	
ATION OF HOLE:— Vertical	DRILL:—	COMPLETED:— 18-7-62	
OF SITE:—	DRILLER:— D.R. Hardman	FINAL DEPTH:— 711'0"	

Index Page:—

BLIND TARGET:— Fingal No. 4

MARKS:—

SURVEY DATA			ASSAY DATA													
DEPTH	Bearing mag.	Inclin. degs.	SAMPLE No.	FROM		TO		RECOVERY			ASSAY RESULTS				%Cal. Val.	
				ft.	ins.	ft.	ins.	ft.	ins.	%	Moist.	Vol.	Ash.	S%	F.C.	B.T.U.
Surface	V	Vert.	232	141	4	143	4	0	9	75	4.1	23.1	29.5	0.29	43.3	9,060
100	V	89°15'	308	233	2	236				90	6.2	21.9	33.1	0.33	38.8	8,320
130	wedge	88°45'	309	238	6	242	9	3	3	90	4.9	30.7	18.5	0.50	45.9	10,830
150	159.30	88°10'		373	0	375	6	1	6	90	3.1	14.1	60.5	-	22.2	-
170	V	90°00'		402	8	405	0	1	3	53	3.8	18.0	46.1	-	32.1	-
190	161.45	88°45'		419	7	421	3	1	6	97	3.7	18.9	50.4	-	27.0	-
210	V	90°00'		526	2	527	11	1	6	100	3.5	27.1	26.4	0.44	42.9	9,490
230	V	89°49'		543	0	545	0	2	0	100	3.5	23.4	28.3	0.77	44.8	9,570
				583	2	584	6	1	3	100	3.7	25.6	36.0	-	34.7	-
				591	0	593	0	2	0	100	3.4	25.2	21.8	0.39	49.6	10,580
				610	9	612	3	1	6	100	2.8	23.1	37.1	-	37.0	-

GEOLOGICAL LOG

Logged by:— V.M. Threader

FROM	TO	RECOVERY			DESCRIPTION	SECTION	
		ft.	ins.	%		Core	Sample
	41 0	12	6	30	Mud and weathered dolerite		
0	55 0	7	6	54	Brown friable sandstone		
0	62 0	7	0	100	Grey mudstone with carbonaceous flecks		
0	68 0	2	3	56	Shale and shaly coal		
0	70 0	2	0	100	Coaly shale		
0	70 6	0	6	100	Coal		
6	71 6	0	9	75	Grey-brown mudstone		
6	71 8	0	2	100	Coal		
8	90 0	12	0		Grey shale, few coal pennies at 83'		
0	93 0				Grey sandy mudstone		
0	141 4				Grey to brown medium to coarse grained feldspathic sandstone probable faults at 105'6" and 108'3"		
				App.	both 20° to core also fault gouge at 110'0"		
4	143 4	9		90	Coal (sampled)		
4	144 10				Black and grey carbonaceous shale		
10	145 2	4			Coal		
5	2145 7				Soft grey clay		
5	7146 1	6			Coal		
6	1151 8				Grey and black shale with narrow bands of coal		
8	8152 2	6			Light grey mudstone		
2	2152 5	3			Coal		

Continued over:—

DEPARTMENT OF MINES — TASMANIA
DIAMOND DRILL CORE RECORD

FILE No.: Fingal No. 4	MAP SHEET No. 49	DISTRICT Fingal	LOCATION OF SITE:—
R.B.M. road approximately 3/4 mile beyond access road to Valley mine			
OF SITE:— 1793.1 (Mines Dept. Survey 1966)	SITE SURVEY ON MAP No.:—	CORE SIZE:— NX to 38' BX to 90' AX to 1083'1"	
DRILLING OF HOLE:—	AIR PHOTO No.:—	COMMENCED:— 24/8/62	
TERMINATION OF HOLE:— Vertical	DRILL:— B12 (F20C to 242')	COMPLETED:— 30/7/65	
COORDS. OF SITE:— (approx.) 871000N/529000E State Grid.	DRILLER:— A. Roberts D. Hardman	FINAL DEPTH:— 1033 feet.	

Index Page:—

PLUNG TARGET:—

MARKS:—

SURVEY DATA			ASSAY DATA						ASSAY RESULTS						
Hole No.	Bearing mag.	Inclin. degs.	SAMPLE No.	FROM		TO		RECOVERY		Moist	Vol.	Ash	Silphur	F.C.	B.T.M.
				ft.	ins.	ft.	ins.	ft.	ins.						
			1	317	0	320	0	2	6	83	6		34.5		
			2	327	0	331	0	4	0	100	4.9	27.3	25.0	0.39	42.8 9.880
			3	469	2	472	6	3	0	90	3.9	25.3	25.8	0.33	45.0 10.050
			4	482	9	488	8	5	11	90	4.3	22.5	29.4	0.25	43.8 9.170
			5	591	6	600	6	2	8	28	3.2	22.6	34.7		39.5
			6	619	0	623	0	3	4	83	3.7	18.9	46.4		31.0

GEOLOGICAL LOG

Logged by:—

Depth ft. ins.	TO		RECOVERY		DESCRIPTION	SECTION	
	ft.	ins.	ft.	ins.		Core	Sample
0	8	0	-	-	No core.		
0	20	0	2	0	Dolerite (probably scree)		
0	25	6	1	0	Carbonaceous mudstone		
6	27	0	1	0	Light grey mudstone		
0	33	0	5	0	Light grey fine grained sandstone		
0	87	0	48	0	Feldspathic sandstone, coaly streaky and fragments at 66'0" - 68'6" and shale fragments at 74'6" - 75'0".		
0	89	0	1	9	Fine grained sandstone with streaks of black shale.		
0	127	0	28	0	Feldspathic sandstone, highly carbonaceous shale 98'0" - 99'0" and shale with carbonaceous fragments 99'6" - 100'0"		
0	128	8	1	8	Shaly coal with 2" clay seam		
8	133	8	5	0	Grey mudstone		
8	134	4	0	8	Coal containing 1" clay seam & shaly fragments		
4	198	6			Feldspathic sandstone with coal and shaly fragments 165'0" - 167'0"		
6			6)		Coal		
			4)		Dark grey mudstone		
			9)	100	Light grey clay		
	200	6	5)		Coal		

Continued over:—

DEPARTMENT OF MINES — TASMANIA
DIAMOND DRILL CORE RECORD

No. <u>Fingal</u> <u>5</u>	MAP SHEET No. <u>49</u>	DISTRICT <u>Fingal</u>	LOCATION OF SITE:— No. 3 to 35'0" BX to 509'0" NX to 84'0" AX to 884'6"
In head waters of Cardiff Creek 64 ch. from B.H. 4 on bearing of 262°M			
(Mines Dept. Survey 1966)		SITE SURVEY ON MAP No.:	CORE SIZE:—
NAME OF HOLE:—		AIR PHOTO No.:	COMMENCED:— 20-8-65
DIRECTION OF HOLE:— <u>Vertical</u>		DRILL:— <u>12 B</u>	COMPLETED:— 29-10-65
ADDRESS OF SITE:—		DRILLER:— <u>G. Burns</u>	FINAL DEPTH:— <u>884'6"</u>

Index Page:—

TARGET:—

MARKS:—

SURVEY DATA			ASSAY DATA												
H	Bearing mag.	Inclin. degs.	SAMPLE No.	FROM		TO		RECOVERY			ASSAY RESULTS				
				ft.	ins.	ft.	ins.	ft.	ins.	%	Moist.	Vol.	T.O.	Ash %	BTU/lb
			827/1	721	0	723	6	2	6					57.3	-
			2	724	0	726	6	2	6					43.3	-
			3	815	8	819	0	3	4	100					
			774/1	1000	10	1003	10	2	3		4.4	22.3	52.0	21.3	10,144
			2	1003	10	1006	10	2	3	90	3.3	26.6	50.9	19.2	10,755
			3	1006	10	1009	10	2	3		2.9	26.1	34.1	36.9	8,190
			827/4	1126	0	1131	6	5	0	100				39.4	

GEOLOGICAL LOG

Logged by:—

TO	RECOVERY	DESCRIPTION	SECTION				
			Core	Sample			
ft.	ins.	ft.	ins.	%			
0	425	0	-	app 95	Jurassic dolerite. Bottom 3 ft. is fine grained due to chilling at contact.		
0	428	0	3	0	100	Indurated sediments, dark grey and flint-like. Dolerite/sediment contact is inclined at 50° to core length (i.e. dip 40°)	
0	433	0	5	0	100	Feldspathic sandstone with black banding.	
0	439	0	6	0	100	Fine grained feldspathic sandstone.	
0	452	0	13	0	100	As above with black banding. Current bedded in part.	
0	480	0	26	9	95	Feldspathic sandstone. 458' 1" band of clean fine grained sandstone. 461-466 dark grey banding 466-467 and 473-475 clay pellet conglomerate.	
0	480	6	0	6	100	Black shale	
0	481	6	0	6	100	Feldspathic sandstone	
6	486	6	5	0	100	Current bedded banded siltstone	
6	521	0	34	6	100	Current bedded feldspathic sandstone 500-501 banded mudstone 503, 504 and 513 siltstone bands 519 coaly band 520-521 colour change to yellow (weathered)	

Continued over:—

DEPARTMENT OF MINES — TASMANIA
DIAMOND DRILL CORE RECORD

No.:— 6	MAP SHEET No. 49	DISTRICT FINGAL	LOCATION OF SITE:— 0.32 (No. 4 32-72 (No. 3 72-350 M 350-825 (B 825 - 1502 (A).
50 feet from Duncan adit portal on 100° M			CORE SIZE:—
OF SITE:— 2427 H	SITE SURVEY ON MAP No.:—		COMMENCED:— 19-11-65
ING OF HOLE:—	AIR PHOTO No.:—		COMPLETED:— 8-2-68
ATION OF HOLE:— Vertical	DRILL:— 12B		FINAL DEPTH:— 1502 ft. Cns.
OS. OF SITE:—	DRILLER:— D. Hardman		

Index Page:—

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL - HOLE C1.

ft.	in.	ft.	in.	Remarks
0		380	10	Dolerite scree
380	10	383	4	Fine grained brecciated mudstone and sandstone weathered <u>insitu</u> to angular rock fragments and clay. Travertine at contact.
383	4	385	0	Fine grained light grey jointed mudstone.
385	0	386	0	Coal bed with moderately pure layers, of vitrinite. Becomes more impure towards 386' where it grades into mudstone. Gypsum veins up to $\frac{1}{8}$ ".
386	0	390	0	Light coloured mudstone weathered to clay at 389'.
390	0	391	9	Carbonaceous mudstone.
391	9	409	8	Dark grey fine grained mudstone, weathered to clay and small fragments in some patches.
409	8	415	0	Fine even grained light grey mudstone.
415	0	426	0	Medium to coarse grained feldspathic sandstone with thin coal seams and lenses up to $\frac{1}{8}$ ".
426	0	432	0	Rock weathered. Mudstone and feld. sandstone fragments in clay.
432	0	458	8	Feldspathic sandstone and some siltstone with coal seams and lenses up to $\frac{3}{8}$ ". The thicker seams ($\frac{1}{8}$ ") are mostly more than 3" apart, whereas the thin seams are often very close (spacing to 1/16") Banded sandstone.
458	8	460	6	Very fine brownish-grey mudstone which grades into the coal.
460	6	468	2	Black homogeneous coal seam of fairly low quality.
467	0	467	6	Coal is broken and there are thin clay beds up to $\frac{1}{4}$ ".
468	2	479	6	Alternating beds of carbonaceous sediments and non-carbonaceous mudstone and sandstones. The coal beds become less carbonaceous downwards.
479	6	479	9	3" rock fragments and clay.
479	9	509	0	Light grey fine grained mudstone. Some thin carbonaceous lenses between 487' and 490'. Most breaks in the core are drilling breaks parallel to the bedding.
509	0	526	4	Massive feldspathic sandstone with thinly bedded, closely spaced black carbonaceous layers. Jointing sub-vertical. Coal lenses up to $\frac{1}{8}$ " at 526'.
526	2	529	9	Alternating fine grained grey mudstone and coal. Coal becomes more vitreous and broken towards 529'.
529	9	535	3	Green clay.
535	3	541	0	Severely broken vitreous coal grading

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL - HOLE C1

ft.	in.	ft.	in.	Remarks
				(cont'd)
535	3	541	0	into carbonaceous mudstone at 541'
541	0	547	0	Mudstone with thin clay beds brecciated and decomposed to clay and rock fragments in patches.
547	0	558	7	Fine grained light greycross-bedded mudstone.
558	7	611	3	Medium grained massive feldspathic sandstone. Coaly lenses and seams up to $\frac{1}{4}$ " are common from 577'-580'.
611	3	614	4	Grey mudstone.
614	4	619	9	Greenish - grey mudstone, with alternating bands of black slightly carbonaceous mudstone. Average thickness of bands is $\frac{1}{8}$ "
				616'-616'8" Region of slickensided and sheared mudstone.
619	9	620	2	Brown slightly weathered mudstone.
620	2	624	3	Carbonaceous mudstone with slickensides at 622'
624	3	628	4	Coal with closely spaced vitreous layers up to $\frac{1}{8}$ " thick. 1" mudstone beds at 624'7" (weathered) and one at 625'1". No vitreous layers below 627'8" and from here it grades into a carbonaceous mudstone at 628'6".
628'	6"	634	11'	Grey mudstone with some slickensides.
634	11	709	8	Fine to coarse grained feldspathic sandstone with sets of thin coaly lenses at 646'6", 654', 662', 668', 678'4", 685'9", 706' and 709'. The sets are up to 1ft. long and consist of thin (up to $\frac{1}{8}$ ") coal lenses with an average spacing of $\frac{1}{4}$ ".
709	8	712	0	Black coal with vitreous layers up to $\frac{1}{8}$ " Broken from 710'6" to 711'8" - 40% core loss.
712	0	713	5	Grey weathered mudstone consisting of rock fragments and clay.
713	5	719	10	Fairly uniform dark grey carbonaceous mudstone. Broken core due to fretting.
719	10	724	10	Carbonaceous sandstone containing thin wavy lenses of carb. material up to $\frac{1}{16}$ " and some mud. beds with gradational contacts.
724	10	753	6	Massive feldspathic sandstone medium to coarse grained with coal lenses up to $\frac{1}{8}$ " at 735'10", 736'10", 738'1".
753	6	754	7	Grey banded carbonaceous mudstone.
754	7	755	9	Dull coal with vitreous bands up to $\frac{1}{16}$ ".
755	9	756	7	Dark grey carbonaceous mudstone

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL - HOLE C1

ft.	in.	ft.	in.	Remarks
756	7	759	4	Grey weathered and decomposed carbonaceous mudstone with closely spaced fissile partings.
759	4	760	11	Carbonaceous mudstone.
760	11	761	4	Coal with vitreous layers up to $\frac{1}{2}$ ". Vertical gypsum veins.
761	4	782	1	Light grey slightly carbonaceous mudstone due to scattered vegetable matter; No coal lenses.
782	1	784	6	Dark grey carbonaceous mudstone containing 3" coal.
784	6	786	4	Dull coal with irregular vitreous layers.
786	4	788	4	Carbonaceous mudstone.
788	4	790	9	Coal with mudstone beds at 788'6" and 790'5".
790	9	809	7	Grey mudstone which grades from carbonaceous to slightly carbonaceous at the base.
809	7	850	0	Fine to medium grained feldspathic sandstone, with thin coal lenses.
850	0	853	3	Grey mudstone, only slightly carbonaceous.
853	3	853	4	Muddy coal with very thin vitreous layers. 2" mudstone.
853	4	870	9	Fine to medium grained feldspathic sandstone. Weathered from 861'6" to 864'7". 857'9" - 1" thick set of thin carb. layers.
870	9	872	0	Grey mudstone becoming carbonaceous at 872'. Joints slickensided.

Hole stopped at 872'.

Logged by I. Munro & D. Furber

HYDRO ELECTRIC COMMISSION

COAL RESOURCES INVESTIGATION - FINGAL - HOLE C2

ft.	in.	ft.	in.	Remarks
0	0	13	11	Mudstone weathered to greenish grey clay.
13	11	15	2	Grey massive mudstone.
15	2	17	0	Partly weathered grey siltstone.
17	0	21	6	Weathered, jointed feldspathic sandstone with limonite staining.
21	6	54	7	Brown to grey, medium to coarse grained feldspathic sandstone. 24'3" - 25'0" Cavities left by leached coal seams up to $\frac{1}{8}$ " wide. Clay pellet conglomerate phases as shown. 35'0" - 46'6" Coal lenses up to $\frac{1}{8}$ " are spaced from $\frac{1}{4}$ " to 12".
54	7	60	0	Dark grey, slightly carbonaceous mudstone with some thin vitreous coal lenses up to $\frac{1}{4}$ ". One 1" band of dull coal at 59'9".
60	0	62	7	Mudstone with dull coal bands up to 3".
62	7	63	5	Dull, jointed and broken coal with thin vertical gypsum veins and some pyrite.
63	5	64	1	Weathered mudstone.
64	1	64	7	Dull coal
64	7	66	7	Mudstone containing small ($< \frac{1}{4}$ ") carbonaceous pellets.
66	7	69	9	Dull and vitreous coal with mudstone bands up to 4".
69	9	71	4	Carbonaceous mudstone with coal beds up to 1".
71	4	72	0	Dull coal with vitreous bands.
72	0	76	6	Carbonaceous mudstone
76	6	81	10	Dirty dull coal beds up to 8" interbedded with slightly weathered mudstone.
81	10	84	1	Slightly carbonaceous mudstone.
84	1	87	2	Fine grained feldspathic sandstone.
87	2	89	0	Mudstone and siltstone
89	10	126	10	Grey to brown medium grained feldspathic sandstone. A few very thin ($< 1/16$ ") coaly bands from 91'0" 92'6" Brown colour and slightly weathered from 99'6" to 110'0".
126	10	131	10	Grey siltstone.
131	10	132	8	Dull coal.
132	8	133	3	Partly weathered mudstone.
133	3	137	2	Coal with vitreous layers up to $\frac{1}{4}$ ". Thin gypsum veins and some pyrite on joints.
137	2	137	9	Weathered mudstone.

COAL RESOURCES INVESTIGATION - FINGAL- HOLE C2.

ft.	in.	ft.	in.	Remarks
137	9	147	8	Coal with vitreous layers up to 1". Severely broken from 146'0" - 147'5". Some mudstone beds up to 3".
147'	8	160	10	Grey mudstone and siltstone.
160	10	169	3	Medium grained grey feldspathic sandstone. 1" of vitreous coal at 168'8".
169	3	171	0	Fine grained grey mudstone.
171	0	171	5	Siltstone.
171	5	203	0	Medium grained feldspathic sandstone. 182'0" - 182'9" Vitreous coal lenses and bands up to $\frac{3}{4}$ ". 189'1" - 189'6" Broken mudstone due to fretting.
203	0	204	2	Carbonaceous mudstone.
204	2	206	0	Dull coal with vitreous bands up to $\frac{3}{8}$ ". Two 1" bands of clayey weathered carbonaceous mudstone at 204'5" and 205'3".
206	0	218	3	Sheared grey siltstone. Clay in the thicker joints.
218	3	220	8	Dull coal with some vitreous bands. 218'6" - 219'4" Brecciated band containing clay and broken coal.
220	8	222	6	Carbonaceous mudstone and siltstone.
222	6	268	10	Fine to medium grained feldspathic sandstone with some groups of thin impure coaly lenses.
268	10	273	10	Clay, feldspathic sand and sandstone fragments formed by decomposition of sandstone and mudstone. A slickensided surface at 268'10" has a 1" thick brecciated zone containing clay and sandstone fragments. Very stiff clay and mudstone fragments from 272'0" = 273'0". The whole interval is probably a fault zone. 12
273	10	275	9	Dull coal with vitreous layers up to $\frac{3}{8}$ ". Vertical gypsum veins up to 1/16" (30% core loss).
275	9	279	1	Mudstone with 2" clay at 276'8".
279	1	285	1	Sandy siltstone.
285	1	316	10	Medium to coarse grained feldspathic sandstone.
316	10	317	5	Broken, jointed, slickensided mudstone with sandstone lenses.
317	5	317	9	Feldspathic sandstone with irregular mudstone lenses up to 1" thick. Some lenses are carbonaceous.
317	9	329	9	Coarse siltstone to fine sandstone with small groups of very thin carbonaceous lenses.
329	9	330	3	Coal with vertical gypsum veins. $\frac{1}{2}$ " brecciated clayey coal at 330'0".
330	3	341	6	Mudstone with many slickensided joints, some containing clay.

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATIONS - FINGAL - HOLE C2

Ft.	in.	ft.	in.	Remarks
341	6	344	0	Grey siltstone.
344	0	379	10	Medium to coarse grained feldspathic sandstone.
379	10	380	7	2" coal lens, 1" sandstone, 4" slickensided mudstone, 2" slickensided coal.
380	7	456	7	Medium to coarse grained feldspathic sandstone.
456	7	458	7	Carbonaceous siltstone.
458	7	460	0	Medium grained feldspathic sandstone with clay-pellet conglomerate phase. Pellets or lenses are carbonaceous, and are up to 2" thick with most, wider than 1/2".
460	0	484	11	Medium grained feldspathic sandstone with clay-pellet phases.
484	11	485	7	Feldspathic sandstone containing thick carbonaceous mudstone lenses and pellets.
485	7	488	6	Fine grained feldspathic sandstone.
488	6	489	9	Carbonaceous siltstone.
489	9	499	5	Banded fine grained sandstone to siltstone. Bands are carbonaceous beds up to 1" and some small lenses.
499	5	521	10	Mainly mudstone with some siltstone phases. Very carbonaceous from 504'8" to 505'7".
521	10	525	0	Dull coal with some vertical joints.
525	0	526	0	Carbonaceous mudstone.
526	0	533	3	Dull coal with thin vertical gypsum veins.
533	3	561	9	Grey mudstone, banded in places due to thin siltstone phases. From 541'2" - 542'2" the rock is broken, partly weathered to clay and has slickensided joints.
561	9	563	10	Dull coal with vertical gypsum veins. Broken from 562'1" to 563'0". 562'4"
563	10	569	5	Carbonaceous siltstone.
569	5	579	0	Fine to medium grained feldspathic sandstone.
579	0	579	4	Very carbonaceous mudstone, with horizontal gypsum seams.
579	4	580	4	Completely weathered and broken muddy siltstone.
580	4	583	2	Partly weathered siltstone, carbonaceous in some parts.
583	2	588	3	Fine grained siltstone.
588	3	595	2	Slightly carbonaceous mudstone, banded below 591"
595	2	596	3	Dull, fairly impure broken coal with

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATIONS - FINGAL - NOLE C2

ft.	in.	ft.	in.	Remarks
				(cont'd) slickensided joints.
596	3	602	6	Mudstone.
602	6	603	4	Dull coal with some thin vitinite layers. Partly broken.
603	4	607	0	Black, very carbonaceous mudstone. Density too high for coal.
607	0	615	6	Mudstone, banded in places, with carbonaceous mudstone and siltstone beds.
615	6	617	2	Partly broken dull coal with thin vitrinite layers. Vertically jointed.
617	2	624	11	Brown to grey fine grained mudstone or claystone. Decomposed to clayey silt from 618'2" - 618'10" and 621'2" - 621'6".
624	11	625	8	Dull coal with vitrinite bands up to 1/2".
625	8	632	10	Carbonaceous mudstone.
632	10	692	10	Fine to medium grained feldspathic sandstone. Some vitrinite lenses up to 1/2" from 279'6" - 281'3".
692	10	693	0	Carbonaceous mudstone
693	0	697	4	siltstone with some mudstone phases.
697	4	711	4	Medium grained feldspathic sandstone.
711	4	722	4	Mudstone with some siltstone.
722	4	725	10	Siltstone.
725	10	733	4	Mudstone with some siltstone phases. Partly sheared near 730'.
733	4	744	8	Coarse grained siltstone, banded with very thin carbonaceous bands from 740'-744'.
744	8	769	0	Mainly mudstone with thin beds of siltstone and coarse sandstone. Carbonaceous from 764'0".
769	0	805	1	Medium to coarse grained white, banded, sandy quartzite. Slightly feldspathic with many very thin, closely spaced carbonaceous bands. Some broken and partly weathered patches.
805	1	806	8	Pebble conglomerate containing rounded quartz pebbles and many clay pellet lenses. The Triassic - Permian boundary lies at 805'1" where the mudstone siltstone - feldspathic sandstone changes to a pebbly greywacke lithology.
806	8	821	0	Grey, sub-greywacke with a few very small white pebbles from 815'9" - 818'3" the rock is brecciated and weathered and probably represents a fault zone. The weathered rock consists of angular rock fragments in a black clayey matrix.

Hole completed at 821'0"
Logged by T. Munro

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL - HOLE C3

ft.	in.	ft.	in.	Remarks
0		8	6	Scree.
8	6	18	6	Weathered mudstone with sandstone bands.
18	6	58	0	Weathered sandstone.
58	0	73	0	Fresh medium feldspathic sandstone with black streaks, clay pellet conglomerate at 72'.
73	0	94	0	Grey banded mudstone clear transition to coal at 94'.
94	0	97	10	Coal = Valley Mine Seam.
97	10	100	10	Mudstone with coaly bands.
100	10	103	0	Coal.
103	0	106	0	Weathered mudstone (seat earth)
106	p	113	6	Grey mudstone.
113	6	115	10	Coal.
115	10	121	0	Mudstone 2" coal at 117' and 6" coal at 120'.
121	0	122	0	Fine sandstone.
122	0	129	0	Banded mudstone with bands of sandstone increasing downwards.
129	0	151	0	Medium feldspathic sandstone.
151	0	170	0	Banded mudstone, darker downwards, thin coal 6" at 157', grain increases downwards in bands to medium feldspathic sandstone at 170'. Crystals of calcite at 170' in near vertical joint.
170	0	215	3	Medium feldspathic sandstone.
215	3	218	3	Coal: 1" coal to 215'4"; 2" band to 215'6"; 1" coal to 215'7"; 1/2" band to 215'7 1/2".
218	3	229	0	Grey mudstone.
229	0	237	0	Dull coal, broken core.
237	0	252	0	Banded siltstone - mudstone with coarser sandstone beds.
252	0	257	7	Grey mudstone (fossils)
257	7	260	10	Broken coal.
260	10	270	10	Banded sandstone - siltstone and mudstone.
270	10	272	10	Coal.
272	10	275	0	Banded weathered sandstone.
275	0	281	0	Mudstone.
281	0	283	3	Coal
283	3	299	6	Grey banded mudstone.
299	6	302	0	Coal.
302	0	321	0	Banded siltstone, mudstone

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL C3.

ft.	in.	ft.	in.	Remarks
				(Cont'd)
				sandstone (coarsest near 310)
321	0	322	0	Coal grading down into coaly mudstones.
322	0	327	0	Coal grading down into coaly mudstones.
322	0	327	0	Black mudstones.
327	0	334	0	Grey mudstone.
334	0	387	0	Banded fossiliferous feldspathic sandstone to 340', then fossiliferous but fewer bands to cleaner 380'-381' coaly partings, bands, and finer sandstone banding.
387	0	406	0	Banded fine sandstone and siltstone.
406	0	429	0	Medium feldspathic sandstone clay pellets at 411'.
429	0	437	0	Fine and medium banded sandstone.
437	0	439	0	Medium sandstone.
439	0	448	10	Medium sandstone banding towards end.
448	10	458	0	Banded sandstone, coaly pellets at 450' for 1/2" and at 452' for 2 1/4".
458	0	466	0	Banded mudstone.
466	0	470	0	Banded mudstone, fine sandstone and siltstone.
470	0	475	0	Banded whitish sandstone, thin black bands and coal streaks.
475	0	494	0	Fine banded sandstone, fossiliferous, siltstone bands.
494	0	522	0	Medium grey sandstone quartzose becomes coarser downwards, black coal partings throughout.
522	0	533	9	Permian, pebbles to 1", plant fossils, mudstone dark grey to black.

Hole completed 533'9".

Logged by G.E. Hale

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL HOLE C4.

ft.	in.	ft.	in.	Remarks
0	0	50	6	Scree.
51	0	55	6	Medium feldspathic sandstone.
53	6	57	6	Coal.
57	6	67	9	Banded sandstone and mudstone.
67	9	68	0	Coal (20% core loss)
68	0	77	7	Mudstone with thin coal bands.
77	7	80	1	Coal (20% core loss)
80	1	85	0	Mudstone with 3" coal.
85	0	94	0	Medium sandstone.
94	0	99	0	Mudstone.
99	0	101	7	Coal with mudstone bands.
101	7	102	7	Coarse sandstone.
102	7	110	0	Grey mudstone.
110	0	119	0	Medium grey sandstone.
119	0	121	0	Dark grey mudstone.
121	0	131	6	Banded sandstone and mudstone.
131	6	142	0	Dark grey mudstone.
142	0	190	0	Medium grey sandstone (feldspathic)
190	0	198	8	Grey mudstone
198	8	253	0	Grey medium feldspathic sandstone.
198	8	253	0	Medium grey feldspathic sandstone- clay pellets at 219'-221' and 244'- 245'.
253	0	266	6	Medium sandstone.
266	6	282	0	Grey medium sandstone, banded.
282	0	290	0	Banded sandstone with 12" black mudstone at 284'
290	0	305	0	Finer sandstone with shale bands.
305	0	310	0	Carbonaceous mudstone and poor coal.
310	0	342	8	White quartzose sandstone. 311'5" Clay pellets. 311'9" 1" of coal. Permian at 342' dark grey mudstone with pebbles to 1/2" diameter.

Hole completed at 397'3"

Logged by G.E. Hale

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - TINGAL HOLE C5

ft.	in.	ft.	in.	Remarks
0	0	40	0	Scree - dolerite boulders.
40	0	43	0	Weathered grey mudstone.
43	0	51	0	Grey mudstone with carbonaceous bands; 43'6" - 3" 45' - 2" 46' - 2"
51	0	52	0	Grey mudstone.
52	0	61	9	Fine medium banded feldspathic sandstone.
61	9	66	0	Banded mudstone (fossils)
66	0	67	6	Coal
67	6	83	3	Banded sandstone (calcareous) near top, mudstone increases downwards, current bedded.
83	3	88	6	Fine banded sandstone.
88	6	94	2	Dull coal or black carbonaceous mudstone.
94	2	100	0	Black mudstone grading to banded sandstone.
100	0	102	8	Dark grey mudstone.
102	8	105	0	Banded mudstone and sandstone.
105	0	106	0	Dark grey mudstone.
106	0	112	8	Light grey banded mudstone and siltstone.
112	8	149	0	Light grey medium feldspathic sandstone.
149	161	161	0	Darker bands of siltstone in sandstone.
161	0	223	3	Fine sandstone increasing in coarseness downwards. clay pellet conglomerates at 190' - 194' 211' - 212'; 214' - 220' (very coarse).
223	0	223	3	Coal pellets and a few inches of mudstone penetrates into sandstone at 224'.
223	3	227	0	Fine sandstone.
227	0	232	0	Banded mudstone.
232	0	233	0	Fine sandstone.
233	0	237	0	Dark grey and banded carbonaceous mudstone.
237	0	249	0	Fine sandstone.
249	0	249	6	Coaly band.
249	6	267	0	White sandstone with black bands.
267	0	268	3	Black carbonaceous mudstone.
268	3	317	0	Light coloured quartzose sandstone - bands common below 281' 3" black band at 287'.
317'	0	329	11	Permian - dark grey mudstone with pebbles to 1/2" diameter, some banding.

Hole completed 329'11"

Logged by G.E. Hale

HYRDO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL HOLE C6

Ft.	in.	ft.	in.	Remarks
0		34	0	Weathered mudstone.
28	0	29	0	Weathered coaly band.
34	0	41	6	Yellow weathered mudstone. 36'2"-39'8" broken carbonaceous bands.
41	6	54	6	Dark grey mudstone with some fine sandstone bands.
54	6	57	6	Coal broken for 1st foot.
57	6	63	0	Medium sandstone with thin carbonaceous bands.
63	0	67	0	Grey mudstone with sandstone bands.
67	0	68	8	Coal with $\frac{1}{2}$ " bands.
68	8	71	10	Grey soft siltstone with carbonaceous bands.
71	10	72	0	Coaly band.
72	0	75	0	Very broken mudstone with coaly bands.
75	0	80	8	Dark grey mudstone.
80	8	82	5	Coal.
82	5	86	6	Dark grey mudstone grading to sandstone.
86	6	90	0	Fine banded sandstone grading to mudstone.
90	0	94	5	Mudstone with siltstone bands.
94	5	98	0	Coal - 1" band at 97'.
98	0	100	0	Banded mudstone faulted at 60° against sandstone.
100	0	102	10	Medium feldspathic sandstone.
102	10	110	6	Mudstone grading to coal.
110	6	113	0	Coal grades to dark grey mudstone.
113	0	146	0	Dark grey mudstone - breaks easily. (125'-130').
				More silty and lighter colour.
146	0	190	3	Dark grey feldspathic sandstone. Clay pellet conglomerate at 147'-151' and at 188'.
190	3	192	4	Banded sandstone and mudstone.
192	0	203	0	Bands of sandstone increase downwards.
203	0	216	3	Medium uniform feldspathic sandstone.
216	3	221	4	Mudstone.
221	4	221	9	Fine sandstone.
221	9	227	3	Dark grey mudstone.
227	3	245	0	Banded sandstone with bands decreasing from 232'2".
245	0	247	0	Medium feldspathic sandstone grades to banded sandstone.

HYDRO ELECTIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL HOLE C6

ft.	in.	ft.	in.	Remarks
247		251	4	Banded sandstone and thin mudstone.
251	4	252	0	Dark grey mudstone.
252	0	265	7	Mudstone with thin sandstone bands.
265	7	314	9	Medium quartzose sandstone with black coaly streaks, some pyrite. 1" of coal at 314'8".
314	9	316	9	Dark grey mudstone.
316	9	330	0	Coarse quartzose sandstone.
330	0	342	0	Permian greywacke sandstone 4½" Quartzose bands at 330'11" and 1" at 331'2".

Hole completed at 342ft. oins.
Logged by G.E. Hale

HYDRO ELECTRIC COMMISSION

COAL RESOURCES INVESTIGATION - FINGAL - HOLE C7

Ft.	in.	ft.	in.	Remarks
0	0	13	0	Weathered yellowish mudstone.
13	0	16	0	Weathered brown medium feldspathic sandstone.
16	0	30	10	Dark grey mudstone.
30	10	33	0	Brown medium sandstone with black bands.
33	0	34	0	Black mudstone, 3" brown sandstone.
34	3	45	0	Grey and brown weathered mudstone with coaly intrusions at base.
45	0	46	0	Broken coal.
46	0	54	0	Medium feldspathic sandstone.
54	0	58	0	Mudstone.
58	0	66	0	Coal.
66	0	67	0	Grey mudstone.
67	0	69	0	Feldspathic sandstone.
69	0	72	2	Grey mudstone, 2" coal at bottom.
72	2	72	8	Grey mudstone.
72	8	78	0	Coal. 1½" band at 73' and ½" clay at 77'6".
78	0	97	0	Banded sandstone and siltstone.
97	0	102	0	Grey mudstone banded in part.
102	0	105	0	Coal.
105	0	107	0	Banded black siltstone - claystone.
107	0	110	0	Banded feldspathic sandstone - pellets at 110'.
110	0	116	0	Medium feldspathic sandstone.
116	0	117	0	Coal (broken).
117	0	118	0	Sandstone.
118	0	121	0	Banded mudstone.
121	0	122	0	Broken coal.
122	0	129	6	Dark grey mudstone.
129	6	131	6	Poor coal.
131	6	141	0	Grey mudstone.
141	0	145	0	Coal.
145	0	147	0	Grey mudstone.
147	0	150	0	Banded sandstone - mudstone.
150	0	173	0	Banded mudstone, 6" coal at 152'.
173	0	215	0	Medium feldspathic sandstone.
215	0	217	0	Carbonaceous material - calcareous and clay pellets.
217	0	232	0	Medium feldspathic sandstone - clay pellets at 230'.

HYDRO ELECTRIC COMMISSION

COAL RESOURCES INVESTIGATION - FINGAL - HOLE C7

ft.	in.	ft.	in.	Remarks
232	0	236	0	Banded sandstone - mudstone becomes finer to siltstone between 236' and 237'.
237	0	239	0	Banded fine siltstone.
239	0	240	0	Banded mudstone becomes coarser between 240'-245'.
245	0	272	6	Medium feldspathic sandstone.
272	6	276	0	Banded mudstone grades to
276	0	290	0	Banded sandstone and siltstone, mudstone band 283'-284'.
290	0	312	6	Banded siltstone.
312	6	314	8	Calcareous medium feldspathic sandstone.
314	8	319	0	Black mudstone - slickensides at 316'
319	0	369	0	Quartzose sandstone with black sands and coal streaks very coarse sandstone at 367'.
369	0			Coarse quartzose sandstone.
369	0	386	3	Dark grey Permian mudstone - plant fossils pebbles to $\frac{1}{4}$ " diameter.

Hole completed at 386ft. 3 ins.

Logged by G.E. Hale

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL - HOLE C8

ft.	in.	ft.	in.	Remarks
0	0	273	9	Talus and scree - dolerite boulders, sand and clay.
273	9	285	0	Grey mudstone - no baking
285	0	291	0	Dark grey to black carbonaceous mudstone.
291	0	335	0	Grey banded mudstone. Black Colour from 304' to 320'.
335	0	387	0	Grey feldspathic sandstone.
387	0	452	0	Banded sandstones, mudstones. Clay pellets at 407' for 18" Black band at 421'
452	0	458	0	Fine grey feldspathic sandstone with finer and darker bands towards bottom.
458	0	458	6	Fine grey quartzose sandstone.
458	6	471	0	Dark grey banded mudstone carbonaceous for bottom 2'.
471	0	491	9	Medium white quartzose sandstone.
491	9	494	6	Coarse quartzose sandstone.
494	6	511	0	Medium white quartzose sandstone.
511	0	521	10	Dark grey Permian mudstones with pebbles to $\frac{1}{2}$ " diameter.

Hole completed at 521ft. 10 ins.

Logged by G.E. Hale

HYDRO ELECTRIC COMMISSION
COAL RESOURCES INVESTIGATION - FINGAL - HOLE C9

ft.	in.	ft.	in.	Remarks
				Scree and sand.
0	0	125	2	Scree and sand.
132	0	139	0	Weathered coal and mudstone.
139	0	148	0	Banded mudstone.
148	0	149	0	Broken coal.
149	0	159	0	Grey mudstone.
159	0	166	0	Coal, 2'11" loss.
166	0	169	0	Banded sandstone and siltstone.
169	0	176	1	Grey mudstone, 3" carbonaceous at 175', 1" grey sandstone at 176'.
176	1	179	9	Brown mudstone.
179	9	187	2	Black carbonaceous mudstone and dull coal.
187	2	191	8	Dark grey mudstone.
191	8	247	2	Medium grey feldspathic sandstone. Grey feldspathic sandstone, clay pellets at 229'. Coal and mudstone fragments at 245' and 247'2".
247	2	249	0	dark grey mudstone.
249	0	249	6	Sandstone.
249	0	252	0	Banded sandstone and mudstone.
252	0	300	0	Banded fine feldspathic sandstone Sand siltstone with some coarser bands.
300	0	307	0	Carbonaceous band, at 292'2" Medium feldspathic sandstone.
307	0	321	0	Banded sandstone - siltstone 3" carbonaceous band at 319'.
321	0	343	0	Grey feldspathic sandstone banded near 343'.
343	0	363	10	Quartzose sandstone with black streaks coarser towards top and bottom, pellets near bottom.
368	10	385	3	Permian dark grey mudstone with small pebbles.

Hole completed at 385ft.3ins.

Logged by G.E. Hale.

CORNWALL COLLIERY, CORNWALL - HOLE No. 1

ft.	in.	ft.	in.	Remarks
0	0	5	0	Talus.
5	0	6	0	Weathered sandstone.
6	0	27	0	Medium to light grey siltstones and mudstones.
27	0	30	0	Dark grey to black mudstone.
30	0	34	0	Medium grey siltstone.
34	0	35	0	Dark grey to black mudstone.
35	0	35	6	Black siltstone
35	6	38	0	Dark grey to black mudstone
38	0	39	6	Medium grey siltstone; dip 6°.
39	6	42	0	Laminated black carbonaceous mudstone.
42	0	43	0	Black shale (clod).
43	0	44	0	Black siltstone; dip 5°.
44	0	45	0	Black cherty siltstone.
45	0	52	0	Soft, dark grey friable siltstone.
52	0	53	6	Hard, dark grey silty chert.
53	6	55	6	Soft, black friable siltstone.
55	6	58	6	Hard, black and dark grey silty chert.
58	6	59	6	Light grey fine-grained lithic sandstone.
59	6	61	6	Driller recorded poor coal. Core removed by Mines Department.
61	6	62	6	Light grey fine-grained sandstone.
62	6	65	6	Driller recorded: 11" coal 1" band, 24" coal. Core removed by Mines Department.
65	6	66	6	Soft weathered, light greenish-grey siltstone.
66	6	68	0	Hard, medium grey cherty siltstone.
68	0	68	6	Soft, weathered, light greenish-grey siltstone.
68	6	69	6	Hard black silty chert.
69	6	71	6	Soft, weathered, light grey siltstone.
71	6	76	0	Driller recorded: poor quality: coal. Core removed by Mines Department.
76	0	77	0	Hard, black and medium grey cherty siltstone.
77	0	79	6	Soft, weathered, light grey siltstone and fine grained sandstone.
79	6	87	6	Driller recorded: (2'2" coal { white band Core removed by Mines Department. (4'6" Dirty coal with { stone bands.
87	6	88	0	Soft, weathered, greenish-grey fine-grained sandstone.

CORNWALL COLLIERY, CORNWALL - HOLE No. 1

ft.	in.	ft.	in.	Remarks
88	0	90	0	Hard black carbonaceous shale (clod).
90	0	91	0	Soft weathered light greenish-grey siltstone.
91	0	95	0	Soft, black friable siltstone.
95	0	97	0	Hard, black carbonaceous shale (clod).
97	0	98	0	Hard, medium grey cherty siltstone.
98	0	99	0	Soft, weathered, light greenish-grey siltstone.
99	0	101	0	Hard black cherty siltstone.
101	0	102	0	Soft, weathered light and medium grey siltstone.
102	0	106	6	Medium hard, black cherty siltstone.
106	6	112	0	Light medium-grey laminated carbonaceous siltstone. dip 3°: 3" coal.
112	0	124	6	Light grey, fine-grained, lithic sandstone with carbonaceous laminations.
124	6	128	0	Black carbonaceous shale (clod.)
128	0	129	6	Black sandy siltstone
129	6	130	6	Weathered greenish-grey claystone.
130	6	133	0	Medium hard, black silty mudstone.
133	0	134	0	Soft, weathered, light greenish-grey sandstone.
134	0			6" coal.
134	6	141	0	Black carbonaceous shale (clod); friable dip 10°.
141	6	142	0	Medium grey siltstone.
142	0	147	0	Light grey fine-grained sandstone; dip 6°.
147	0	196	0	Light grey medium-grained lithic sandstone; few carbonaceous and coal laminations; dip 10°.
188	0			3" coal.
194	0	196	0	Prominent carbonaceous layering, coal lenses.
196	0	202	0	Light grey and medium grey carbonaceous silty mudstone.
202	0	210	6	Light grey medium-grained sandstone with clay pellets.
205	6			6" black siliceous mudstone.
210	6	211	0	Light grey siltstone; dip 12°.
211	0	238	0	Light grey medium grained lithic sandstone.
225	6	228	0	carbonaceous and coaly layering; friable; soft; dip 10°.
238	0	245	0	Light grey fine-grained lithic sandstone.
245	0	253	0	Light grey medium-grained lithic sandstone.
253	0	256	0	Light grey fine-grained lithic sandstone.
255	6	256	0	Numerous fine carbonaceous laminations.

CORNWALL COLLIERY, CORNWALL - HOLE NO. 1

ft.	in.	ft.	in.	Remarks
404	0	406	6	Driller recorded 2'6" Coal: Core removed by Mines Department.
406	6	408	0	Dark grey siltstone; some carbonaceous laminations.
408	0	417	0	Light grey fine to medium-grained lithic sandstone.
417	0	423	0	Light grey medium-grained lithic sandstone; some carbonaceous layering.
423	0	426	0	Light grey fine-grained sandstone.
426	0	477	0	Light grey medium-grained lithic sandstone; few carbonaceous laminations; dip up to 10°.
434	0			1/3" coal lense and clay pellets.
451	0			2" Black carbonaceous shale (clod).
455	0	456	0	Noticeably calcareous.
477	0	477	6	Irregular sandstone and mudstone; some slickensides.
477	6	479	0	Light grey fine-grained lithic sandstone.
479	0	480	0	Irregular sandstone and mudstone with carbonaceous layering.
480	0	481	0	Dark grey silty mudstone.
481	0	481	6	Irregular sandstone and mudstone; dip to 30°.
481	6	485	0	Light grey fine-grained lithic sandstone.
485	0	486	6	Black carbonaceous shale (clod) and slickensided mudstone.
486	6	490	0	Light grey fine-grained sandstone with up to 1/2" carbonaceous and coal laminations.
490	0	493	0	Dark grey silty mudstone.
491	6			Slickensides.
493	0	498	0	Interbedded light grey and medium grey siltstone and fine-grained sandstone.
498	0	509	0	Interbedded light grey siltstone and mudstone.
509	0	518	0	Medium grey silty mudstone; laminated at base; dip 8°.
518	0	521	0	Light grey medium-grained lithic sandstone; crumbly.
521	0	524	6	Driller recorded 2'9" coal; Core removed by Mines Department.
524	6	534	0	Medium grey laminated siltstone.
534	0	535	0	Medium grey silty mudstone with 2" black carbonaceous shale (clod).
535	0	537	0	Medium grey siltstone with 1/8"-1/4" carbonaceous laminations at base.
537	0	537	6	Medium grey siltstone.
537	6	538	6	Black carbonaceous shale (clod).
538	6	544	0	Driller recorded; 6" fine sandstone 7" sand 6" buff brown sand and light band.

CORNWALL COLLIERY, CORNWALL - HOLE NO. 1

ft.	in.	ft.	in.	Remarks
				1'2" coal and 2" band. 3'2" coal and band. 9" coal
				Core removed by Mines Department.
544	0	547	0	Light grey fine-grained lithic sandstone.
547	0	551	6	Dark grey silty mudstone.
551	6	552	0	Black carbonaceous shale.
552	0	558	0	Interbedded light grey fine to medium-grained lithic sandstone.
558	0	561	0	Light grey fine-grained lithic sandstone.
561	0	562	0	Dark grey mudstone and black carbonaceous shale.
562	0	565	6	Driller recorded; 2'8" coal Brown band Coal
				Core removed by Mines Department.
565	6	579	0	Interbedded medium grey siltstone and fine sandstone.
571	0			½" coal.
579	0	580	6	Black carbonaceous shale (clod).
580	6	582	6	Medium grey fine-grained lithic sandstone with numerous carbonaceous laminations; crumbly.
582	6	586	0	Black carbonaceous shale (clod).
586	0	587	0	Light greenish-grey and dark grey laminated silty mudstones; crumbly.
587	0	589	0	Black carbonaceous shale (clod).
589	0	594	9	Driller recorded: 10" Coal 4" Black stone + ½" white band. 4'00" Coal 3'00" Banded coal.
594	9	600	0	Laminated dark grey mudstone and medium grey siltstone.
600	0	603	0	Light grey fine-grained lithic sandstone.
603	0	605	0	Dark grey silty mudstone.
				Hole Completed 605'.
				Logged by S.J. Paterson.
				6-10-1959.

CORNWALL COLLIERY, CORNWALL - HOLE NO. 2.

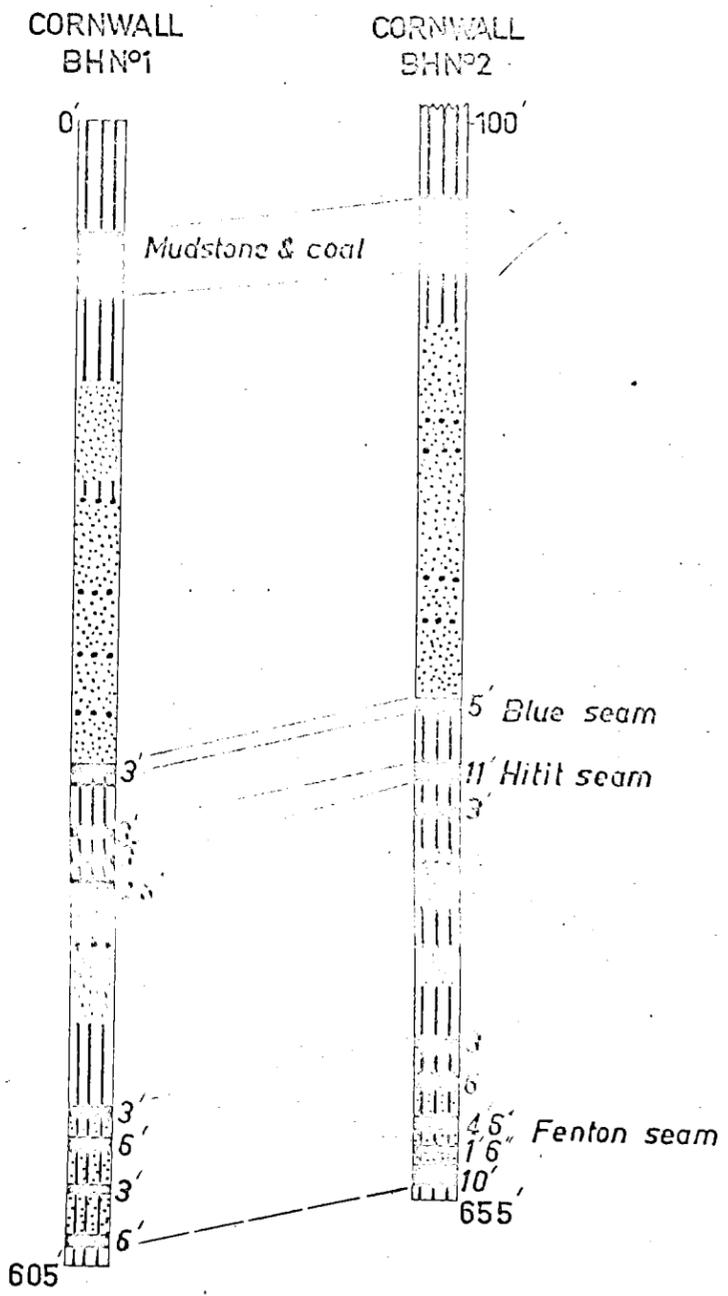
ft.	in.	ft.	in.	Remarks	Sample No.
0	0	102	6	Clay and boulders. (Drillers comment).	
102	6	103	0	Light grey medium-grained sandstone.	
103	0	104	6	Light grey to medium grey laminated siltstone and mudstone.	
104	6	105	0	Light grey fine grained sandstone.	
105	0	108	0	Medium grey siltstone; friable - core broken.	
108	0	112	0	Laminated black, medium and light grey siltstone; Dip 5°.	
112	0	113	0	Laminated light grey fine sandstone and siltstone.	
113	0	114	6	Black shale (clod)	
114	6	116	0	Light grey silty mudstone.	
116	0	121	0	Laminated light, medium and dark grey, white and black siltstone; 3½"-4" laminations; Dip 5°.	
121	0	125	0	White siltstone with bands of black siltstone; calcareous; dip 5°.	
125	0	126	0	Black shale with white siltstone bands.	
126	0	130	0	Medium grey siltstone.	
130	0	132	0	Core removed by Mines Department. Driller recorded light and dark mudstone.	
132	0	135	0	Core removed by Mines Department; Driller recorded black shale (clod).	
135	0	137	0	Laminated light grey fine-grained sandstone and siltstone.	
137	0	137	6	Medium grey mudstone.	
137	6	139	0	Black shale (clod).	3A
139	0	140	0	Light grey mudstone.	
140	0	143	6	Core removed by Mines Department. Driller recorded poor coal with grey band.	4
143	0	145	0	Light grey mudstone with black shale.	
145	0	146	0	Core removed by Mines Department. Driller recorded coal.	
146	0	147	6	Light grey mudstone.	
147	0	149	6	Core removed by Mines Department. Driller recorded coal.	
149	6	150	0	Medium grey mudstone.	
150	0	156	0	Core removed by Mines Department. Driller recorded coal with white bands.	
156	0	157	0	Medium grey silty mudstone and black shale.	
157	0	161	0	Core removed by Mines Department. Driller recorded poor quality coal with numerous bands (½"-4") and some black shale (clod).	
161	0	161	6	Medium grey siltstone.	
161	6	164	0	Core removed by Mines Department. Driller recorded poor quality coal with numerous bands (½"-4") and some black shale (clod).	
164	0	165	0	Medium grey mudstone and black shale.	

ft.	in.	ft.	in.	Remarks
165	0	165	6	Coal.
165	6	166	0	Medium grey silty mudstone.
166	0	176	0	Core removed by Mines Department. Driller recorded dirty coal with mudstone and black shale bands.
176	0	187	0	Medium grey laminated siltstone and mudstone; Dip 5°.
179	0			4" Coal and black shale.
187	0	189	0	Light grey fine-grained lithic sandstone with carbonaceous laminae.
189	0	191	0	Laminated light, medium and dark grey siltstone, mudstone and sandstone.
191	0	193	0	Core removed by Mines Department. Driller recorded dark shale.
193	0	195	6	Interbedded light grey silty mudstone and black shale.
195	6	197	6	Core removed by Mines Department. Driller recorded thin coal seams.
197	6	199	0	Black shale.
199	0	200	0	Light grey silty mudstone.
200	0	201	0	Core removed by Mines Department. Driller recorded black shale (clod).
201	0	202	0	Light grey silty mudstone and sandstone + clay pellets.
202	0	205	0	Core removed by Mines Department. Driller recorded black shale (clod).
205	0	206	0	Light grey mudstone.
206	0	209	0	Core removed by Mines Department. Driller recorded coal and black shale (clod).
209	0	211	0	Dark to medium grey carbonaceous mudstone.
211	0	216	0	Medium to dark grey, laminated, fine-grained lithic sandstone.
216	0	259	0	Light greenish-grey medium to fine-grained lithic sandstone with carbonaceous and coaly partings.
254	0			Siltstone layer; dip 5°.
259	0	260	0	Small paraconformity; clay pellets and coaly partings.
260	0	275	0	Light greenish-grey medium to fine-grained lithic sandstone.
272	6			Coal parting.
273	6			3" Black shale.
275	0	276	6	Black shale (clod).
277	0			Small paraconformity; 2" coal; clay pellets.
277	0	282	0	Light greenish-grey medium to fine-grained lithic sandstone.
282	0	298	0	Core not available - Driller recorded sandstone.
298	0	299	0	Light grey medium grained lithic sandstone with numerous irregular coaly partings.

ft.	in.	ft.	in.	Remarks	Sample No.
299	0	300	0	Medium grey siltstone - calcareous; small paraconformity.	
300	0	332	0	Light greenish-grey medium-grained lithic sandstone.	
327	0			½" calcite vein.	
331	0			Coal parting.	
332	0			3" coal.	
332	6	338	0	Laminated medium-grey siltstone and dark grey mudstone.	
338	0	358	6	Light greenish-grey medium-grained sandstone with some carbonaceous layers and clay pellets (up to 1")	
341	0	342	0	Weathered zone; soft yellow brown.	
347	6	348	0	Weathered zone; soft yellowish-brown.	
350	0	350	6	Weathered zone; soft yellowish-brown.	
358	6	359	6	Medium to dark-grey laminated sandstone; small angular unconformity at base; dip 22°.	
359	6	367	0	Light greenish-grey medium-grained lithic sandstone with ½" clay pellets and ¼" clay bands.	
367	0	368	0	Medium grey siltstone.	
368	0	401	6	Light greenish-grey medium-grained lithic sandstone.	
368	0	376	0	Weathered zone; soft yellowish-brown.	
377	0	382	0	Weathered zone; soft yellowish-brown.	
390	0	396	0	Weathered zone; soft yellowish-brown.	
396	0	401	6	Light grey medium-grained lithic sandstone.	
401	6	402	6	Light grey fine-grained lithic sandstone.	
402	6	406	0	Medium grey laminated siltstone.	
406	0	409	0	Core removed by Mines Department. Driller 21A recorded coal.	
409	0	409	6	Dark grey mudstone.	
409	6	411	6	Coal with 7" mudstone band. Core removed 21B by Mines Department.	
411	6	415	0	Medium grey laminated siltstone; dip 10°.	
415	6	416	6	Coal with 1" white bands; Core removed by Mines Department.	
416	6	434	0	Interbedded dark grey mudstone, medium grey siltstone and light grey fine-grained lithic sandstone; dips up to 15°.	
434	0	434	6	Light grey fine-grained lithic sandstone.	
434	6	435	6	Dark grey siltstone.	
435	6	439	0	Light grey fine-grained lithic sandstone with carbonaceous partings.	
439	0	450	0	9" coal 7" black shale 2'6" coal 11" white mudstone 9" coal 1" white band 5'8" coal Core removed by Mines Department.	Sample No. 25A " " 26A " " 27

FT.	in.	ft.	in.	Remarks	Sample No.
450	0	459	0	Dark grey laminated mudstone.	
451	0			$\frac{1}{2}$ " coal parting.	
459	0	461	0	Medium grey siltstone with $\frac{1}{16}$ "- $\frac{1}{4}$ " mudstone laminations.	
461	0	462	0	Dark grey laminated siltstone; dip 10° .	
462	0	465	0	3" coal. 2" grey band 2" coal $\frac{1}{2}$ " brown coal 2'6" coal	28.
				(Core removed by Mines Department.)	
465	0	466	0	Dark grey laminated silty mudstone.	
466	0	473	0	Light greenish grey medium-grained sandstone; some silty layers; dip 10° .	
473	0	476	0	Broken slickensided mudstone; Fault zone.	
476	0	512	0	Light greenish-grey speckled medium-grained lithic sandstone; some carbonaceous layering.	
484	6			$\frac{1}{8}$ " coal parting, dip 6° .	
497	0			$\frac{1}{4}$ " coal parting; clay pellets; dip 6° .	
500	0			Soft, friable.	
510	0	512	0	Soft, friable.	
512	0	516	0	Dark grey carbonaceous mudstone.	
516	0	517	0	Soft, light grey siltstone; friable; powders easily.	
517	0	518	0	Dark grey mudstone.	
518	0	523	0	Medium grey siltstone.	
523	0	525	6	Dark grey mudstone.	
525	6	530	6	Interbedded medium grey, medium to fine lithic sandstone, siltstone and mudstone; dip 20° .	
530	6	531	6	Medium grey fine grained lithic sandstone.	
531	6	552	0	Light greenish grey medium grained lithic sandstone; $\frac{1}{2}$ " carbonaceous layer at 334'; dip 10° .	
552	0	553	6	4" coal and light grey fine-grained lithic sandstone.	
553	6	557	0	Medium grey siltstone.	
557	0	558	6	Dark grey mudstone.	
558	6			Fault, dip 45° ; slickensides.	
558	6	559	0	Light grey fine-grained sandstone, Dip 2° .	
559	0	562	0	Dark grey siltstone.	
562	0	566	0	Dark grey laminated carbonaceous mudstone; silty at base.	
566	0	571	0	Dark grey fine-grained sandstone with some carbonaceous laminae.	
571	0	571	6	Light grey medium-grained sandstone with clay pellets.	
571	6	573	6	Dark grey sparsely laminated mudstone.	
573	6	574	6	Medium grey fine-grained lithic sandstone.	

ft.	in.	ft.	in.	Remarks	Sample No.
574	6	576	6	Dark grey laminated siltstone.	
576	6	578	0	Medium grey fine-grained lithic sandstone.	
578	0	579	0	Dark grey laminated siltstone.	
579	0	582	6	Coal. (Core removed by Mines Department)	29
582	6	587	0	Medium-grey carbonaceous siltstone.	
587	0	590	0	Dark grey carbonaceous mudstone; dip 10°.	
590	0	593	0	Dark grey carbonaceous siltstone.	
593	0	598	0	Medium grey fine-grained carbonaceous lithic sandstone.	
598	0	604	6	2'3" coal 4" white clay 2" coal 3" band 1'4" coal (Core removed by Mines Department.)	30
604	6	609	0	Light greenish-grey sandstone with carbonaceous laminae; dip 8°.	
609	0	615	6	Dark grey to black carbonaceous mudstone; dip 4°.	
615	6	619	6	Light greenish-grey fine-grained lithic sandstone; dip 6°.	
619	6	620	0	Dark grey mudstone.	
620	0	625	0	1'11" coal 2" hard white band 2'6" coal (Core removed by Mines Department.)	31
625	0	626	0	Dark grey mudstone; horizontal dip.	
626	0	638	0	Light greenish-grey, medium-grained lithic sandstone; few 1/16" carbonaceous laminae; dip 4°.	
636	0			1' light fawn-blue-grey medium-grained lithic sandstone.	
638	0	639	6	Poor coal. (Core removed by Mines Dept.)	32
639	6	642	0	Laminated carbonaceous mudstone and siltstone. 639' - 1/2" calcite vein.	
642	0			2" coal.	
642	0	644	0	Dark grey fine-grained carbonaceous sandstone.	
644	0	654	6	1'2" coal 1/2" grey band 2" coal 1" grey band 4" coal 1" stone band 11" coal 11" coal, mudstone, sandstone band. 10" coal 3" stone band 4'9" coal (Core removed by Mines Department.)	33
654	0	655	0	Dark grey carbonaceous mudstone. Hole completed 655'. Logged by S.J. Paterson. 6-10-1959.	



BOREHOLE LOGS
CORNWALL N°1 & 2

Analyzes of Samples of Coal from Cornwall No. 2 Bere (1957)

Registered No.	Sample No.	Position	Moisture	V.C.M.	Fixed Carbon	Ash	Sulphur	B.T.U's.
1417	3A	136'11" - 138'11½"	3.8	17.0	29.5	49.7		
1418	4	138'11½" - 143'4½"	3.6	20.5	40.6	35.3		
1419	6	151'8½" - 155'6"	4.3	21.5	37.0	37.2		
1420	21A	406'2½" - 409'	3.3	21.7	34.2	40.8		
1421	21B	409'5" - 411'4½"	3.6	22.8	30.2	43.4		
1422	25A	439' - 440'3½"	3.8	12.0	16.7	67.5		
1423	26A	440'3½" - 443'1½"	3.3	24.3	46.9	25.5	0.24	9,880
1424	27	443'8" - 450'	3.6	22.8	46.9	26.7	0.24	9,530
1425	28	461'9" - 465'	3.9	20.2	30.9	45.0		
1426	29	579' - 582'5"	3.9	19.4	36.1	40.6		
1427	30	598'4" - 604'7"	4.9	18.4	39.3	37.4		
1428	31	620'4" - 622'8"	3.4	21.9	43.1	31.6	0.24	8,730
1429	32	637'2" - 639'4"	4.1	19.2	27.5	49.2		
1430	33	644'2½" - 646'7"	3.3	20.5	3.4	42.2		

ft.	in.	ft.	in.	Remarks
0	0	9	0	No core.
9	0	16	0	Light yellowish-green weathered medium-grained sandstone.
16	0	44	0	Light grey medium-grained lithic sandstone; calcareous in part.
44	0	50	0	Light yellowish-green medium-grained weathered sandstone.
47	0			Clay pellets.
50	0	55	0	Light grey medium-grained sandstone.
55	0	62	00	Light yellowish-green medium-grained weathered sandstone; few coal lenses.
62	0	67	0	Light-grey fine-grained lithic sandstone.
67	0	69	0	Light grey medium-grained sandstone; some broken pieces.
69	0	73	0	Medium grey siltstone.
73	0	74	6	Black carbonaceous shale (clod.)
74	6	77	0	Light grey fine-grained sandstone; $\frac{1}{16}$ "- $\frac{1}{2}$ " carbonaceous layering; dip 5° .
77	0	80	0	Medium grey siltstone.
80	0	89	6	Medium grey fine-grained lithic sandstone; thin $\frac{1}{16}$ " carbonaceous layering; dip 5° .
89	6	93	6	Light yellowish-green fine-grained weathered sandstone; coarser at top.
93	6	95	0	Medium grey fine-grained sandstone.
95	0	115	0	Light yellowish green fine to medium grained weathered sandstone.
105	0	106	6	Fresh sandstone.
115	0	118	0	Light grey medium-grained sandstone with carbonaceous layers; dip 5° .
118	0	119	0	Black carbonaceous shale (clod)
119	0	119	6	Laminated medium-grained sandstone and black carbonaceous shale.
119	6	121	0	Medium grey silty mudstone.
121	0	138	6	Laminated medium grey siltstone, sandstone and mudstone with carbonaceous laminae, dip to 10° .
138	6	141	6	Light grey fine-grained lithic sandstone.
141	6	142	0	Dark grey slickensided mudstone.
142	0	156	0	Medium grey siltstone with $\frac{1}{16}$ " carbonaceous laminations; dip 5° .
156	0	158	0	Light grey fine-grained lithic sandstone.
158	0	167	6	Light greenish grey medium-grained lithic sandstone with few coaly partings.
167	6	169	0	Black carbonaceous shale (clod)
169	0	171	0	Dark grey carbonaceous siltstone.
171	0	177	0	Interbedded light grey fine-grained sandstone and dark grey siltstone with carbonaceous laminations; dip to 10° .
177	0	182	0	Medium grey laminated carbonaceous siltstone.

FT.	in.	ft.	in.	Remarks
182	0	196	0	Interbedded dark grey siltstone, sandstone and black carbonaceous shale.
192	0			1" coal
196	0	197	0	Black carbonaceous shale (clod)
197	0	203	0	Interbedded dark grey siltstone and mudstone; dip 5°.
203	0	205	0	Medium grey mudstone.
205	0	228	0	Interbedded medium grey siltstone, fine sandstone.
228	0	231	6	Light grey medium-grained lithic sandstone.
231	6	232	0	Medium grey siltstone.
232	0	248	0	Light grey medium-grained lithic sandstone.
(240	0	241	0	1" zone of clay pellets.)
248	0	249	0	Light grey coarse-grained sandstone; broken.
249	0	252	6	Light grey medium-grained lithic sandstone; crumbly.
252	6	253	0	Dark grey clay pellet conglomerate and siltstone.
253	0	256	0	Light grey fine-grained sandstone with siltstone bands and carbonaceous laminations
256	0	268	0	Light grey medium-grained lithic sandstone.
(260	0			Two ¼" bands black siltstone, dip 5°.)
268	0	272	0	Whitish grey medium-grained lithic sandstone.
272	0	274	6	Light grey fine-grained lithic sandstone.
274	6			2" band dark grey silty mudstone.
274	6	276	0	Light grey medium-grained lithic sandstone.
276	0	283	6	Light grey fine-grained lithic sandstone; few carbonaceous laminations; dip to 10°.
283	6	284	0	Light grey medium-grained lithic sandstone.
284	0	289	0	Interbedded dark grey siltstone and silty mudstone.
289	0	294	0	Light grey medium to fine grained lithic sandstone.
294	0	294	6	2" contorted black carbonaceous shale and 4" medium grey medium-grained lithic sandstone.
294	6	297	0	Whitish -grey fine-grained lithic sandstone; few clay pellets.
297	0	299	6	Light grey medium-grained lithic sandstone.
299	6	300	0	Medium grey coarse grained lithic sandstone with coal lenses; crumbly.
301	0	304	0	Interbedded dark grey siltstone and fine sandstone.
304	0	304	6	Black carbonaceous shale (clod)
304	6	306	0	Dark grey slickensided mudstone.
306	0	311	0	Light grey fine grained lithic sandstone.
311	0	314	6	Light grey medium-grained lithic sandstone.
314	6	317	0	Light grey fine-grained lithic sandstone.

ft.	in.	ft.	in.	Remarks
317	0	324	0	Interbedded dark grey siltstone, silty mudstone and light grey fine-grained lithic sandstone.
324	0	327	6	Medium grey siltstone.
327	6	330	6	Interbedded medium-grey siltstone and silty mudstone.
330	6	331	6	Black carbonaceous shale (clod).
331	6	332	0	Dark grey silty mudstone.
332	0	333	0	Light grey fine-grained lithic sandstone with numerous carbonaceous laminations.
333	0	339	6	Interbedded dark grey siltstone, mudstone and light grey fine-grained sandstone.
339	6	340	0	Black carbonaceous shale (clod).
340	0	343	0	Medium grey siltstone.
343	0	345	6	Medium grey coarse-grained lithic sandstone.
345	6	349	0	Interbedded medium grey silty mudstone and siltstone.
349	0	349	6	Black carbonaceous shale (clod) with $\frac{1}{8}$ " coal lenses.
349	6	351	6	Medium grey silty mudstone.
351	6	352	0	Black carbonaceous shale with $\frac{1}{16}$ " clay pellets.
352	0	353	0	Medium greenish-grey silty mudstone.
353	0	362	0	Light greenish-grey volcanic with small zeolite vughs and veins; fine-grained basalt.
362	0	364	6	Black silty mudstone with inclusions of light greenish-grey volcanic rock.
364	6	371	0	Medium to dark grey siltstone with numerous iron particles.
371	0	373	6	Light greenish-grey fine-grained lithic sandstone.
373	6	374	6	Light greenish-grey coarse-grained sandstone.
374	6	375	6	Medium-grey siltstone.
				Hole completed 375' 6".
				Logged by S.J. Paterson.
				5-10-1959.

UNEXPLORED WORK:-

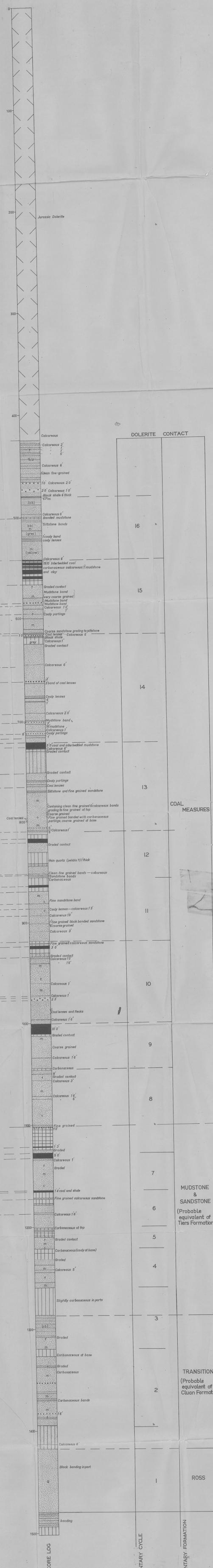
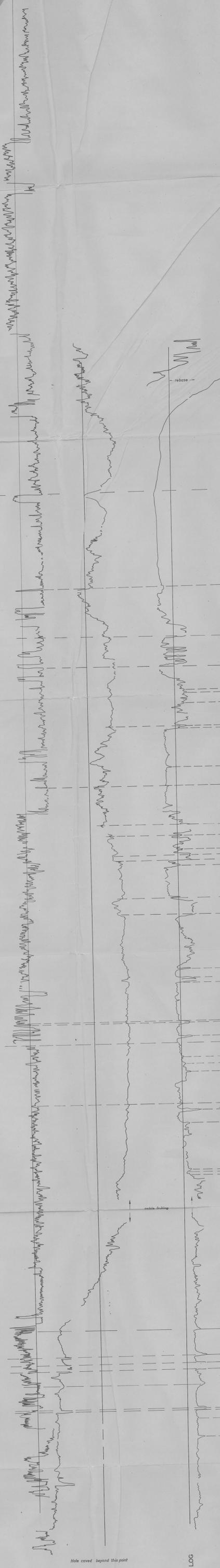
Depth in	Feet	Depth in Feet	Remarks
Surface shaft	0 - 12.6		
Surface soil and drift	12.6 - 31.9		
Shale showing fossils	31.9 - 42.3		Permian
Hard shale	42.3 - 123.9		Group
Conglomerate	123.9 - 124.9		
Hard limestone	124.9 - 256.11		Carboniferous
Shaly mudstone with bands of carbonate of lime	256.11 - 275.9		Group
Hard shaly mudstone	275.9 - 282.1		
Shaly mudstone and conglomerate	282.1 - 288.4		
Hard shaly mudstone	288.4 - 342.0		
Mudstone with coal stains	342.0 - 359.0		
Mudstone and conglomerate	359.0 - 383.0		Permian
Sandstone with coal stains	383.0 - 414.6		Group
Mudstone, shale, and conglomerate	414.6 - 433.0		
Conglomerate	433.0 - 455.0		
Black shale	455.0 - 461.3		
Conglomerate	461.3 - 500.3		
Hard slate	500.3 - 524.6		Carboniferous

EXPLORED WORK:-

Surface shaft, clay and drift	0 - 3.0		
Surface shaft, mudstone	3.0 - 16.0		
Shale	16.0 - 30.0		
Mudstone	30.0 - 33.0		
Coal and band of shale	33.0 - 37.4		Carboniferous
Coal	37.4 - 38.7		Group
Shale	38.7 - 49.0		
Mudstone with thin coal seams	49.0 - 70.0		
Mudstone and shale	70.0 - 71.7		

III. LITHOLOGY (Cont.)

Lithology	Depth		Approx. No. of Fossils
	ft.	in.	
Coal	95.	1 - 105.	9
Matrix of clay, sandstones and coal	96.	3 - 21.	7
Sandstone	98.	7 - 115.	7
Black shale	115.	7 - 124.	1
Sandstone	124.	1 - 127.	3
Coal	127.	3 - 135.	0
Black and blue shale and fireclay	130.	0 - 152.	6
Sandstone and shale	152.	5 - 177.	10
Sandstone	177.	10 - 194.	4
Shale and fireclay	194.	4 - 209.	4
Sandstone, shale and coal	209.	4 - 230.	0
Conglomerate and hard blue sandstone	230.	5 - 302.	0
Blue shale	302.	0 - 363.	0
Conglomerate	363.	0 - 365.	0
Gray sandstone	365.	0 - 371.	6
Greenish sandstone	371.	0 - 393.	6
Fossiliferous limestone	393.	6 - 412.	0
Sandstone and conglomerate	412.	0 - 443.	3
Fossiliferous limestone	443.	3 - 503.	6
Dark gray sandstone	503.	6 - 540.	0
Sandstone and shale	540.	0 - 551.	2
Sandstone	551.	2 - 577.	0
Conglomerate, shale and sandstone	577.	9 - 631.	0
Coal	631.	9 - 632.	0
Coal and sandstone	632.	9 - 653.	0
Dark blue	653.	2 - 665.	3
Sandstone and conglomerate	665.	9 - 675.	6
Black and white shale	675.	0 - 717.	0
	717.	0 - 717.	0



Rock Type	Gamma Ray	Self Pot.	Resistivity
Calcareous bands	High	High	High
Lithic Sandstone	High	Low	Low
Siltstone	High	Low	Low
Mudstone	High	High	Low
Clay pebble band	Low	Low	Low
Clean fine grained Sandstone	Low	Low	High
Coal	Low	High	High
Carbonaceous Mudstone	Var.	High	Var.

DEPARTMENT OF MINES — TASMANIA
 ELECTRIC, RADIOACTIVITY & GRAPHIC LOGS
 OF BH.6 FINGAL AREA
 DATE SEPTEMBER 1968
 GEOLOGIST K. M. THREADER
 DRAUGHTSMAN H. MACKINNON
 REVISIONS

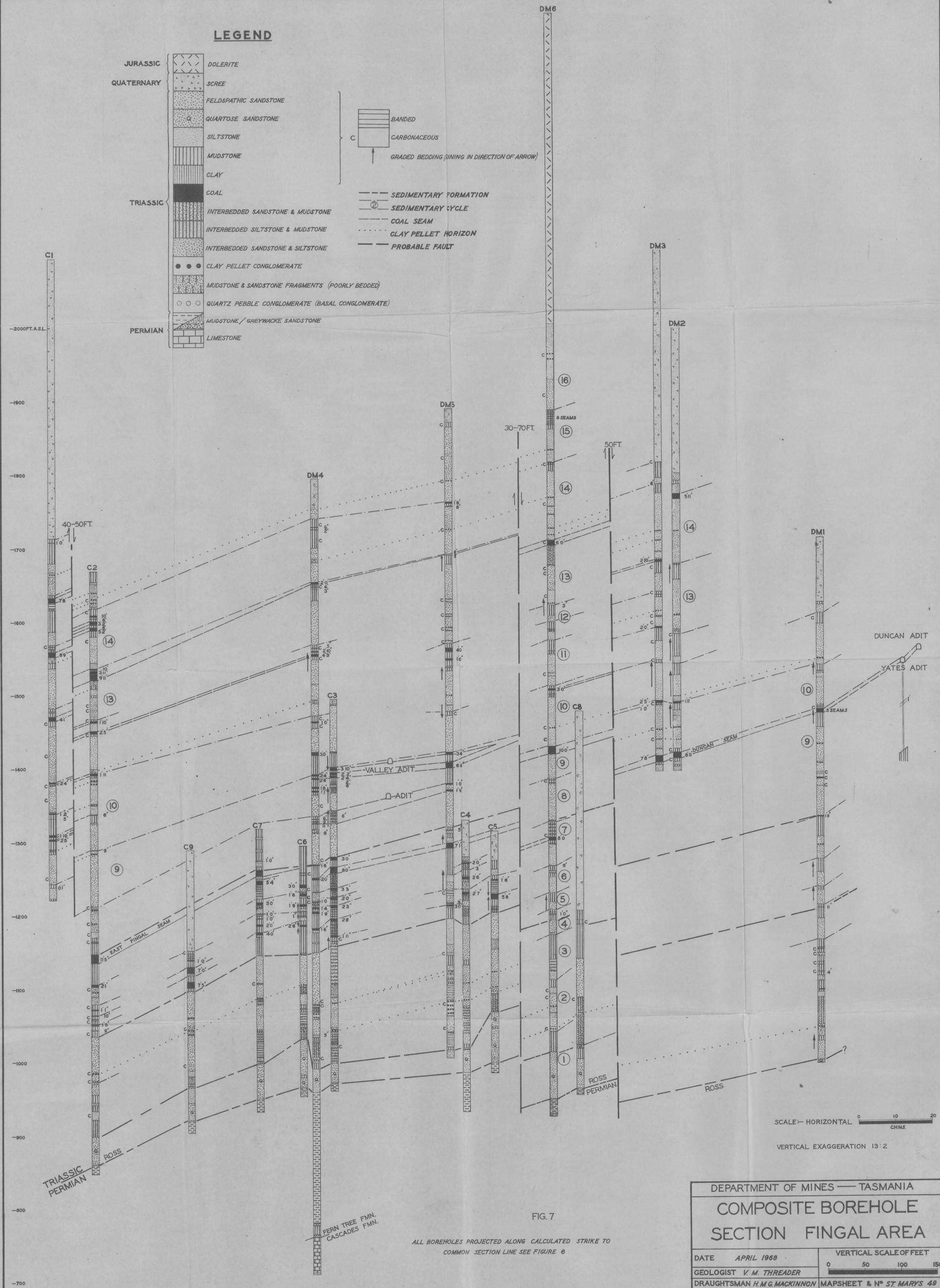
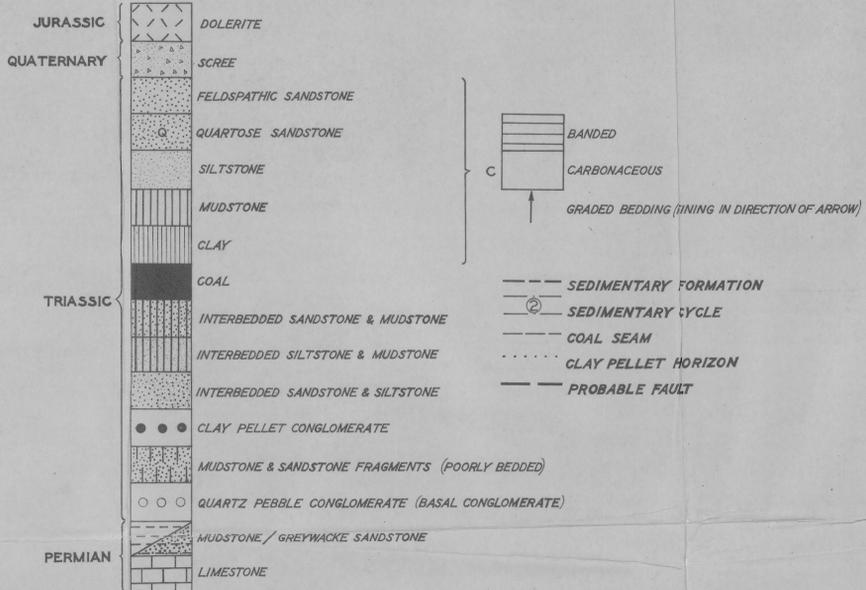
GEOPHYSICIST M. J. LONGMAN
 0 20 FEET 40 60
 MAP SHEET & NO. BEN LOMOND 48
 FILE NO. 3182

Legend as in Fig 7

FIGURE 8

SEDIMENTARY CYCLE
 SEDIMENTARY FORMATION
 PERMIAN TRIASSIC

LEGEND



SCALE: HORIZONTAL 0 10 20 CHNS.
VERTICAL EXAGGERATION 13:2

DEPARTMENT OF MINES — TASMANIA
COMPOSITE BOREHOLE SECTION FINGAL AREA

DATE	APRIL 1968	VERTICAL SCALE OF FEET
GEOLOGIST	V. M. THREADER	0 50 100 150
DRAUGHTSMAN	H. M. G. MACKINNON	MAPSHEET & N° ST. MARY'S 49
REVISIONS		FILE N° 3160

FIG. 7
ALL BOREHOLES PROJECTED ALONG CALCULATED STRIKE TO COMMON SECTION LINE SEE FIGURE 6

Reduce to 12'

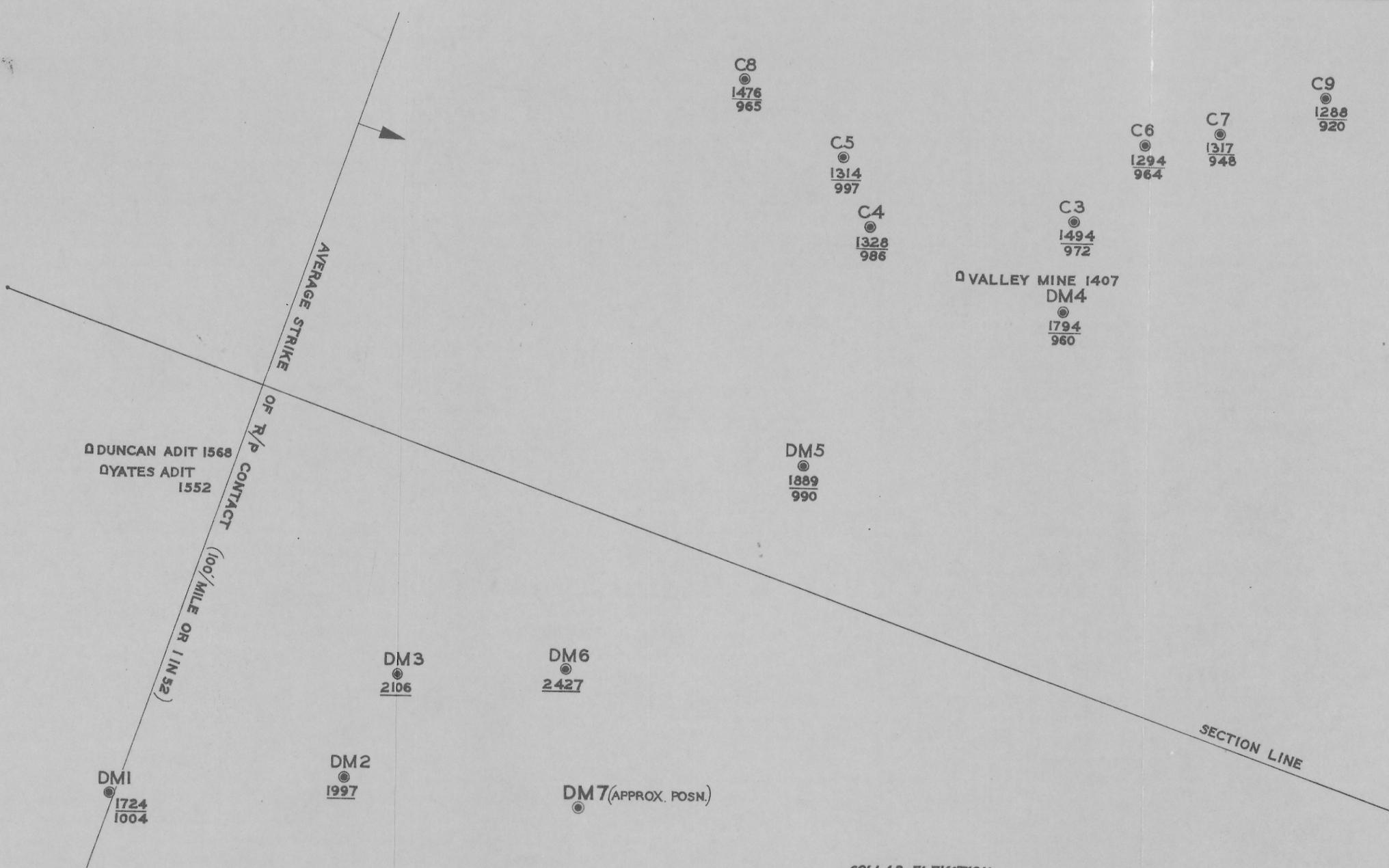
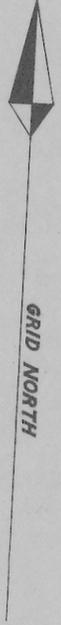


FIGURE 6

DEPARTMENT OF MINES — TASMANIA	
LOCATION OF BOREHOLES FINGAL AREA	
DATE JUNE 1968	0 CHN 20 40
GEOLOGIST V. THREADER	0 FT. 1000 2000
DRAUGHTSMAN H. MACKINNON	MAPSHEET & N° B. LOMOND 48
REVISIONS	FILE N° 3166