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**The Department Of Mines
coal exploration programme,
Fingal Tier**

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Figure 37 to Figure 86 are graphic logs of coal seam intersections in boreholes. These figures are reproduced on microfiche, and are listed on page 167.

Figure 87 to Figure 101 are sections drawn connecting certain boreholes. These figures are reproduced on microfiche, and are listed on page 168.

ABSTRACT

A diamond drilling programme over part of a 174 km² reserve on Fingal Tier was undertaken by the Department of Mines, beginning in 1959 and accelerated over the period 1979-1980.

Geological mapping, geophysical studies of the area, coal analyses, and petrology have all contributed to the exploration programme.

Eight coal seams, some discontinuous, were traced over the exploration area. The seams split and lense out, and are often banded with mud and claystone. The seams occur in a sequence of dominantly lithic sandstone interbedded with minor mudstone, claystone, siltstone, and rare tuff assigned to the Upper Permian Super-Group. The coal is of Triassic age.

Reserves are estimated of 65 million tonnes (measured) in the Duncan Seam, 60 million tonnes (indicated) in the East Fingal Upper Split, and 100 million tonnes (indicated) in an intermediate seam. Analytical data for this seam is limited and access may be difficult. These are *in situ* estimates; recoverable reserves have not been estimated. Local experience suggests a recovery of 40-50% and a washery yield of 60-80% for the Duncan Seam.

1. INTRODUCTION

LOCATION

The original Fingal Valley Exempt Area over which the Department of Mines conducted a coal exploration programme covered an area of about 174 km² south-east of the township of Fingal. The exempt area was bounded by Exploration Licence 5/61 (Industrial and Mining Investigations with Shell Co. of Australia Joint Venture), in the east; Exploration Licence 18/77 (Shell Company of Australia) in the west (now relinquished), and the Duncan mine lease (Cornwall Coal Company N.L.) in the north-west. The location of the Exempt Area is shown in Figure 1. Part of this area has been ceded to the Cornwall Coal Company as E.L. 17/81 (figs. 1, 2), and is now consolidated in E.L. 50/82.

TOPOGRAPHY, VEGETATION, AND LAND USE

Fingal Tier, which forms the northern boundary of the exempt area, rises sharply from the southern extremity of the Fingal Valley, a wide flat valley cut by the Break O'Day River. Fingal Tier rises 700 m above sea level. The summit of the Tier is a fairly extensive plateau with many ridges and small hills rising 20-40 m above the main plateau.

Steep gullies leading down from the plateau are common as seen in Fingal Rivulet where the watercourse passes through a steep sided gorge. The streams are fed by patches of marshland found in depressions on the summit of the Tier and are directly dependant on rainfall for their permanence.

The slopes of Fingal Tier are covered with a dry sclerophyll forest, with tea-tree growing along the banks of streams. The summit is covered with a mosaic of dry sclerophyll and marshland sedges.

The Fingal Valley is predominantly farming country, while forestry is the chief land use on Fingal Tier.

HISTORY OF THE PROJECT

Coal exploration by the Department of Mines commenced in the Fingal Valley in 1959 with a scout diamond drilling programme aimed at testing for continuation of the known and worked seams in the vicinity of the Duncan, Fingal, and Valley coal mines near Fingal and the defunct Silkstone, Nicholas, and Cornwall coal mines on the Nicholas Range. Thirteen holes were drilled to a total depth of 3000 m using one drilling rig over a 13 year period. In 1972, drilling commenced on a 25-hole, half-mile grid to prove a reserve of coal for power generation. This was converted to a kilometre grid in 1978. A second geologist joined the investigation in 1978 and a third geologist in 1980 to keep pace with the expanded drilling programme. In 1976 the Department of Mines considered a proposal to expand the coal exploration programme to a five kilometre grid over 100 km² of the dolerite plateau south of Fingal Tier (Threader, 1976) in anticipation of an increased demand for coal. In the following year, exploration companies (C.R.A. and the Shell Company) applied for, and were granted, extensive exploration rights in the area and the Government programme was not proceeded with.

The Department's exploration was carried out on land exempted from the Mining Act of 1929 which allows exclusive rights to the Department of Mines for the purpose of its investigations.

- In 1978, interest was centred on 94 km² entitled the 'Fingal Valley Exempt Area', Statutory Rule 1978/110 (amended S.R. 1964/167).

In 1979, two other areas were included:

- (1) Mount St John Exempt Area, 78 km², S.R. 1979/107, and
- (2) Fingal Exempt Area, 368 ha, S.R. 1979/107.

(The latter was subsequently amended to Fingal Exempt Area, 176 ha, S.R. 1979/168).

The total area investigated by the Department of Mines is 174 km².

In March 1981 the western part of the exempt area was relinquished. The area was marked out as E.L. 17/81 by the Cornwall Coal Company No Liability and now forms part of E.L. 50/82 held by Cornwall Coal. The remaining part of the area is now referred to as the Fingal Exempt Area S.R. 1981/32.

During the period 1972-1982 sixty-nine holes were drilled and additional holes were drilled in neighbouring areas for other, but related purposes. These include eight holes drilled to assist the coal company to locate new adit entries, but do not include five holes drilled for stratigraphic control of the gravity survey in the coalfields.

2. DRILLING INFORMATION

R. Billingham

In late 1978 a decision was made by the Department of Mines to increase the drilling rate of the coal exploration programme by moving all suitable drills to the Fingal Tier as they were released from other programmes. In early 1979 the Government of Tasmania approved the allocation of funds for a further expansion of the programme of coal drilling in the area adjacent to the Duncan Colliery which was exempt from the Mining Act. It was anticipated that by increasing the number of rigs available and the hours worked a drilling rate of 12 000 m per annum could be achieved. As a result of the expenditure the drilling rate in the exempt area increased from 1213 m in 1978 to 5267 m in 1979 and 11 143 m in 1980. In 1980 23 holes were completed.

DRILLING RIGS

In 1978 the rigs available for drilling deep holes were:

- Longyear 38 - capacity 575 m NQ
- Joy 30HD - capacity 450 m NQ
- Edeco - capacity 385 m NQ

As coal intersections were required in NQ size (core diameter 47.6 mm) if possible, and some holes would be in excess of 600 m deep, it was obvious that larger drills would be required. The Joy 30HD rig was purchased in 1963 and parts were no longer available in Australia. As funds became available from Treasury in 1979 and 1980, new rigs were purchased and the Joy 30HD and Edeco were removed from Fingal.

The new rigs purchased and now drilling, are:

- Longyear 44 - capacity 750 m HQ
- Warman 1000 - capacity 850 m NQ (truck mounted)
- Longyear 38 - capacity 575 m NQ
- Longyear 44 - capacity 750 m HQ (truck mounted)

These units have capacity to pre-collar holes and to drill to coal in HQ size core size 63.5 mm if required, both of which assist in obtaining a satisfactory coal sample. With the old rigs it was frequently necessary to reduce the hole size from NQ to BQ core size 36.4 mm prematurely.

ACCESS TO SITE

The exempt area was traversed by old logging tracks which required clearing before drill sites and water holes could be constructed. The expanded programme necessitated major roadworks which were expensive and time consuming due to steep hillsides, deep gullies and rocky outcrops. Access was a particular problem during the wet weather. About 45 km of road were constructed or cleared in two years.

DRILLING CREWS

The new drills and expanded programme required the employment of additional labour and a re-organisation of the working hours. A total of 13 men were used permanently which allowed for five drilling crews of two men each, two spare men to help move rigs and cover for absenteeism, and one senior foreman to exercise daily supervision over all activities.

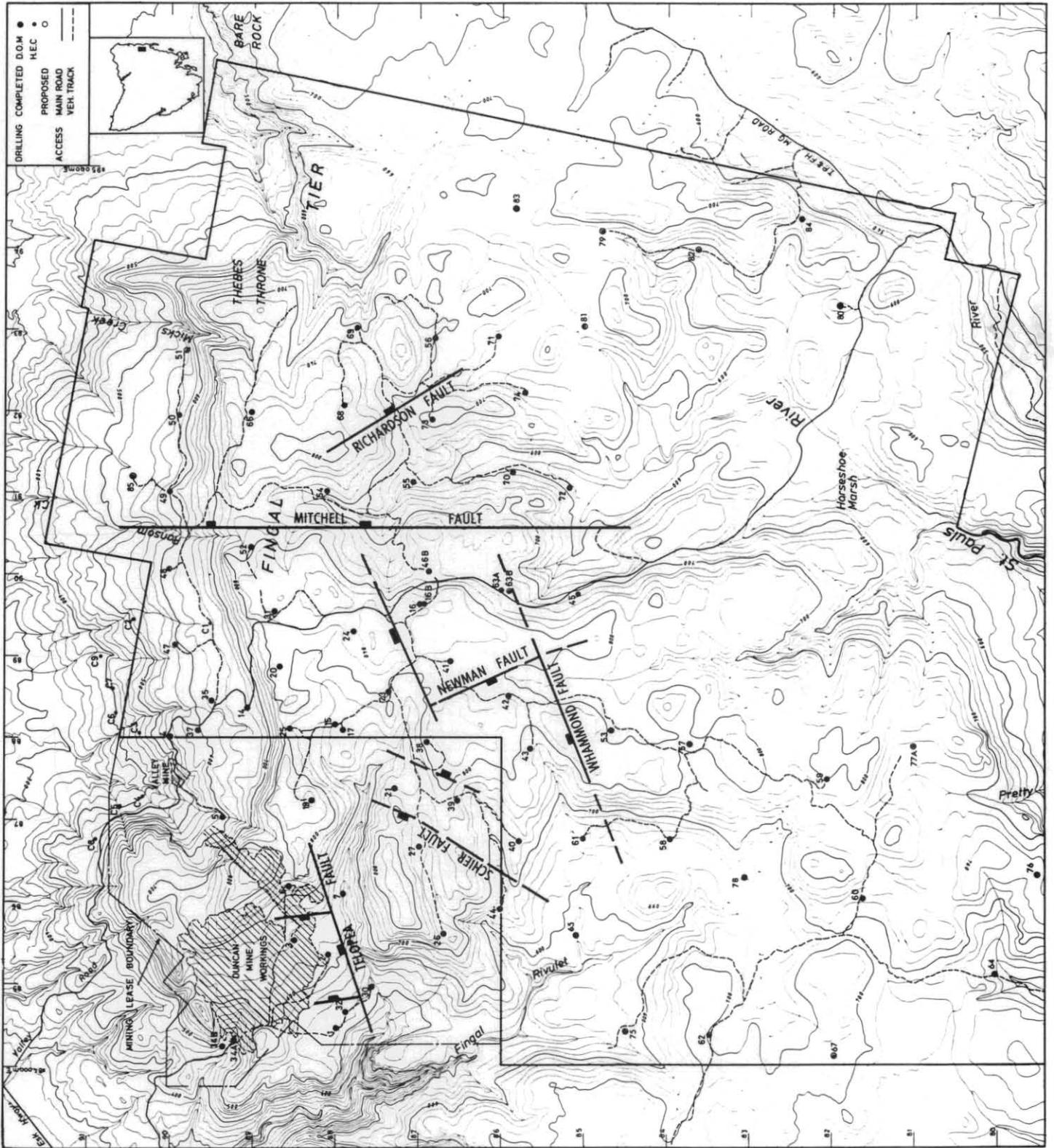
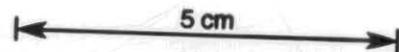


Figure 2. Location of drill holes and major faulting.
(Fault locations from mapping by C.R. Calver)



Improved drill utilisation was obtained by extending the daily hours worked to ten, and working through the normal December-January shutdown.

DRILLING PROBLEMS

The areas being investigated involved drilling through three totally different horizons.

Solid dolerite. Thicknesses of over 400 m of solid dolerite were encountered on the plateau, which posed problems only of time and drill capacity. It was hoped that the dolerite could be pre-collared to depth with a down-the-hole hammer using the Warman drill, but due to delays in receiving the new air compressor and establishing drill sites, this was not possible.

Dolerite talus. Overburden drilling through boulders and unconsolidated material is a major common problem for which there is no simple solution. Drilling on the scree covered slopes of the Fingal Valley proved to be very expensive in terms of both time and equipment.

Triassic sediments. Other than rapid wear on the drill string, no problems were encountered in the solid sandstone, but a few holes were lost due to our inability to penetrate running mud and swelling mudstones. Normal drilling techniques such as the use of drilling fluids, casing off and wedging were used to overcome these problems.

HOLE DEPTHS

No wire-line logging of completed holes was undertaken nor was an accurate measurement made of the length of drill steel down each hole at interim and final levels. Small inaccuracies of depth may therefore occur in the borehole logs.

LOCATION OF SITES

Drill locations and collar elevations have been surveyed and tied to State datum (Appendix 2).

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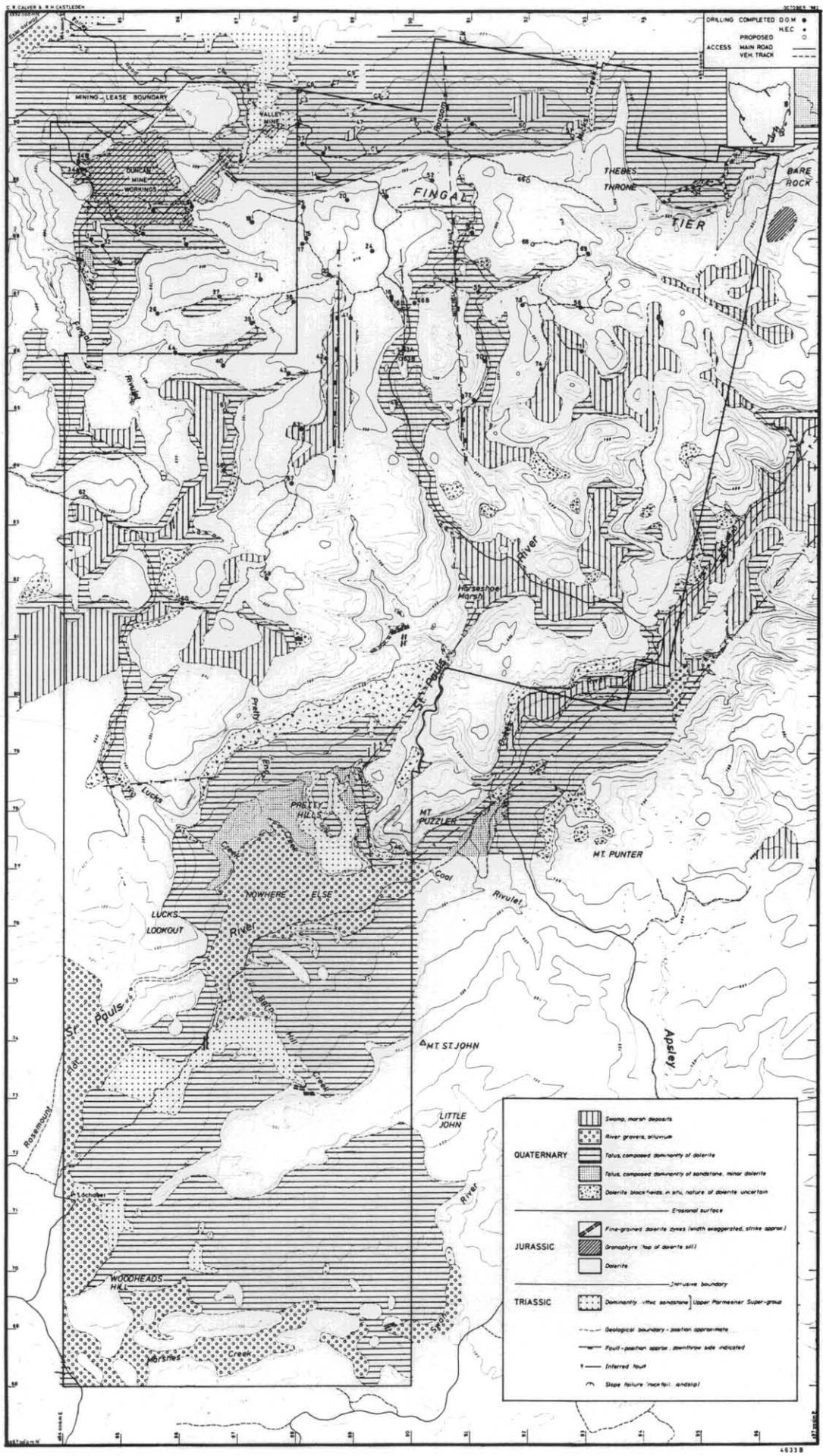
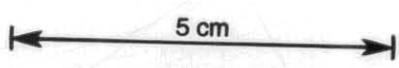


Figure 3. Geology of Exempt Area.



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3. GEOLOGY.

The geology of the south side of the Fingal Valley and of the Mount St John area

C. Calver

Field observations were made during the 1979-1980 summer field season in two areas (Calver, in Baillie and Calver, 1980):

- (1) the southern side of the Fingal Valley between the Esk Main Road and the edge of the Fingal Tier between the Duncan Road and Gray;
- (2) the southern extension of the State Coal Reserve, in the north-western corner of the Bicheno Quadrangle (Mount St John area).

The broad dolerite plateau between the Fingal Tier and the southern edge of the St Marys Quadrangle has been mapped previously by R.H. Castleden.

Mapping was done at a scale of 1:20 000 (fig. 3).

STRATIGRAPHY

Flat-lying marine sediments of Permian age (correlates of the Upper Marine sequence of the Lower Parmeener Super-Group) are conformably overlain by Triassic coal measures, up to 400 m thick, of the Upper Parmeener Super-Group. Jurassic dolerite intrudes the coal measures in both the areas mapped. Dolerite contacts are often transgressive, and an important aspect for initial coal exploration is to determine the configuration of the intrusions, and to locate faults. This is limited in the field by extensive talus cover, and lack of stratigraphic control in the thick coal measure sequence.

A tentative stratigraphy is shown in Table 1 (legend). The rock types differentiated are described more fully below. The oldest unit mapped on the south side of the Fingal Valley is Permian limestone and calcareous mudstone (Pc). No rocks older than Triassic coal measures (Tc) crop out in the Mount St John area.

LOWER PARMEENER SUPER-GROUP

Limestone and calcareous mudstone (Pc)

This unit is richly fossiliferous, with a highly variable terrigenous content. Relatively pure carbonate tends to be thick-bedded, with large brachiopods and bivalves in a medium to coarse-grained, calcite-cemented, bioclastic matrix. With increasing terrigenous content this passes into calcareous, poorly sorted mudstone or siltstone, often leached of its carbonate content; and bryozoan-rich shale. These rock types are interbedded and are laterally variable on a finer-than-mappable scale. Glacially-derived dropstones, up to 0.5 m in diameter, composed of quartzite, quartz, conglomerate and granite are common. This unit crops out intermittently in creeks in the lowest parts of the floor of the Fingal Valley to the west of Cullenswood [EP945953].

Table 1. STRATIGRAPHY IN THE EXEMPT AREA

QUATERNARY	river gravels, alluvium, talus (dominantly dolerite) colluvium (dominantly dolerite)			
	EROSIONAL SURFACE			
TERTIARY	quartz gravel basalt			
	LOW ANGLE UNCONFORMITY			
JURASSIC	fine-grained dolerite dykes dolerite			
TRIASSIC	coal measure sequence quartz sandstone	Upper Freshwater sequence	UPPER	PARMEENER SUPER- GROUP
	LOW ANGLE UNCONFORMITY			
PERMIAN	pebbly mudstone	Upper Marine sequence	LOWER	

Pebbly sandstone (Ps1)

This unit consists of thick-bedded to massive, unfossiliferous, poorly sorted, pebbly, fine sandstone or siltstone, with or without glauconite. Dropstones are abundant and may be concentrated into bands, forming horizons of open-framework conglomerate. To the east of Bedding Hill [EP910955] glauconite is present and may form up to 20% of the rock. This unit is 2-4 m thick in the area mapped.

Mudstone (Psm)

This is a poorly stratified, rather uniform, pale-to-medium-grey mudstone; dropstones are present. Close-spaced joints and fractures impart a hackly appearance to outcrops, which tend to break up into centimetre-size cuboidal fragments. A few more massive, poorly-sorted grey siltstone beds are present. This unit is approximately 30 m thick in the Fingal Valley, but elsewhere in the St Marys Quadrangle it is highly variable in thickness (2-50 m). It crops out only in creeks, and elsewhere is mapped on the basis of surface float.

UPPER PARMEENER SUPER-GROUP

Triassic sediments paraconformably overlie the Permian mudstone formation (Pm). The contact is not exposed in the areas covered by this report, but elsewhere in the St Marys Quadrangle, there is a sharp lithologic discontinuity between the mudstone and overlying, well sorted, coarse quartz sandstone. There is usually a pebbly horizon at the base of the sandstone containing mudstone clasts probably derived from the underlying Permian.

Quartz sandstone (Ts)

Coarse to fine-grained, well sorted white quartz sandstone. A few metres of basal subarkosic quartz grits and coarse sandstone, with quartz pebble conglomerate horizons, grade up into medium- to fine-grained sucrose quartz sandstones. Undulose bedding-planes and trough cross-bedding are usual, in beds up to 2 m thick.

Outcrops are rare apart from good exposure in Cardiff Creek [EP877910] where the formation is 20-30 m thick, grading up over several metres into lithic sandstone. Elsewhere it is mapped on the basis of abundant surface float.

Coal measures (Tc)

This unit is dominantly comprised of fine- to medium-grained lithic sandstone, with siltstone, mudstone, carbonaceous mudstone, coal, rare conglomerate, and rare tuff. The lack of stratigraphic control in the coal measures is caused by rapid lateral and vertical variation, the absence of marker beds, the uniformity of the dominant lithic sandstones throughout the sequence, and poor outcrop.

The lithic sandstones are well-sorted, grey-green in colour, medium- to thick-bedded, with undulose bedding planes; trough cross-bedding is often apparent.

Intraclasts, in the form of mudflakes and flattened wisps of coal are common, especially near the base of thick sandstone units. Carbonate cementation and partial replacement of the lithic sandstone has occurred in a few places, such as at EP974928, where large (1-1.5 m) carbonate nodules are aligned in parallel trains, indicating a joint control. Particularly massive lithic sandstone units often tend to form cliff lines.

Siltstones and mudstones contain a variable proportion of carbonaceous material, often in the form of well-preserved plant fossils.

Coal exposures, which may be of possible economic or stratigraphic significance, are given in Table 2.

Pebbly horizons are found in the coal measures, and seem to be more common in the upper part of the sequence. Pebbles are usually found scattered along sharp interfaces at the bases of the coarser lithic sandstone units. They are well-rounded, up to 150 mm in diameter, and are composed of resistant rock types such as quartzite, quartz, hornfels, chert, siliceous tuff, and rare granite. A conglomerate, similarly composed and about 2 m thick, crops out in Micks Creek at EP931901 and conglomerate boulders occur almost *in situ* at FP006891, near Gray.

Blocks of tuff, almost *in situ*, overlie a coal seam at EP865706 (Mount St John area). The tuff is massive, uniform, white, rather poorly sorted with particles up to sand size; abundant glass shards are visible in thin-section.

The thickness of the coal measures varies according to the level of the base of the dolerite, but on field evidence it appears to reach a maximum of about 400 m in the area south and east of the Duncan Mine.

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Table 2. SUMMARY OF COAL OUTCROPS

Thickness (approx.)	Description	Grid Ref.	Approx. Altitude (m)
FINGAL VALLEY		EP	
1. 2 m, bottom not exposed	Coal overlain by lithic sandstone. Duncan Seam	844893	480
2. 2 m, bottom not exposed	Coal overlain by lithic sst. Old workings in Cardiff Creek	874903	400
3. 2 m	Old workings	876902	430
4. 0.5 m, bottom not exposed	Coal and grey clay (30%) overlain by lithic sst.	881906	400
5. 1 m	Dull coal over and underlain by mudstone	928926	270
6. 1 m, contacts not exposed	Good-quality coal with some thin clay bands	933911	350
7. 0-7 m, bottom not exposed	Dull coal overlain by lithic sst.	929917	300
8. 1 m, contacts not exposed		932908	380
9. 1-2 m, contacts not exposed	Good-quality coal, with 30% thin beds of grey mudstone and sandstone	931903	480
10. 0.6 m, contacts not exposed		931901	500
11. 1 m, contacts not exposed	Poor quality coal, with carbonaceous siltstone	984930	257
MOUNT ST JOHN AREA			
1. 0.3 m, contacts not exposed		897755	430
2. 0.5 m, contacts not exposed	30% white clay bands	893750	420
3. 1 m, bottom not exposed	30% grey mudstone, overlain by tuff	865706	425
4. 0.5 m, contacts not exposed	Good quality coal, overlain by grey mudstone	863797	400

JURASSIC DOLERITE (Jdl)

A subdivision into fine, medium and coarse grain size with arbitrary divisions at 0.5 and 1.5 mm was made, but no attempt was made to map grain size variations in detail.

Fine-grained dolerite (<0.5 mm) is very dark in colour, with no regular jointing characteristic of coarser dolerites. Dolerite of this grain size is usually found to be in close proximity to a contact.

Medium-grained dolerite (0.5-1.5 mm) always has well-developed

columnar jointing, and a smaller-scale vertical platy joint pattern (parallel joints 5-20 mm apart).

Coarse-grained dolerite (>1.5 mm) is up to 4 mm in grain size in the Coggle Hills area, where columnar jointing tends to be poorly developed, outcrops tend to be low and rounded rather than columnar in appearance, eroding by exfoliation.

Occurrences of fine-grained dykes intruding the dolerite are indicated on Map 4633B. Typically, a limited area of dolerite contains many pale grey, aphanitic dykes up to 300 mm wide, with chilled margins, and very thin veins of quartz and black glass. The dykes are irregular, often sinuous, but tend to be roughly subhorizontal. The earlier dolerite usually shows evidence for brittle fracture at the time of intrusion of the dykes, which appear to be dilatational, with matching opposite sides. The three occurrences mapped by the writer were all intruding fine-grained dolerite [EP870890, EP880732, EP896690].

A dyke about 4 m thick intrudes lithic sandstone on the Meadstone Road at EP865740.

QUATERNARY

Dolerite talus (Qt)

This is composed of all sizes of boulders up to 10 m in diameter, usually in a matrix of clayey weathering products. Thick mantles of talus cover the slopes around the dolerite highland areas, and occupy a nearly continuous strip of land along the floor of the Fingal Valley.

Large talus boulders can usually be readily distinguished from outcrop by the absence of consistent vertical jointing (or the lack of any consistent jointing direction); variations in grain size between adjacent boulders; and lack of continuity of outcrop.

Isolated areas of talus, such as the occurrences on the floor of the Fingal Valley, may be erosional remnants of a once-continuous mass of talus, or may be lag deposits from relatively low-level intrusions.

Colluvium (Qc)

This consists of immature dolerite stream gravels composed of platy dolerite fragments, 50-200 mm in diameter, in a sandy or clayey matrix, usually showing imbrication.

Colluvium covers most of the southern side of the Fingal Valley. It is probably largely alluvial fan material derived from north-flowing streams. It reaches a maximum thickness of over 6 m near the foothills of the Tier, and thins northward.

Alluvium (Qa)

This consists of well-sorted, unconsolidated sands and gravels occupying low-lying areas adjacent to the Break-O-Day and St Pauls Rivers.

Swamp and marsh deposits, common in small basins on the high plateau south of the Fingal Tier, are included in this category.

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STRUCTURE

Fingal Valley area

Between Smudgy Gully [EP870890] and Thebes Throne [EP940890] the base of the sill appears to be nearly horizontal at about 650 m a.s.l. or rather lower (500-550 m) to the east of Ransom Creek [EP905900] where there is a fault with a downthrow to the east. West of Smudgy Gully, the base of the sill rises further to over 700 m a.s.l. before descending rapidly to a low level (below 300 m) in the Fingal Rivulet.

There are three discrete bodies of dolerite, separated from the main sill, to the north of Appetite Hill/Smudgy Gully. The first is a roughly circular boss of dolerite [EP865905] about one kilometre in diameter with a steep transgressive contact at least on its eastern side. Extending south-west from this towards the Duncan Mine is a dyke-like body of dolerite which is well-expressed topographically. It is cut by creeks in two places, where outcrops of Triassic sandstone indicate that the 'dyke' is in fact discontinuous and is separate (at least at the surface) from the circular dolerite boss. Magnetometer traverses have confirmed that these occurrences are separated from the main sill to the south by a tract of intervening sediment thinly covered by talus.

To the east of Thebes Throne, the dolerite contact descends to about 360 m a.s.l. or lower, in the vicinity of Bare Rock. Further east, it rises again to about 500 m and it maintains this level down the eastern edge of the high, dolerite-capped plateau as far south as Bedgood Hill [FP040805].

A north-south fault downthrowing to the east at Ransom Creek can be inferred by the displacement of the gently south-east-dipping quartz sandstone from the foothills of the Tier to the central part of the Valley at Bedding Hill [EP910955]. The overall dip of the sediments, and hence the throw of the fault, are difficult to determine. A southerly component of dip of 2° would give a displacement of about 100 m. However, no such displacement has been found on the north side of the valley.

The inferred fault at Crouchs Creek, 2 km to the west and also downthrowing to the east, is suggested by a 20 m displacement in the level of the Triassic quartz sandstone.

Mount St John area

The high plateau which extends south-west of Mount St John is a remnant of a sill with a roughly horizontal base at about 500 m a.s.l. To the east of Little John, the base of the sill descends to 320 m a.s.l. in the Swan River, where the contact is exposed, and is conformable with horizontally-bedded lithic sandstone.

Triassic sediments crop out sparingly to the south of the Mount St John plateau, but south of the latitude of Woodheads Hill [EP848698], dolerite outcrops reappear. There is a general coarsening in grain size southwards towards the Coggle Hills. This may indicate a contact which dips gently to the south, to be well below 250 m at the latitude of Marshes Creek where very coarse-grained dolerite crops out.

Low-level dolerite outcrop also occurs in the St Pauls River, north-west of Meadstone Saddle. A zone of fine-grained dolerite at the southern side of this area [EP862746] suggests a steep transgressive contact. The

dolerite outliers on the slopes to the north-west of Mount St John were distinguished from surrounding large talus boulders and recognised as outcrop on the basis of the criteria mentioned above, but are marked by '?' because of their lack of topographic relief, which is usually characteristic of true outcrop.

Sedimentology of the freshwater sequence, Upper Parmeener Super-Group, on Fingal Tier

C.A. Bacon

The marine and glacio-marine mudstone and siltstone of the Parmeener Super-Group Upper Marine Sequence (Forsyth *et al.*, 1974) is overlain on Fingal Tier by a sequence of quartz arenites and interbedded lutites which in turn are overlain by a sequence of coal-bearing lithic arenites.

The sediments have been classified according to the schemes of Pettijohn (1957) and Folk (1974).

QUARTZ SANDSTONE

The oldest rocks of the Upper Freshwater Sequence on Fingal Tier are a series of quartz arenites interbedded with siltstone and mudstone.

In hand specimen, the quartz arenites are white in colour with a sparkling appearance, probably due to the abundant quartz overgrowths. Macro-features include steep bedding planes dipping at up to 30°, possibly representing large scale cross-bedding; carbonaceous laminae; lenticular disturbed bedding; lenses and bands of mudstone and siltstone; subvertical joints and vertical and horizontal burrows. This lithotype is less than 50 m thick on Fingal Tier, with individual beds rarely being thicker than 6 m; the modal thickness is 2-3 m.

In thin section, the quartz arenites are composed of well sorted (unimodal) close packed quartz grains, most of which are mono-crystalline with undulose extinction and inclusions of sericite. Minor components include fragments of chert, phyllite, and rounded heavy mineral grains such as rutile, tourmaline, and zircon.

LITHIC SANDSTONE

Lithic arenite

Lithic arenite is the dominant lithotype in the Upper Parmeener Super-Group, with individual rock units commonly being tens of metres thick. The thick units typically fine upwards. In hand specimen, the rocks are grey or mustard in colour and are often massively bedded. Fluvial structures such as cross-bedding, with dips of up to 40°, are present. Bottom contacts of individual units are frequently sharp and undulose, and dip at up to 20° to the core axis.

Bands of mudstone (with abundant slickensides), siltstone and clay pellet conglomerate are common. Mudstone and siltstone pellets also occur. Individual pellets range in size from a few to 45 millimetres long. Coal debris occurs as flaser beds of coal, chunks of coal, massive bands of carbonaceous mudstone (rare), coaly partings and wispy carbonaceous laminae, which are often contorted. Calcite veins and nodules are present, but not abundant. Some units have a secondary calcareous cement.

The lithic arenites have a closed, grain-supported framework, very

little matrix, and a unimodal grain size, ranging from 0.5 mm diameter in the coarse lithic arenites to 0.1 mm diameter in the fine arenites. Occasional samples are poorly sorted with a polymodal grain size distribution.

The clastic components include fragments of quartz, chert, volcanic glass, mudstone, siltstone, metamorphic rocks such as phyllite, quartzite and schistose rocks, tuffs, chlorite, biotite, iron oxides, muscovite heavy minerals such as rutile, zircon, tourmaline, garnet, reworked pieces of calcite matrix, coal, plant fragments, plagioclase and less commonly K-feldspars.

Authigenic components include secondary chlorite, clay coatings on clastic grains, quartz overgrowths (rare) and the development of a calcareous cement.

Quartz grains are usually equidimensional, and may be angular, sub-rounded or less commonly well rounded. The quartz is dominantly monocrystalline with undulose extinction, polycrystalline quartz and quartz with straight extinction being rare. Polycrystalline quartz grains in some samples have ragged rims from reaction with the authigenic clay matrix. Quartz comprises 10-30% of the rock volume. Chert clasts are usually well rounded and comprise less than 10% of the rock volume. Quartz as volcanic glass is relatively uncommon; the sub-rounded glass clasts are invariably devitrified and in most cases chloritised.

Plagioclase feldspar is far more common than K-feldspar. Plagioclase, usually andesine or oligoclase, occurs as sub-rounded, elongate laths and comprises no more than 10% of the total rock volume. Plagioclase grains are usually smaller than the quartz grains, a feature indicative of a temperate to warm climate (Folk, 1974).

Alkali feldspar is mostly microcline, with rare grains of perthite. K-feldspar comprises less than one per cent of the rock volume. Albite and orthoclase have also been recognised (Whitehead, 1963), although these minerals are not easily identified unless the thin section has been first treated with cobaltinitrate solution.

Mudstone and siltstone clasts are well rounded, often with growth of secondary chlorite. Siltstone clasts often have flakes of muscovite in a preferred orientation. Mudstone and siltstone both contain quartz clasts and sometimes show small scale banding.

Volcanic rock fragment content is extremely variable, ranging from 0-10%. The most common type of tuffaceous fragment is composed of plagioclase laths (usually andesine) scattered through a devitrified and chloritised glassy matrix. Tuffaceous fragments which resemble ignimbrite occur, but are not as common. The volcanic rock fragments show a variety of textures, including microporphyritic, eutaxitic, trachytic, and flow banded.

Metamorphic rock fragments include rounded clasts of phyllite, quartzite, and schistose rocks. Quartzite fragments occasionally contain small garnets. Grains of detrital biotite and chlorite are not uncommon. Biotite flakes frequently show a preferred orientation, while chlorite often occurs as rounded grains and is not as common as biotite. Muscovite grains are even less common and occur as rare flakes with a preferred orientation.

Clasts of coal, usually composed of the maceral intertinite, occur

in some samples. Quite large, irregular shaped clasts up to 10 mm long occur, although the long clasts tend to be elongate and have a preferred orientation.

Heavy mineral grains, always well rounded, occur in small numbers, usually 5-10 grains per thin section. Minerals found include rounded tourmaline, zircon with rare sphene, garnet and ilmenite. Whitehead (1963) records prismatic apatite grains and irregular shaped epidote in arkose samples from DDH1 on Fingal Tier. The depths of the samples given by Whitehead (1963) correspond to bands of lithic arenite. She notes also that apatite and zircon inclusions in the biotite indicate that all three minerals came from the same source.

Authigenic clay overgrowths are more common in the finer grained lithic arenites and the units with the highest matrix content.

Minor associated features

Clay pellet conglomerate bands are not more than 100 mm thick and are composed of well-rounded, elongate clay pellets in a matrix of coarse lithic arenite. The clay pellets are composed of a matrix of quartz grains and clay. The quartz grains are small, less than 0.1 mm diameter, mono-crystalline and well rounded. The matrix accounts for 85% of the rock volume. Larger clasts of quartz, 0.5 mm in diameter, biotite flakes 0.1-0.2 mm long, rare chert clasts 0.2 mm in diameter, and rare plagioclase laths comprise the remaining 15% of the rock volume. The clay pellets display internal layering.

LUTITES

Lutites in the Upper Parmeener Super-Group are generally quartz-rich shale and mudstone, although chloritic and micaceous mudstone has also been recorded.

Mudstone

Mudstone units are commonly less than one metre thick, but thicker beds of 5-10 m do occasionally occur. In hand specimen, the mudstones are coloured green, brown, grey, or black, with grey mudstone being the most common type. Abundant plant fossil debris is found, along with some signs of bioturbation, frequent slickensides, rheomorphic slumping features, minor cross-bedding and occasional laminations. Contacts between mudstone, carbonaceous mudstone, and coal are often gradational. Calcite veins and nodules are also found, with nodules being rarer than veins.

Lenses and interbedded laminae of coal, silt, and sand are common. Banding in mudstone is frequently caused by the rapid alternation of thin beds of carbonaceous and non-carbonaceous mudstone. Quartz occurs in all the mudstones, invariably fine-grained and mono-crystalline.

Brown mudstone

These rocks are fine-grained and are composed of silt size particles (40%), clay particles (20%), and quartz grains, with an abundance of fine-grained quartz comprising 40% of the rock volume. Quartz also occurs as larger clasts, ranging in size from 1-4 mm diameter. Rheomorphic slumping and bedding laminae are evident. Rare dessication cracks which have been filled with granular mineral charcoal (inertinite), clay and fine quartz grains occur. Fine-grained sericite is present, along with rare clasts of

reworked calcite matrix.

Sandy mudstone

These rocks contain an abundance of small, angular quartz fragments <0.01 mm in diameter, with low roundness and low sphericity and often comprising up to 40% of the rock volume. Silt sized particles comprise 40% of the rock volume with the remaining 20% being clay. Angular plagioclase laths are rare. The rocks often contain minor amounts of biotite as flakes or plates and chlorite as either plates or granular aggregates. The plate shapes align with their long axes parallel to bedding planes. Coaly stringers and fragments, clay lenses, and rare clasts of devitrified glass occur.

Banding is commonly caused by the alternation of quartz-rich with relatively quartz-poor (i.e. silt-rich) layers. Coal dust or aphanitic grains of intertinite are sometimes incorporated with the silt, thus emphasising the layering.

Carbonaceous mudstone

These mudstones invariably show gradational top and bottom contacts with non-carbonaceous mudstone or coal. The modal occurrence is in coal.

In hand specimen, the carbonaceous mudstone shows frequent and fine laminations with many lenses and bands of non-carbonaceous mudstone, siltstone, and clay. Slickensides are abundant, as are coaly debris, wispy coal laminae, coal clasts, and plant fragments.

The rocks are composed of fine-grained quartz, set in a fine-grained matrix of silt, clay, and coal dust. The quartz grains are sub-rounded to sub-angular with moderate to high sphericity and are mono-crystalline with undulose extinction. The majority of the quartz grains, which comprise 40-50% of these rocks, are less than 0.1 mm in diameter. Plagioclase laths, usually andesine, occur in small quantities in some mudstones.

The silty matrix is often composed of equal proportions of silt, clay, and aphanitic mineral charcoal. Chlorite and biotite occur as rare detrital grains in the matrix. Chlorite grains are usually plates and show a preferred orientation.

The carbonaceous mudstone commonly contains inclusions of sand grains, either as individual grains or in small lenses. Chunks of detrital coal ripped from the underlying coal bed are common.

Banding in these rocks is often achieved by alternation of 'coal rich' and 'coal poor' bands of silt and clay. Individual laminae are thin, 1 mm to 0.1 mm in width. The larger detrital particles, such as quartz and coal, show a preferred orientation with the long axes of the clasts being aligned parallel to bedding.

Green mudstone

Green mudstone occurs occasionally towards the lower part of the Upper Parmeener Super-Group. The green colour is in most cases due to the existence of glauconite which is not present in mudstone higher up the sequence. These mudstones are composed of fine-grained quartz, biotite, chlorite, glauconite, and clay minerals. Rounded quartz grains up to 3 mm in diameter are scattered throughout the mudstone and comprise up to 15% of

the rock volume. These grains are probably derived from the associated quartz arenites which are also confined to the lower part of the Upper Parmeener Super-Group.

The chlorite occurs as elongate plates and as granular aggregates, which usually show a preferred orientation. The glauconite occurs as minute granular aggregates scattered through the rock, and concentrated in small lenses.

The green mudstone also contains rounded megaclasts of siltstone and quartzite up to 15 mm in diameter. These megaclasts are most probably reworked dropstones, which, together with the glauconite, are probably derived from the underlying glaciomarine mudstones of the Upper Marine Sequence of the Lower Parmeener Super-Group.

Shale

The shales of the Upper Parmeener Super-Group occur almost exclusively interbedded with carbonaceous mudstone and coal. In hand specimen, the rocks are extremely fissile and friable. The constituents are basically the same as the mudstone, with the shale having a higher mica content. The fissility is produced by the parallel alignment of plates of muscovite and, more commonly, biotite. Plant fragments are very common in the shale, which also contains a high proportion of calcium-montmorillonite. In summary, the components are fine-grained quartz, silt, mica, and clay.

Siltstone

Siltstones are coloured grey, dark grey, or brown in hand sample and often display fine bedding, rheomorphic slumping, and sygmoidal cross-bedding. Thin lenses of mudstone, fine lithic sandstone, and clay are not uncommon, and the siltstone sometimes contains abundant plant fossil debris.

Laminae average one millimetre wide, but finer banding occurs. Banding is caused by alternation of:

- (1) carbonaceous and non-carbonaceous silt layers;
- (2) quartz-rich and relatively quartz-poor silt layers, and;
- (3) coaly stringers or coal flaser beds set in a matrix of silt, quartz, and clay.

The siltstone is composed of fine-grained quartz, clay, and mineral charcoal. The quartz is very small, mono-crystalline, usually rounded with low sphericity, and showing a preferred orientation. Quartz comprises 10-20% of the rock volume. Very small (unidentifiable) silt and clay particles comprise 50% or more of the rock volume. Clasts of inertinite with minor sporonite and gymnospermous wood have been found. Minute grains of detrital biotite, chlorite, and rare muscovite and sericite are common. These grains often have a preferred orientation.

Laminite

'Laminite' is the collective name given to the finely laminated units of interbedded lithic sandstone and siltstone, lithic sandstone and mudstone, mudstone, and siltstone. The laminae are frequently only one millimetre wide. The first two units almost always show a gradational contact with one of the rock types comprising the interbedded unit.

Interbedded siltstone grades upwards into lithic sandstone, and mudstone/lithic sandstone grades into mudstone. The unit siltstone/mudstone is overlain most often by sandstone, either quartz sandstone or lithic sandstone with a sharp bottom contact. This indicates that the units of lithic sandstone and mudstone or siltstone are probably part of channel deposits, while the interbedded siltstone/mudstone unit is a flood-plain deposit which is overlain suddenly by channel deposits (lithic sandstone), produced by processes of channel diversion.

The laminite contains wispy coal laminae, lenses of clay and coaly partings, and bands of clay in some samples.

Palaeosols

Palaeosols are not recognised in any of the conventional drill core logs. However, some of the 'dirt bands' in coal seams may represent ancient soil horizons. The dirt bands are composed of quartz grit, sand, silt, and clay sized particles and are very friable. The maximum thickness reached is about 100 mm, which is quite shallow for a soil. Soil 2-3 m deep of Triassic age has been recorded in New South Wales (Retallack, 1977). In a rapidly changing flood-plain environment with rapid movement of meanders, it is possible conditions did not last long enough for extensive soil development.

ENVIRONMENTS OF SEDIMENT DEPOSITION

The coal-bearing sequence on Fingal Tier was deposited in a fluvial system of meandering streams of moderate to high sinuosity, with poorly developed levee banks and flood basins, as the streams changed course often. The lithic sandstones were deposited by channel processes, as evidenced by the cross-bedding and scour-and-fill structures.

Mudstone was deposited in shallow lakes, formed by the cutting off of meanders and channel diversion. Shale and mudstone are finely laminated and not cross-bedded, indicating a quiet water environment of deposition. Interbedding with coal is also indicative of a non-turbulent environment. The ponds and oxbow lakes dried up on occasions, as evidenced by mud cracks.

Silt was deposited in overbank floods on the flood plain, where due to the long period of exposure to wind between floods, the finer clay particles were winnowed out of the overbank flood-plain deposits, leaving only silt.

GEOLOGICAL SETTING OF THE COAL SEAMS

The coal seams on Fingal Tier, some of which are of workable thickness, occur in a flat-lying fluviatile sequence of lithic sandstone, mudstone, siltstone, claystone, and rare tuff. These freshwater sediments, belonging to the Upper Parmeener Super-Group, overlie glaciomarine mudstones of the Upper Marine Sequence of the Lower Parmeener Super-Group. These rocks in turn overlie a basement of Mathinna Beds (a micaceous turbidite-greywacke sequence of Silurian age) which have been intruded by a suite of Devonian granite batholiths and graniodiorite sheets.

The coal-bearing sequence is commonly 300-400 m thick, while the underlying glaciomarine sediments are thought to be some 150-200 m thick, although no drilling on Fingal Tier has continued past the top of the glaciomarine sequence.

Dolerite intruded these sediments on a massive scale during the Jurassic; the dolerite now forms an extensive plateau capping the whole of the area of study, being 150-300 m thick in most drill holes. The dolerite sheet has associated 'feeders' near DDH's 70, 72, 54, and 69, and numerous accompanying dykes. Seven small dykes interrupt the sedimentary sequence in DDH64.

Tensional faulting in the Jurassic and Tertiary has caused major disruption of the coal seams. The largest fault, the Mitchell Fault, with a throw of some 60 m can be traced from the Exempt Area northwards across the valley. Smaller faults (informally known as the Newman, Schier, Whammond, and Richardson Faults) are shown on Figure 2.

ENVIRONMENT OF COAL DEPOSITION

Coal measure sequences of Triassic age in the Upper Freshwater sequence of the Parmeener Super-Group have been tentatively correlated with the Nymboida and Ipswich coal measures of New South Wales and Queensland (Noldart, 1975). However, the seams from these two coal measure sequences have moderate to high vitrinite contents (Smyth, 1979), and so must have formed under different environmental conditions to the Tasmanian coal.

An alluvial plain environment was deduced from the logging of a sequence of fining-up cycles in diamond drill core (Threader, 1968). This was subsequently confirmed by:

- (a) Smyth and Cook (1976, in Smyth, 1979) who considered that dull coal or durain enriched in semifusinite and fusinite with a high mineral content formed by the flooding of a bog surface with oxygenated water;
- (b) a fluvial model derived from Markov Chain Analysis of the coal-bearing sequence (Bacon, 1979); and
- (c) a study of mine roof structures in the Duncan Colliery (Kind, 1979).

Further information of the environment in which the coal formed may be gleaned from the composition of the coal bed floras. A brief account of floras associated with coal seams is given by Townrow (1962). The flora of the coal measures is dominated by filicales (ferns), pteridosperms (seed ferns) and ginkgoales (maiden hair trees).

The filicalean family Osmundaceae is represented by the sterile leaves *Cladophlebis*. The pteridosperm family, the Corystospermaceae, are represented by the leaves *Dicroidium*, *Xylopteris* and *Halleophyllum*. The ginkgoales *Ginkgoites* and *Sphenobaiera* (*Czekanowskia*) are abundant in places but conifers are rare. The leaf *Phoenicopsis elongata* is probably ginkgoalean. Cycadophyte leaves (e.g. *Pterophyllum*) are moderately common, but no lycopods have been found, and the evidence for the equisetalean (scouring rushes) genera *Phyllothea* and *Neocalamites* is not good, although *Equisetum* stems are quite common throughout the Triassic as a whole (Townrow, 1962). Chunks of silicified wood belonging to the family Podocarpaceae are commonly found in the coal seam currently being worked at the Blackwood Mine on Mount Nicholas.

Megaspore species from lower Mesozoic coal measure sequences in Tasmania have been described by Dettmann (1961). The form species *Banksisporites pinguis* (Harris) Dettmann occurs in the New Town Coal Measures and is derived from the parent cone *Selaginella hallei* Lundblad. *B. pinguis* is characteristic of the Rhaetic zone of *Lepidopteris* in East Greenland, Sweden, Germany and Poland, and extends upwards into the overlying Liassic sediments containing *Thaumatopteris schencki* (Townrow, 1962).

Townrow concludes that rocks of Rhaeto-Liassic age are present in Tasmania.

Conclusions

In the Upper Permian Super-Group coal measure sequences in north-eastern Tasmania, xerophytic woodlands of *Dicroidium odontopteroides* and *Xylopteris* grew on silty flood basin areas, while in wetter areas such as in abandoned channels and filled-in cut-off meanders, a broad leaf forest of ferns, seed ferns, scouring rushes, maiden hair trees and cycads grew.

4. GEOPHYSICS

*D.E. Leaman
R.G. Richardson*

Geological methods provide only a skeletal exploration guide in this complex geological environment even though the high relief terrain would be expected to aid exposure. Drilling superimposed on such a guide is a risky and generally unrepresentative gamble. Indeed, early drilling around Fingal revealed massive talus deposits and variable dolerite intrusions and shortened sections. Many holes were wasted or abandoned. Clearly, other means were needed to provide an indication, at least, of regions where the dolerite was very thick, feeders were present, windows were possible or the section was thick, so enhancing the chance of encountering a useful seam set.

Six geophysical methods have been utilised in this environment; gravity, air and surface magnetics, resistivity, seismic reflection, radiometrics, and down-hole logging.

GRAVITY SURVEYS

Two gravity surveys have been undertaken, one regional and one specific to the State Reserve on Fingal Tier (fig. 4). The regional survey covers the entire region defined as the East Coast Coalfields with a nominal station spacing of one kilometre (2800 km², 2600 stations), while the Fingal Tier coverage has a nominal 300 m spacing (180 km², 1600 stations).

Treatment of the Bouguer anomalies requires special processing and interpretation techniques since all the target structures are normally above the geoid and there is no appropriate horizontal reference plane for modelling. Consequently, equivalent source methods have been used to derive continuations. In addition, the Bouguer anomalies have been analysed by a range of filters. After establishing appropriate criteria for assessment of the targets (within 750 m of the land surface) continuation and residuation enabled three-dimensional modelling.

A qualitative interpretation has been provided for the entire regional survey which suggests that the Upper Parmeener Super-Group, including coal measures, is extensive and generally over 250 m thick across the entire field. Feeders and thick sheets possibly destroy about 15% of the possible volume. Some major faulting can be deduced. The general thickness of the dolerite sheets is extremely variable. Qualitative estimates may be based on the sign and value of the residual Bouguer anomaly. Large negative values (-40 to -60 $\mu\text{m/s}^2$) imply thick sedimentary sections whether or not dolerite is present. Since the Permian, Triassic or dolerite contrasts yield residual attractions of -8.4, -13.4, and +6.7 $\mu\text{m/s}^2$ per 100 m, it will be apparent that positive values imply either much dolerite in a section or no significant section. The qualitative interpretation is vague for values in the range -20 to +10 $\mu\text{m/s}^2$ due to possible section combinations, but values outside this range can be unambiguously related to either thick sections or thick dolerite. Only the proportions are uncertain. Rapid estimates of this type must be verified quantitatively. Figure 5 summarises the qualitative interpretation.

The regional core area (fig. 4) has been evaluated by three-dimensional models. This zone was selected for analysis because it is the best controlled and currently subject to detailed exploration. The analysis confirmed the suggestion of a general persistence of the coal measures at 250-350 m thick but found that faulting is common, including at least two

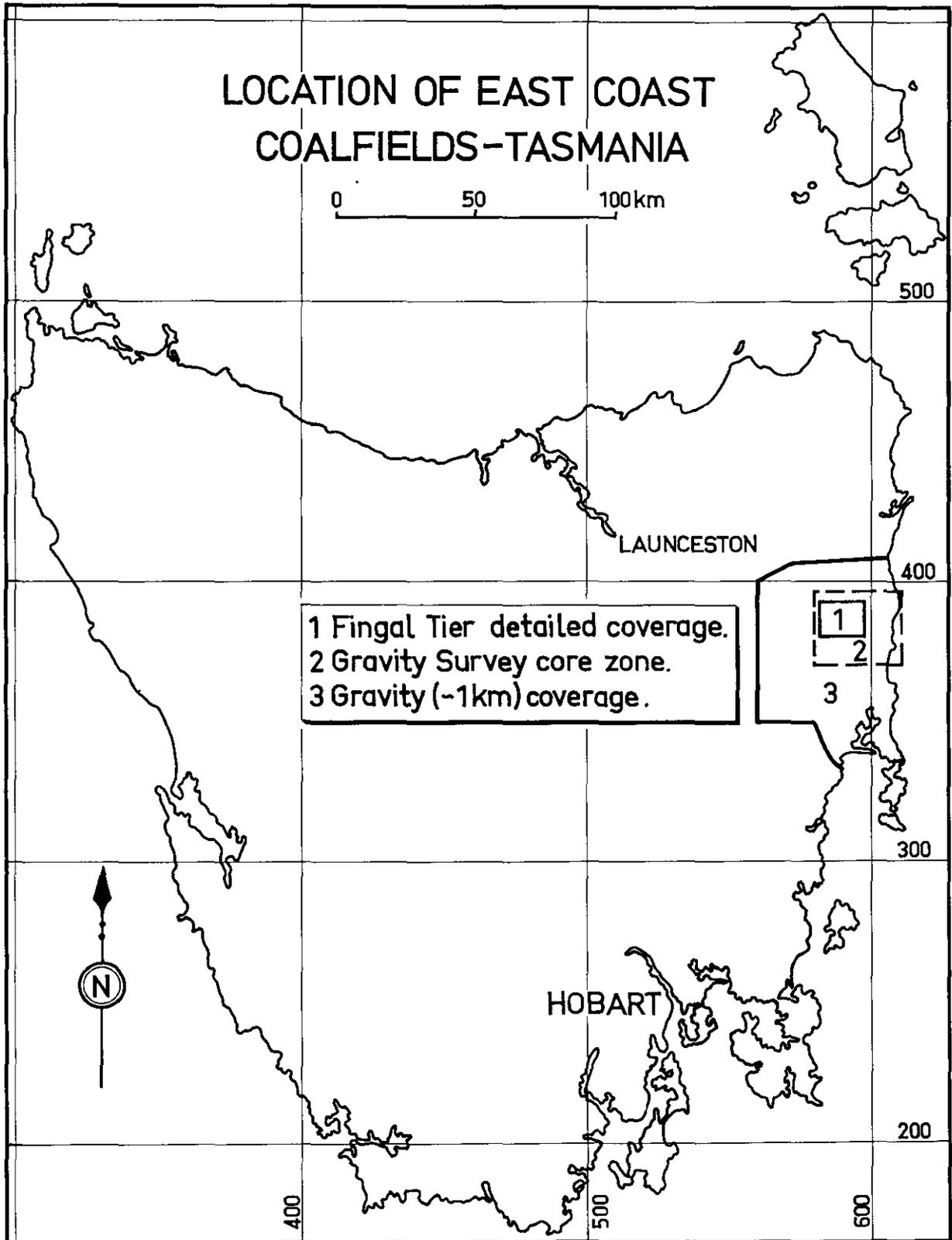


Figure 4.

sizeable grabens. Fault trends are NE-SW, N-S, and E-W. In addition, feeders were found to be much smaller and more numerous than suggested in Figure 5, and commonly occur as clusters. Figure 6 indicates the general fault patterns and feeder distribution revealed by modelling and analysis. Figure 7 compares the field derived by continuation and residuation with that of the model. The basis of the model was available mapping and drilling control extrapolated by the requirements of the gravity field. Differences apparent in Figure 7 may be accounted for entirely by the thickness of slices used to make up the models (50-100 m); thinner units could not be justified on either cost or control grounds. It is possible that only about 10% of the entire region is lacking a thick section. Pre-Permian basement materials were also found to be variable and the extent of granite batholiths and stocks has been defined. Intrusion of a thick granodiorite sheet into the basement rocks near Gray has accounted for the anomalous qualitative estimates of sheet thickness in this part of the region.

The survey has also established the form of the St Marys intrusion - a sheet wedge thickening to about 1200 m at its western margin. The filter analysis of the total field defined the extent of the regional batholiths within the upper 5 km of the crust and also located a smaller stock west of Bicheno. The roof of the latter is at very shallow depth (~120 m) and has been confirmed by drilling.

The Fingal Tier detailed area has been treated by a similar filter, continuation and residual analysis. This has enabled improved definition of feeder position and size, limits of thickened sheets, sheet window location or thinnings, and possible fault positions. The interpretation is summarised in Figure 8. An interpretation of this type can be used as a structural guide and a basis for drill site selection. The principal value relates to identification of marginal, promising, or definitely excluded zones. The regional interpretation suggests the possibility of other promising areas at least comparable to the Fingal region.

Figure 8 also suggests the trend of any future mine planning should drilling confirm consistent and workable seams. The general distribution of intrusion (feeders and sheet truncations), escarpments and faulting suggests that three mines would be necessary for recovery (presuming the exclusion of shaft entry) in this zone.

MAGNETIC SURVEYS

A dual level (900, 1050 m) aeromagnetic survey of the Fingal Tier detailed area (fig. 4) and some 54 km of selected but dispersed surface traversing has been undertaken. Surface surveys were mainly intended to evaluate the method as a means of locating geological boundaries in the area and so improve quality of mapping. The surface evaluation has established the method for this purpose and it is possible to resolve four conditions - coal measures, talus/coal measures, talus/dolerite, dolerite - by simple examination of frequency and amplitude fluctuations. A fluxgate magnetometer with 10nT sensitivity is adequate (strong gradients in some areas preclude the use of proton magnetometers) but the observation interval should not exceed 5 to 10 m. Figure 9 summarises the nature of observed responses.

The aerial survey was flown at two fixed heights to allow spectral and continuation analysis of the anomalies. A drape over the local terrain was not considered desirable or fully controllable and could be derived from the fixed flights in any case. The original objective of the survey was the provision of an independent structural control on dolerite forms,

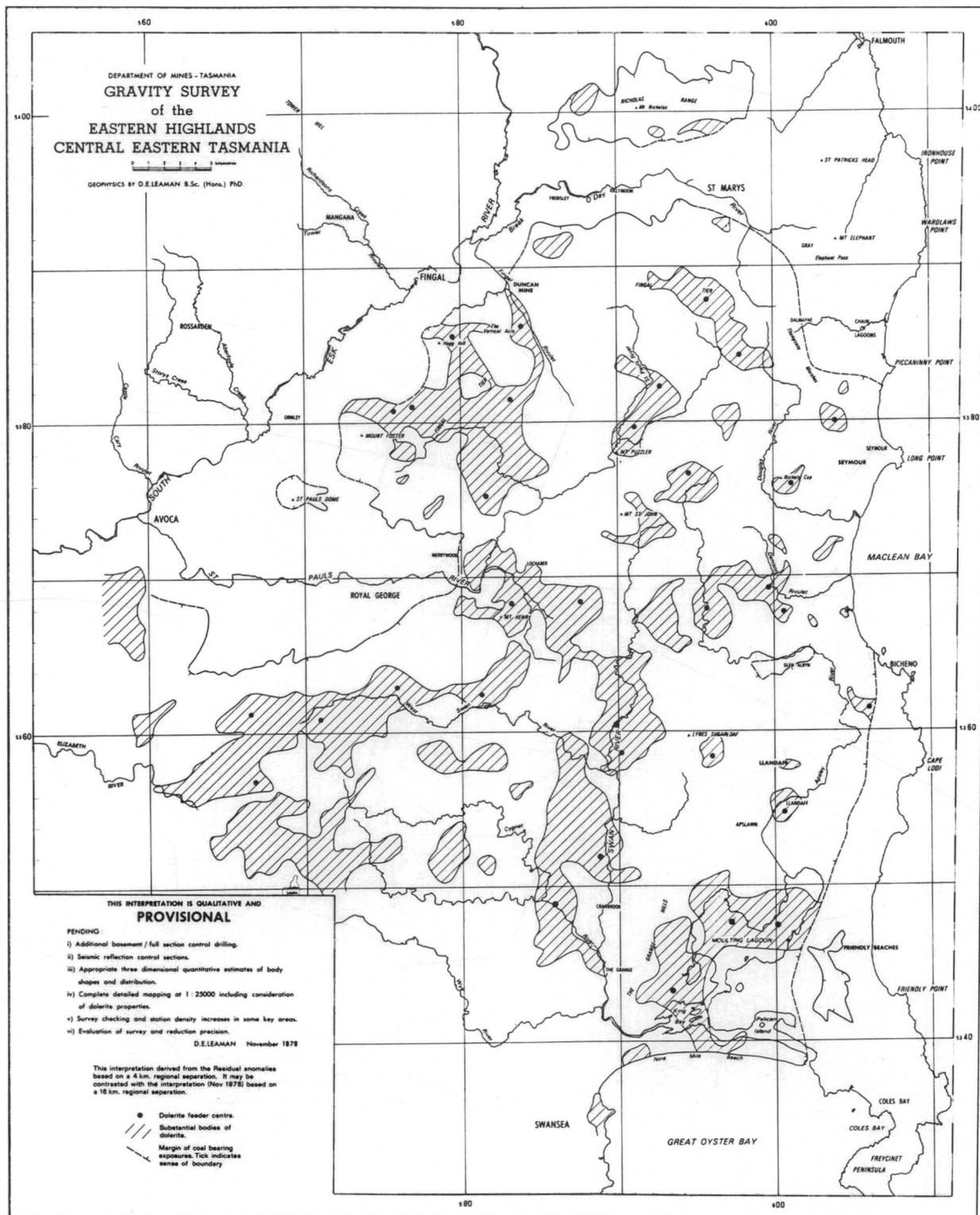


Figure 5.

5 cm

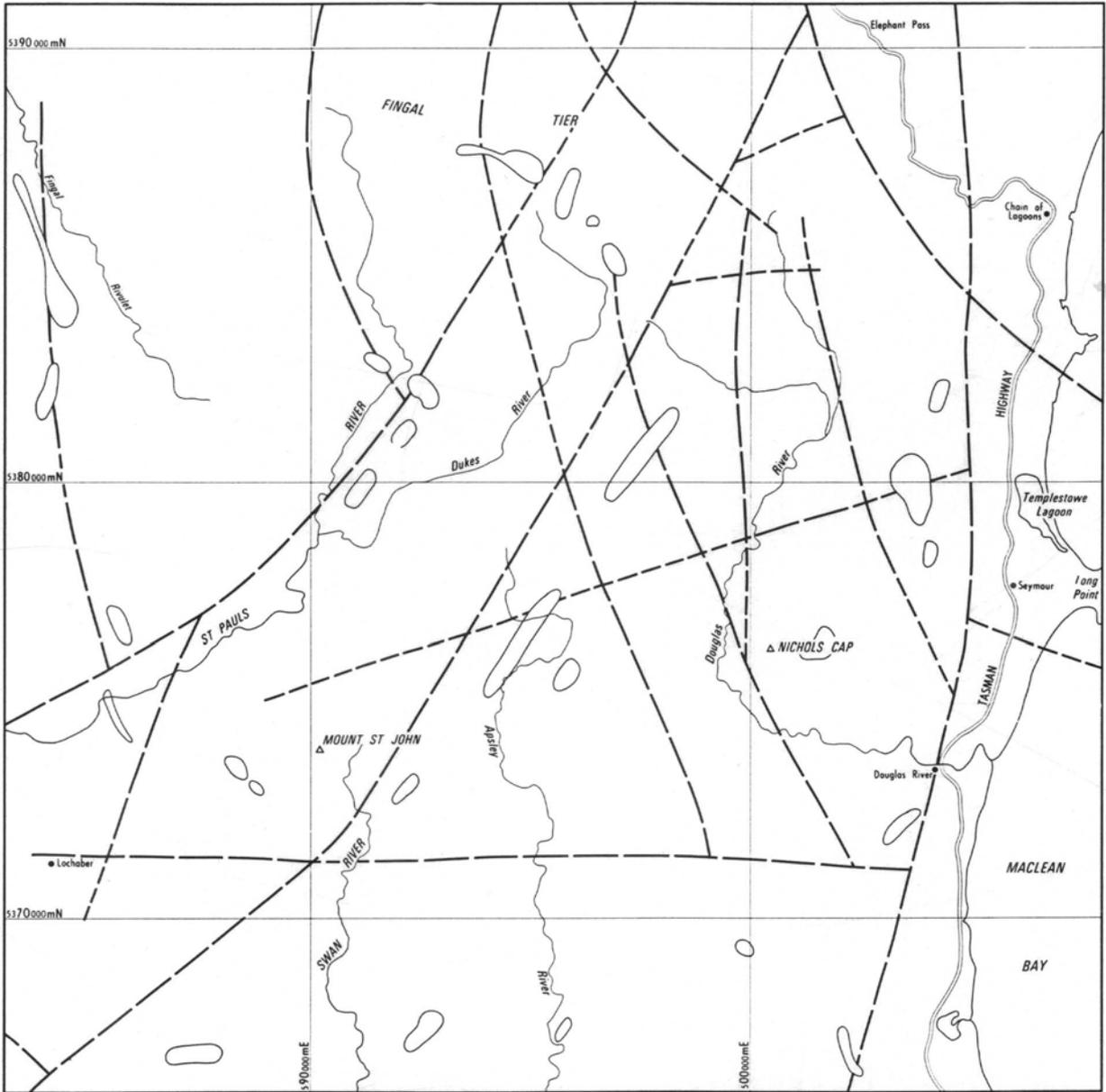
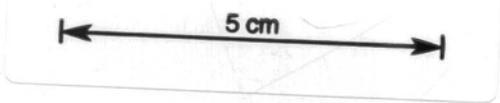
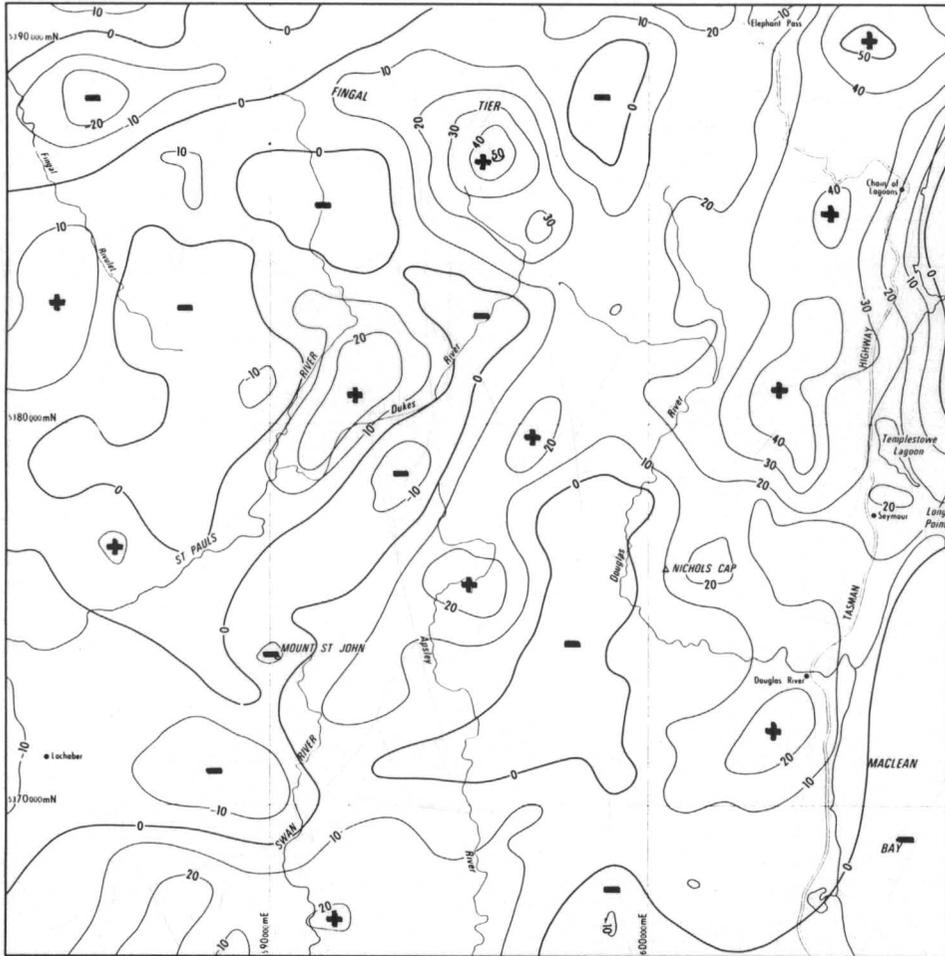


Figure 6. Summary of dolerite feeders and implied faulting.



(a)



(b)

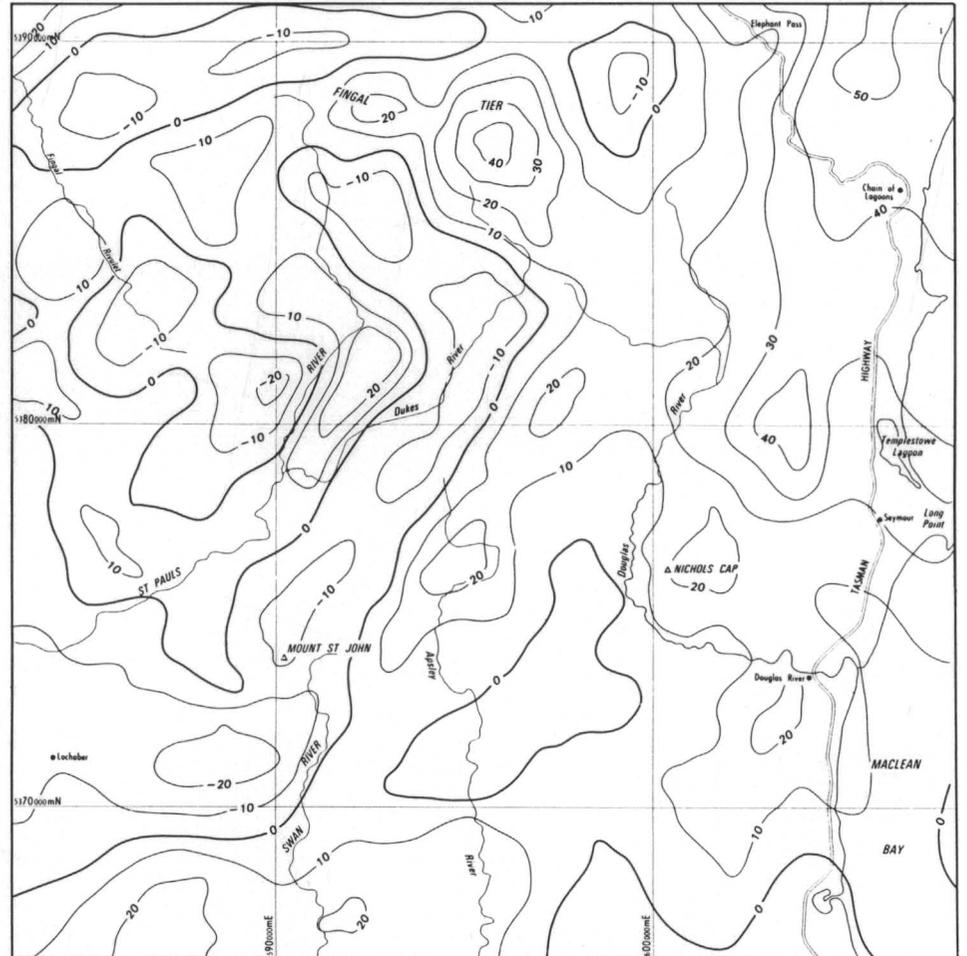
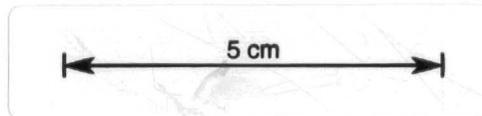


Figure 7. Comparison of reduced observed field (a) and field calculated for model (b).



TYPICAL MAGNETIC RESPONSES OF MATERIALS—FINGAL REGION

46-30

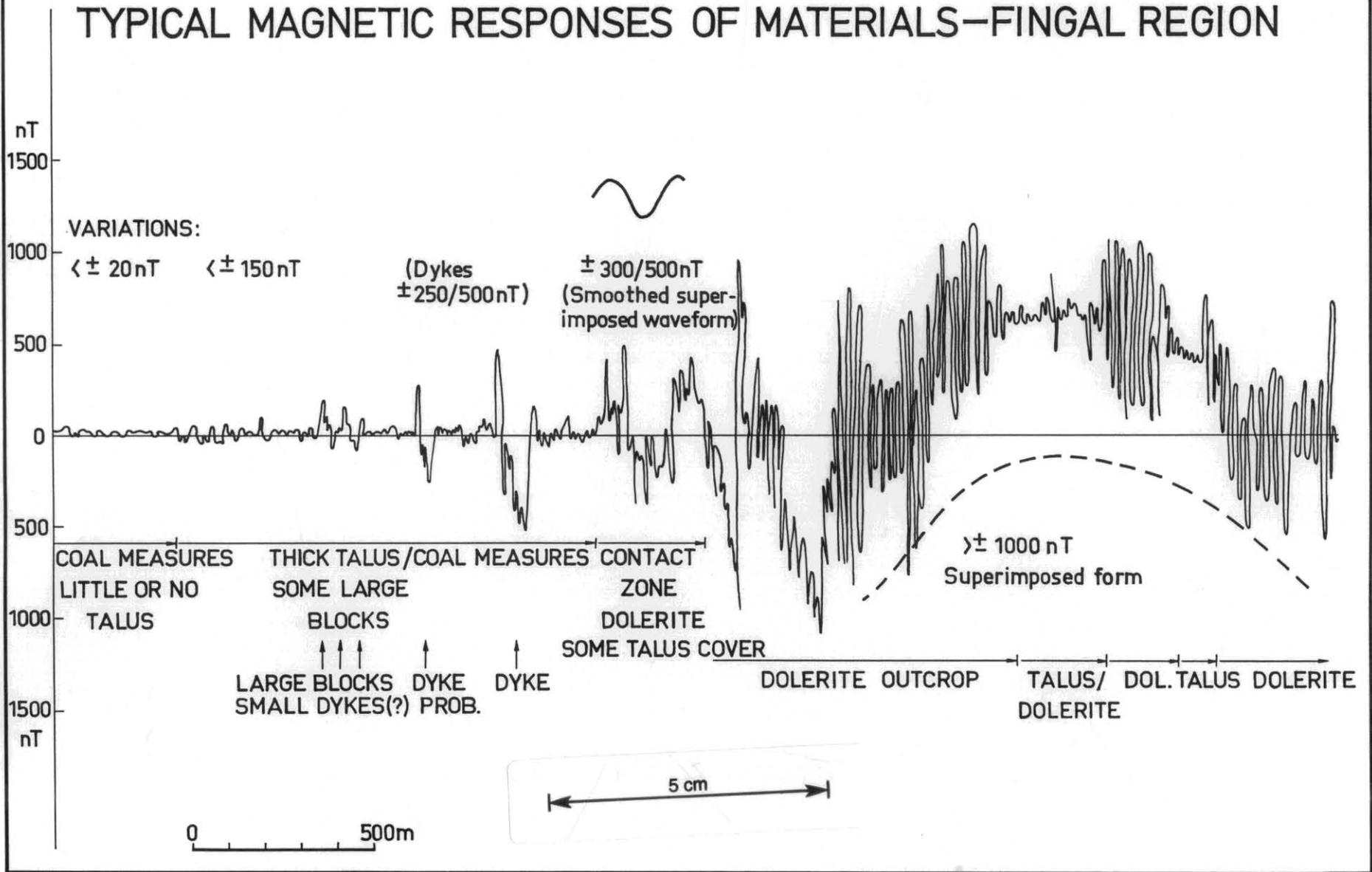


Figure 9.

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so reducing any inherent ambiguity in gravity interpretation. The success of the gravity survey overall, the limited interpretation accretion and confirmation provided by the magnetic survey, and the fact that many features could not have been resolved without the gravity data, suggests that the aeromagnetic approach is not particularly effective, if more rapid and less expensive.

Figure 10 summarises most of the structural information deduced from the magnetic surveys. It is based on observations at 1050 m which were found more relevant and less confusing than lower level data. Gradients and anomalies at this level can be definitely related to features displayed in the Bouguer anomalies. Even so the interpretation is patchy, and while intrusion margins are indicated, their sense and scale is not. Indeed many anomalies are enhanced due to the combination of several features in the same general locality. In general edges produce anomalies, feeder centres or talus/sedimentary tracts yield a nondescript field pattern. The lack of response over feeders was confirmed by susceptibility studies and surface profiles. The survey at 900 m provided more information on areas covered by talus or where the dolerite sheet has been eroded. However due to the considerable terrain clearance variations (50-400 m), these observations are often misleading. The reduction of the 900 m survey to a 100 m drape by continuation enables rapid and clear identification of dolerite - non-dolerite areas, since the dolerite has a characteristic high amplitude cell pattern. However attempts to interpret the drape results in terms of principal structures proved unsatisfactory due to the compound sources of many anomalies. At 100 m it is not possible to resolve these from local surface variations.

RESISTIVITY SURVEYS

Resistivity surveys have been used in other coal-bearing provinces for the location and tracing of seams. Such areas are generally free of severe topographical problems and lack the equivalent of dolerite cover. Electrical methods cannot be used on Fingal Tier for structural purposes, as the average array would exceed 2-3 km and terrain-induced problems would be excessive and uncontrolled. Consequently sounding and traverse trials were made on the narrow coastal plain at Seymour where several seams occur within 40 m of the surface; gentle dips are known and faulting is suspected. Even in this environment the method failed to yield reproducible or consistent results; most problems were related to variable or low contrasts and erratic surface conditions.

SEISMIC REFLECTION SURVEYS

Reflection techniques, given the failure or inapplicability of the electrical approach, offered the only chance of improved structural resolution (over potential methods) and direct assessment of the stratigraphy and seam continuity. But varied geological environments have made evaluation difficult. The coastal environment at Seymour is akin to the established usage of the method except that the target seams are at very shallow depth requiring small charges and high sample rates. Results at Seymour, recorded using short spreads with 6-geophone arrays (28Hz), 10 m apart, and shallow shot holes (1.2 m) were processed to reveal very shallow seams and some faulting (fig. 11). The electrical approach in the same area compares particularly poorly. However, good seismic results depend on shot placement and shot size (very small) in relatively unweathered coal measures. Improved results may be obtained with single geophones and deeper shot holes.

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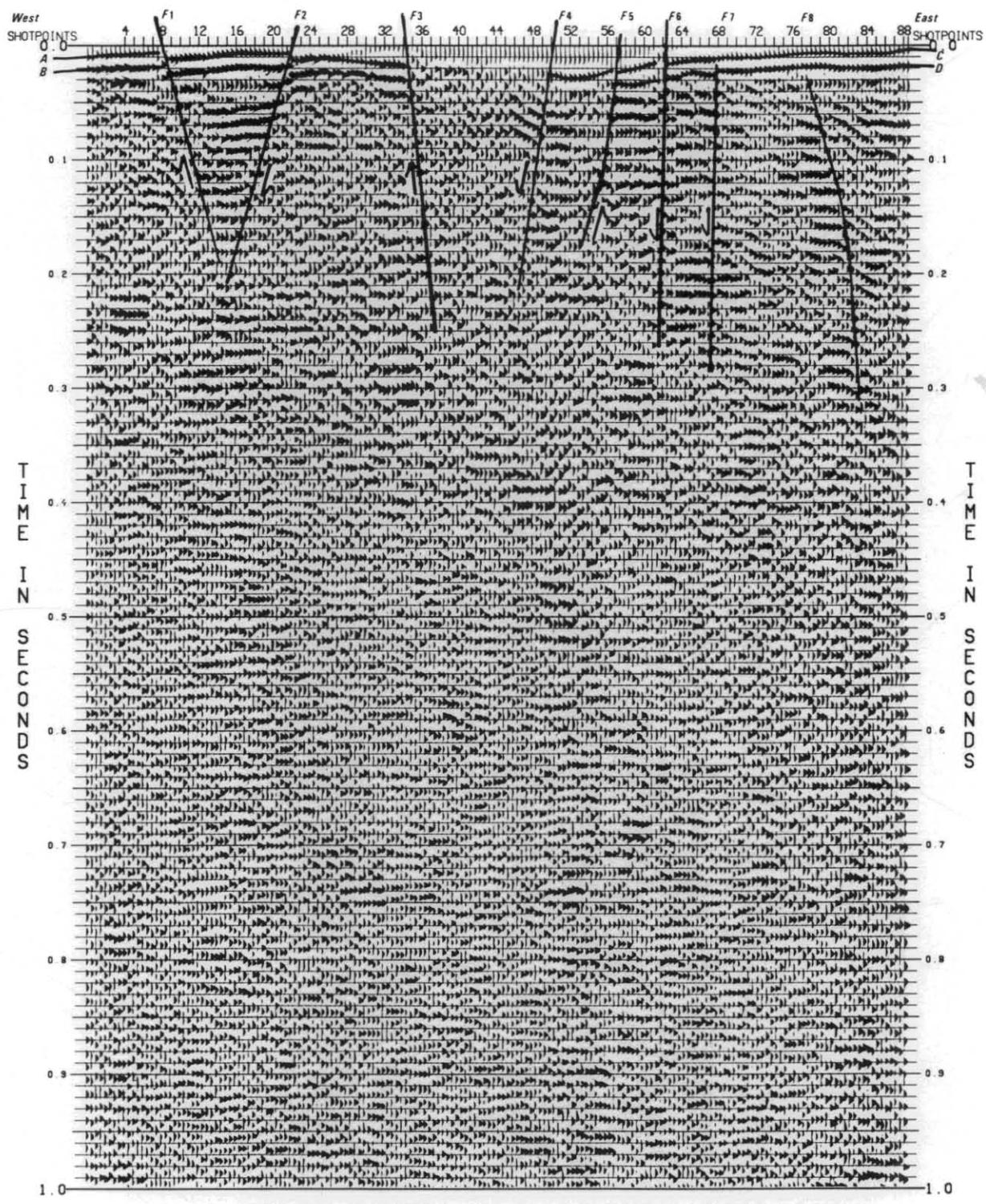
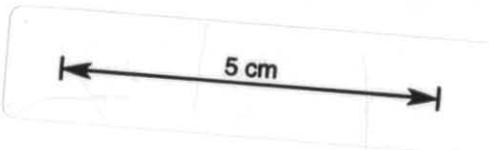
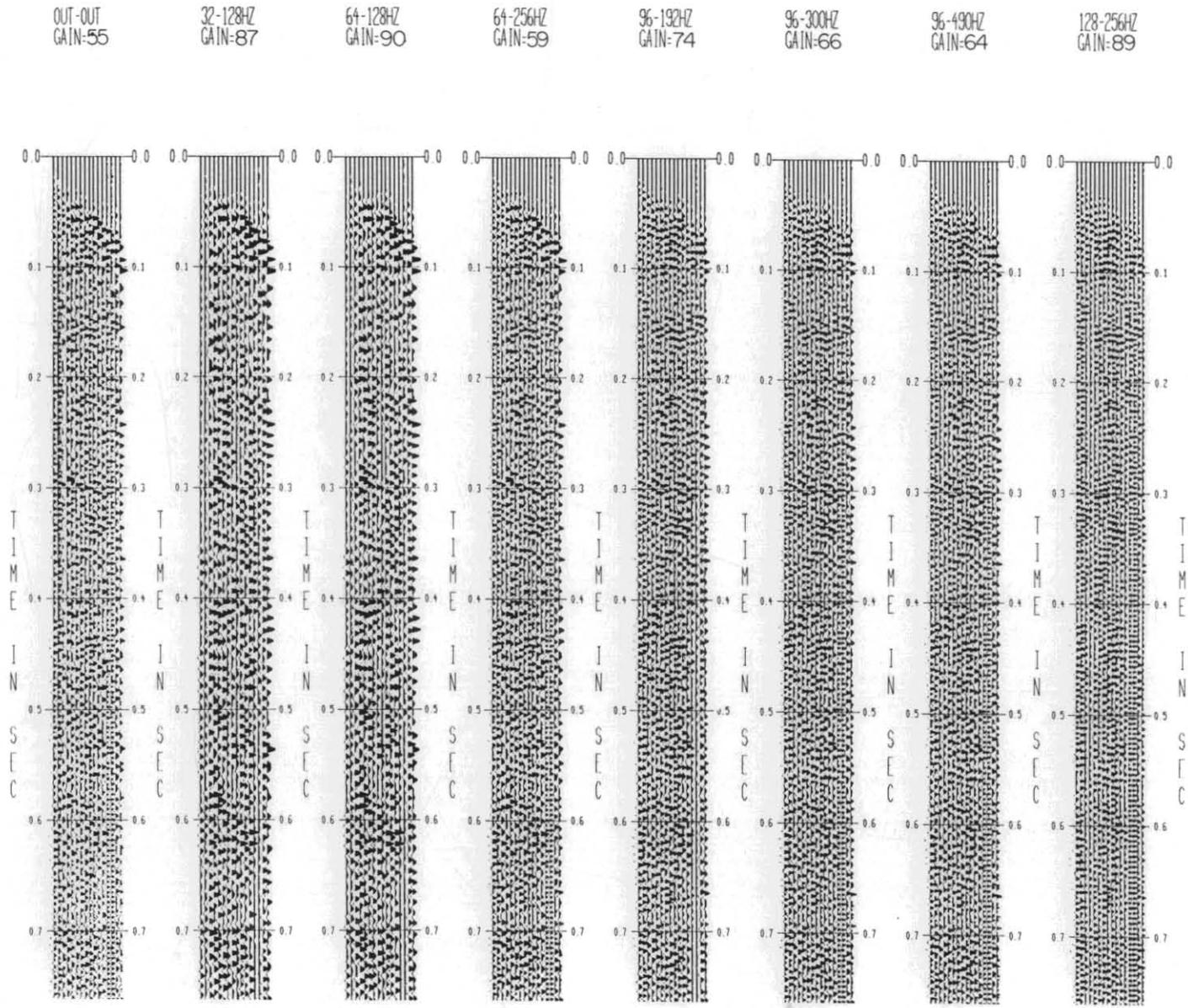


Figure 11. *Interpreted section, Seymour reflection traverse.*



TASMANIAN DEPT. OF MINES
 FINGAL TIER SURVEY
 FIELD RECORD ANALYSIS
 TVS APPLIED
 SEISLINE 2
 SP. 35
 FIELD TAPE 80-24
 REC. #29.30.



46-34

Figure 12.

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The Fingal Tier type environment is quite unusual, with velocities in excess of 5000 m/s within 5 m of the surface and persisting for more than 100-300 m. Three test traverses, including experiments with shot condition-depth and tamping, array geometry, single geophones, and processing parameters, have been fired. Best results have been achieved where shots are fired consistently within rock (6 m deep) using single geophones. Lateral terrain effects and, apparently, jointing within the dolerite degrade the signals. The thickness of dolerite also affects the quality of the processed results. A substantial statics correction is also involved.

Feasibility traverse processing has been able to provide a general profile of the base of both dolerite and coal measures. Some disruptions are evident but only fragments of two seam zones can be identified. More research is needed to improve the method resolution under traverse synthesis due to variability in properties of both the dolerite and the terrain.

In contrast, examination of filter-processed records for individual shots enables consistent picking of dolerite base, two coal measures reflectors, and base of coal measures (e.g. fig. 12). The coal measures reflectors appear to represent the Duncan and East Fingal seams. Sampling of more distant geophones and their incorporation into traverse analysis (single fold) may yield improved traverse results, as the required data are consistently recorded. Alternatively, shooting of a series of expander-soundings may prove more effective and economical as most of the survey expenses relate to shot hole drilling.

The method is clearly viable in both environments but is expensive and does require, at the present time, more fine honing at processing stage for the dolerite environment.

AIRBORNE RADIOMETRICS

A radiometric survey using a NaI gamma detector was made concomitantly with the two-level aeromagnetic survey of the Fingal Tier detailed area (fig. 4). Initial results were distance-dependent but correction has revealed no significant anomalies. Only occasionally do cap variations reflect in the results.

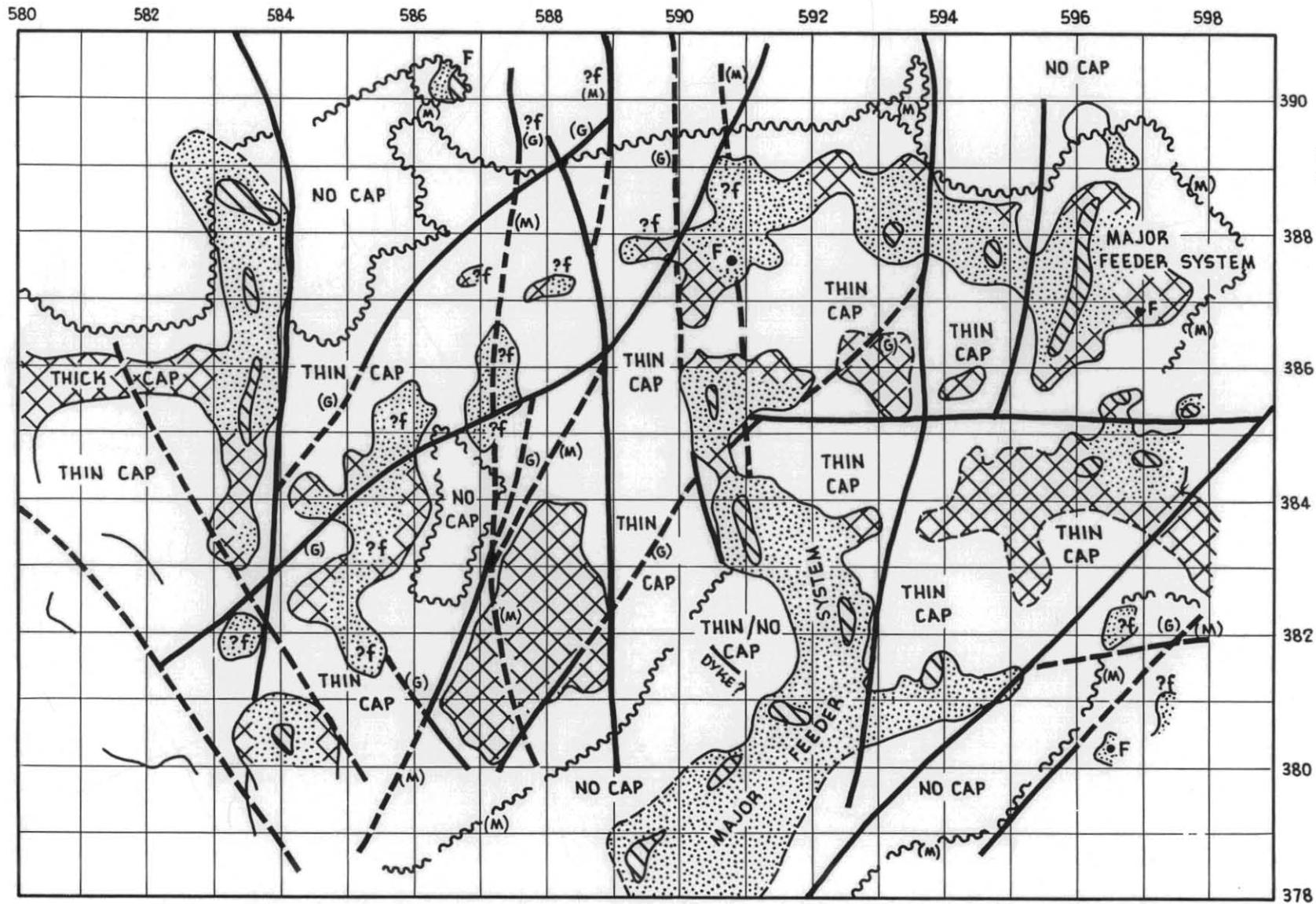
DOWN-HOLE LOGGING

Logging methods have been under-employed. In the initial stages of the programme (pre-1970) SP, resistivity, and natural gamma logs were run to 300 m. The holes logged were not drilled on the dolerite cap. When drilling commenced in dolerite, the thickness of dolerite often exceeded the range of the logger. The tools available were not particularly appropriate to the project and logging ceased. This major deficiency in the programme has finally been overcome and logging may now proceed to 600 m in all holes using a full suite of sondes. It is not yet possible to advise any conclusions or correlations.

SUMMARY OF DOLERITE PROPERTIES

As indicated above, the properties of the Jurassic dolerite control the keys to resolution of the many structural problems associated with Tasmanian coal deposits and a current summary of relevant data is given below.

Heat capacity of the magma was very low. In consequence thermal metamorphic effects are generally minimal and restricted to zones rarely more



- 390 ~~~~~ ESCARPMENTS
- 388 SUBSTANTIALLY THICKENED DOLERITE (RELATIVE TO LOCAL NORM)
- CRITICAL THICKNESS, RISK OF COAL MEASURE TRUNCATION (G)
- F DOLERITE FEEDER (G)
- ?f SMALL FEEDER INFERRED (G)
- 386 ——— TREND, FAULT (?)
- THIN CAP < 150-200m DOLERITE SHEET

- CONTINUOUS LINES REPRESENT FEATURES IDENTIFIED BY BOTH MAGNETIC AND GRAVITY SURVEYS.
- BROKEN LINES, FEATURES INDICATED BY EITHER METHOD
- (M) MAGNETIC, (G) GRAVITY

46-36

Figure 13. Gravity-magnetic interpretation, Fingal Tier.

5 cm

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than 5 m wide, or near pipes. Coal is rarely affected and thermal changes are of no exploration significance.

Magnetic properties may be extremely variable. Remanence and susceptibility measurements of dolerite in the East Coast Coalfields are at variance with published data - usually from other areas. Many sampling problems have been experienced as large apparent outcrops may be part of rotated talus blocks. A consistent pole indication has been given ($\sim 0^\circ, 55^\circ$) which contrasts with other data ($\sim 355^\circ, 85^\circ$). Susceptibilities are very low, averaging $5-15 \times 10^{-3}$ SI units. The remanent intensity, however, is comparable ($0.08-0.60 \text{ Am}^{-1}$). Vertical component variations in the field may range from $\pm 500 \text{ nT}$ to $\pm 10\,000 \text{ nT}$.

Seismic velocities exceed 5000-6000 m/s in fresh rock but the velocity is joint and weathering dependent. These properties, and in particular low angle relaxation joints, absorb high frequency energy and generally reduce the resolving power of seismic methods. Velocities within the coal measures are in the general range 2200-3500 m/s but are not, pending sonic logging, well defined.

Dolerite throughout the coalfields lacks the extreme textural variations so common in central and southern Tasmania. The rock is generally darker, finer and less dense - averaging 2.83 t/m^3 and does not exceed 3.00 t/m^3 . The material throughout the entire area may be the result of a later stage of intrusion within the province. Layering and differentiation, so characteristic of dolerite elsewhere, has not been recognised.

INTEGRATION OF SURVEY RESULTS

Preceding discussion summaries outlining the use and results of the various methods have presented the unilateral conclusions pertinent to each method. However, it is possible to synthesize some data from several methods; gravity, magnetic, and reflection. Radiometric data has been excluded since the information, although extensive, has little real character. The seismic data, though restricted to four relatively short lines, can be assimilated in the form of additional control. Clearly, though, only the gravity and magnetic surveys are of comparable extent, detail and relevance to offer any real opportunity of singular upgrading. And, since the gravity interpretation is more comprehensive and reliable, it is this interpretation which is revised to account for structural implications deduced from the magnetic surveys.

The revision is shown in Figure 13. Most of the features suggested in Figure 10 relate directly to major sheet edges or pipes evident in the primary gravity interpretation. Several groups of features can only be understood in combination with the Bouguer anomalies, either observed or continued, since some anomalies have resulted from the interaction of up to four structures. However the magnetic surveys have suggested that some, more subtle, Bouguer variations are significant and most changes relate to the impact of such features.

Several trends were recorded in each survey and these are shown by firm lines. Others, unsupported, are indicated for completeness. It is not known how many of these features represent two-dimensional variations in the sheets or how many are faults. The largest known fault in the area occurs between grid lines 590000mE and 591000mE. Each method has recognised a structure in this zone - but some 800 m apart. It is possible that the structure is multiple, with the main density contrast in the west and more recently disrupted dolerite, producing the magnetic anomaly, in the east.

Apart from such trend analysis discrepancies the two methods are in accord. The limited seismic data available from Fingal Tier is similarly not in conflict.

CONCLUSIONS

Geophysical methods have been incorporated into an accelerated coal exploration programme in eastern Tasmania. This development was essential if the cost, efficiency, and coverage of the project was to be optimised. Difficult geological conditions have left a legacy of ignorance concerning coal reserves and drilling is not an appropriate basis for a wide-ranging evaluation. Although a range of methods have been used, the gravity method has proven of most value, being able to resolve major faults, thick intrusions, feeders, and estimate coal measures thickness. The reflection method, after some further processing development, is likely to form a useful adjunct. Apart from surface magnetic boundary mapping other methods are not recommended. The results to date are encouraging in the suggestion of the general extent of coal measures. It now remains to be seen how much coal can be won.

Complete details of the geophysical surveys are given elsewhere: gravity (Bulletin 60), magnetics (Unpublished Report 1980/46), radiometrics (UR 1980/51), seismic reflection (UR 1980/45, 1981/6), summary (UR 1980/49). A complete list of reference titles is given in Appendix 7.

5. COAL TESTING

V.M. Threder

GENERAL

The Tasmanian Triassic coal is a high ash, low sulphur, dull steaming coal and is classified as 600(7) according to AS2096-1977. The mineral matter is mainly locked in the contained cell structure of the constituent plant remains and the coal is therefore difficult to wash. Run-of-mine coal frequently has an ash content of around 30%, of which two-thirds is inherent and the remaining third is present as 'dirt bands' which can be washed out to produce a 20% ash coal at around 70-75% recovery. Any attempt to improve the quality of the product above this level results in a sharply reduced washery yield.

ANALYTICAL PROCEDURES

Proximate analyses were carried out on all attractive seams (>1.5 m) and ash analyses on all significant seams after crushing to 9.53 mm. A 3/4 split of all plys was kept for a reconstituted composite seam sample for heavy liquid refraction, but this part of the testing programme was not continued due to limitations in the Department's laboratory.

All proximate analyses carried out by the Department of Mines were done with existing equipment and do not conform to the Australian Standard. Check analyses were periodically carried out by the Joint Coal Board of N.S.W. and discrepancies of 1-2% were noted. It was considered that this discrepancy would have no significant effect on the coal reserve estimates.

BULK SEAM DATA

A three tonne bulk sample was taken from the Duncan mine in October 1979 for the purposes of conducting a series of tests so that a suitable testing procedure could be devised. The full details of the testing of this sample and the laboratory report, designated R786, are included in this report (Appendix 4).

The proximate analyses and float/sink testing were done in the Departmental laboratory.

Additional testing was also carried out by ACIRL at Ryde in New South Wales and involved:

ultimate analyses	forms of sulphur
proximate analyses	Hardgrove grindability

The uranium content was determined by the Australian Atomic Energy Commission. The purposes of this study were to:

- (1) Determine the effect of float/sink testing different size ranges of the same sample.
- (2) Measure the effect of dry and wet drum tumbling sample treatment in the different size ranges (drum tumbling is designed to simulate handling and jig washery treatment).

A comprehensive treatment involving 44 separate float/sink tests was devised (see Figure 28, Appendix 4).

- This test programme produced no clear evidence of a relationship between results obtained from initially finely crushed core and coarsely crushed core.

Wellington (this volume, Appendix 4) states that the 'dirt' bands in the coal break down more readily than the coal fraction and can be readily separated by weathering and screening. He suggests that this characteristic could form the basis of a beneficiation process. This would only affect the more easily separated 'dirt' bands but would have no effect on the inherent ash which makes up the bulk of the total contained mineral matter.

Other matters which would need to be researched are:

- (1) To what extent does the coal quality deteriorate (loss of volatile carbonaceous matter) during the weathering process?
- (2) What is the grain size distribution of the coal before and after weathering and screening - an increase of fines would add to the difficulties of washing (if further treatment was necessary)?
- (3) What loss of coal would be occasioned by the screening process?

6. THE COAL SEAMS

C.A. Bacon

There are eight major coal seams on Fingal Tier; these seams have been labelled 'A-H' by the Department of Mines. Some seams, notably 'A' and 'B', are better described as coaly intervals with plies of coal less than 0.5 m thick being interbedded with carbonaceous mudstone and claystone over intervals of some 5 - 10 m. All the seams are characterised by a high inherent ash content, and have only a small (< 10%) component of bright coal. The seams are of medium rank, high ash, low sulphur steaming coals. The seams often split and occasionally lense out completely, having been either; (a) never deposited, or (b) subsequently eroded from parts of the Exempt Area. Graphic logs of the coal seam intersections are included on microfiche as Figures 37-86. Comments on the seams present in each drill hole in both S.R. 32/81 and E.L. 17/81 are given in Tables 3 and 4 at the end of this chapter. Sections through the areas S.R. 32/81 and E.L. 17/81 are included on microfiche as Figures 87-101.

SEAM CORRELATION

No satisfactory marker horizons have been recognised in the fluvial sequence on Fingal Tier. In order to obtain reliable correlation of coal seams it has been necessary to drill down to the glaciomarine sequence of the Lower Parmeener Super-Group (formerly referred to as 'Permian' sediments). This basement dips gently to the east and forms a known horizon from which correlation of coal seams may be more confidently undertaken. Drill holes commonly reach depths of 500 - 600 m in order to reach the glaciomarine basement.

In the western part of the former (now revoked) exempt area a one to three metre thick conglomerate horizon has proved to be a reasonable marker where present. The conglomerate band (informally called the Dalmayne Conglomerate) is composed of well rounded pebbles and cobbles of green and white quartzite, acid pyroclastic rocks and slate, elongate to spherical in shape and set in a matrix of coarse-grained lithic sandstone.

The conglomerate band is, however, too patchy in areal distribution to be a significant marker bed.

In the eastern part of the exempt area a number of tuff intersections have been recorded. The tuff is an acid air-fall vitric tuff, with the intersections \approx 1 m thick. However, the patchy areal distribution of the tuff make the use of the band as a marker horizon minimal.

SEAM A

This seam is generally thin; 1 - 3 m of interbedded dull coal and carbonaceous mudstone, non-carbonaceous mudstone, and claystone in bands ranging from a few centimetres to 0.5 - 1 m thick. Seam A is not present over parts of the Exempt Area because:

- (a) the collar elevation of the drill hole is below the RL of the seam, or
- (b) the seam has been removed by the dolerite capping.

There are no working sections in any of the Seam A intervals sampled by the Department.

(A working section is defined as an interval of coal > 1.5 m thick with an ash content of \leq 40%).

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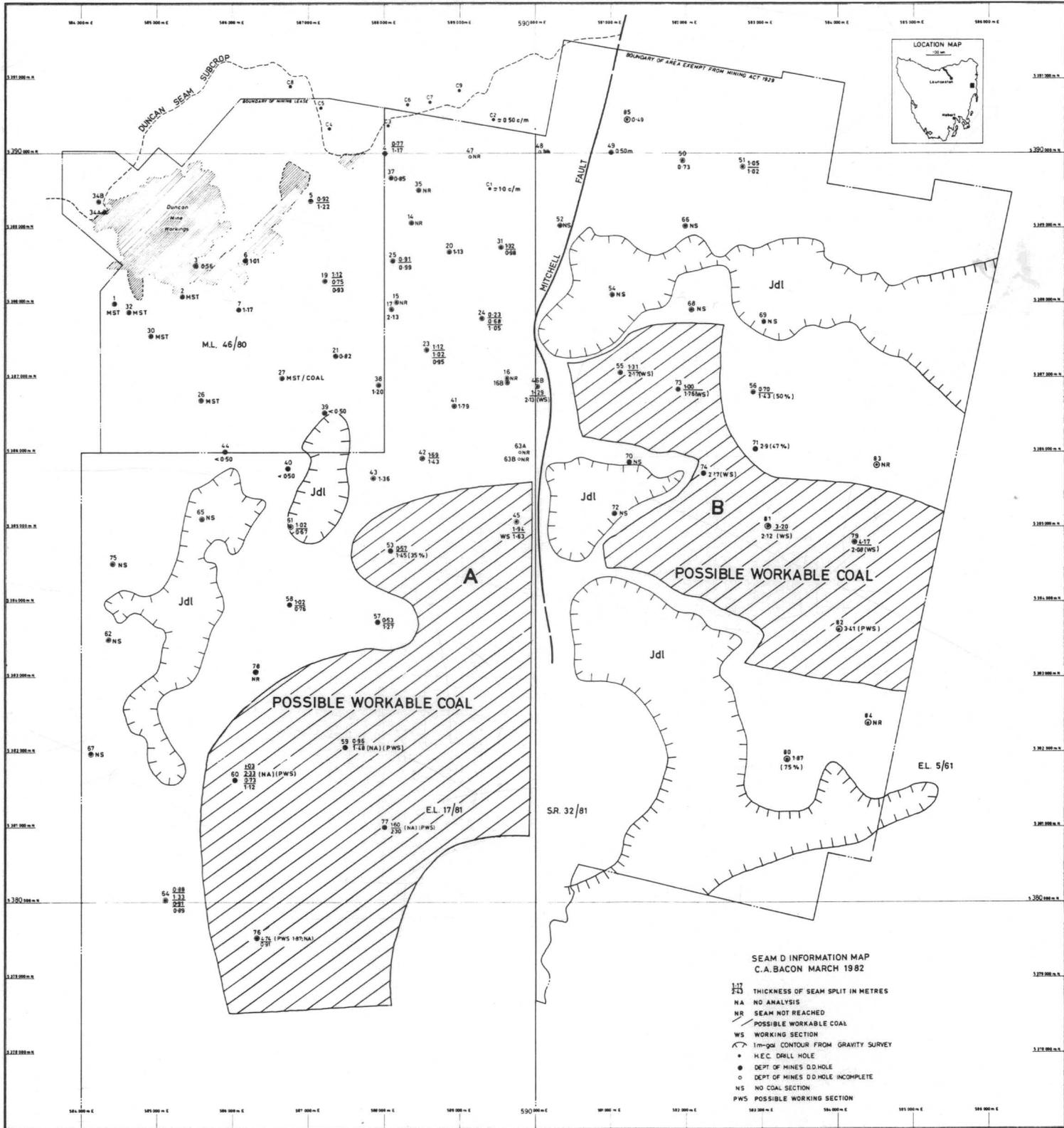
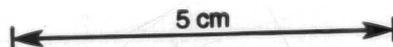


FIGURE 14



SEAM B

This seam is an interbedded coal - non-coal sequence similar to but thicker than Seam A. It is typically a 5 - 10 m thick coaly interval. Examination of the graphic logs of coal seam intersections (Appendix 6) clearly shows the interbedded nature of the seam. There are very few working sections or possible working sections in Seam B in the coal intersections examined by the Department from Fingal Tier.

SEAM C

This seam has many interbedded mudstone and claystone bands and is commonly 3 - 6 m thick, with thicker sections common. Seam C is particularly well developed along the front of the Tier east of the Mitchell Fault (DDH 49, 50, 51), being 16.89 m thick in DDH 49 and split in DDH 50 (6.80, 9.80, 4.81 m splits) and DDH 51 (9.85, 3.25, 1.01 m splits). Unfortunately these coaly intervals of great thickness contain no working sections. There are very few working sections or possible working sections in Seam C on Fingal Tier.

SEAM D

Seam D is commonly 1 - 2 m thick, with only a few mudstone and claystone bands.

Generally the ash content ranges from 25 - 35%, but there are few working sections due to the thinness of the seam. An area of possible working coal extends from DDH 45 to DDH 76, west of the Mitchell Fault in the revoked part of the exempt area (now E.L. 17/81).

There being no coal quality data for DDH 59, 60, and 76 this area is classed as 'possible working coal' only. A reasonable area of workable coal exists to the east of the Mitchell Fault, around DDH 55, 74, 81, 79, and 82. The extent of these areas of possible workable coal is shown on the Seam D Information Map (fig. 14), and tentative reserve estimates for the pockets of potentially workable coal are given in Table 6.

SEAM E

Seam E is most commonly one metre thick and in a large number of holes is represented by a mudstone horizon. There are no working sections in seam E in the holes drilled by the Department.

DUNCAN SEAM (F)

This is the main coal seam to have been worked in the Fingal area. The largest colliery, the Duncan (from which the seam is named), was named after Duncan McGeachie, the son of one of the early managers at the Duncan Mine. The present Duncan Colliery incorporates a number of earlier workings, including the 'Cat and Kitten' and Yates Mine. Two small mines, the Valley Mine and Barber's Mine lie to the east of the present Duncan Colliery and are no longer worked. The Duncan Seam splits into four plies in the vicinity of DDH 4 and DDH 5; it is thought that the seam worked in the Valley and Barber's Mines was one of the lower splits of the Duncan Seam.

Typically the seam consists of 2 - 3 m of dull coal with minor clay and mudstone partings. The raw ash content is approximately 30% and the specific energy approximately 22 - 24 MJ/kg.

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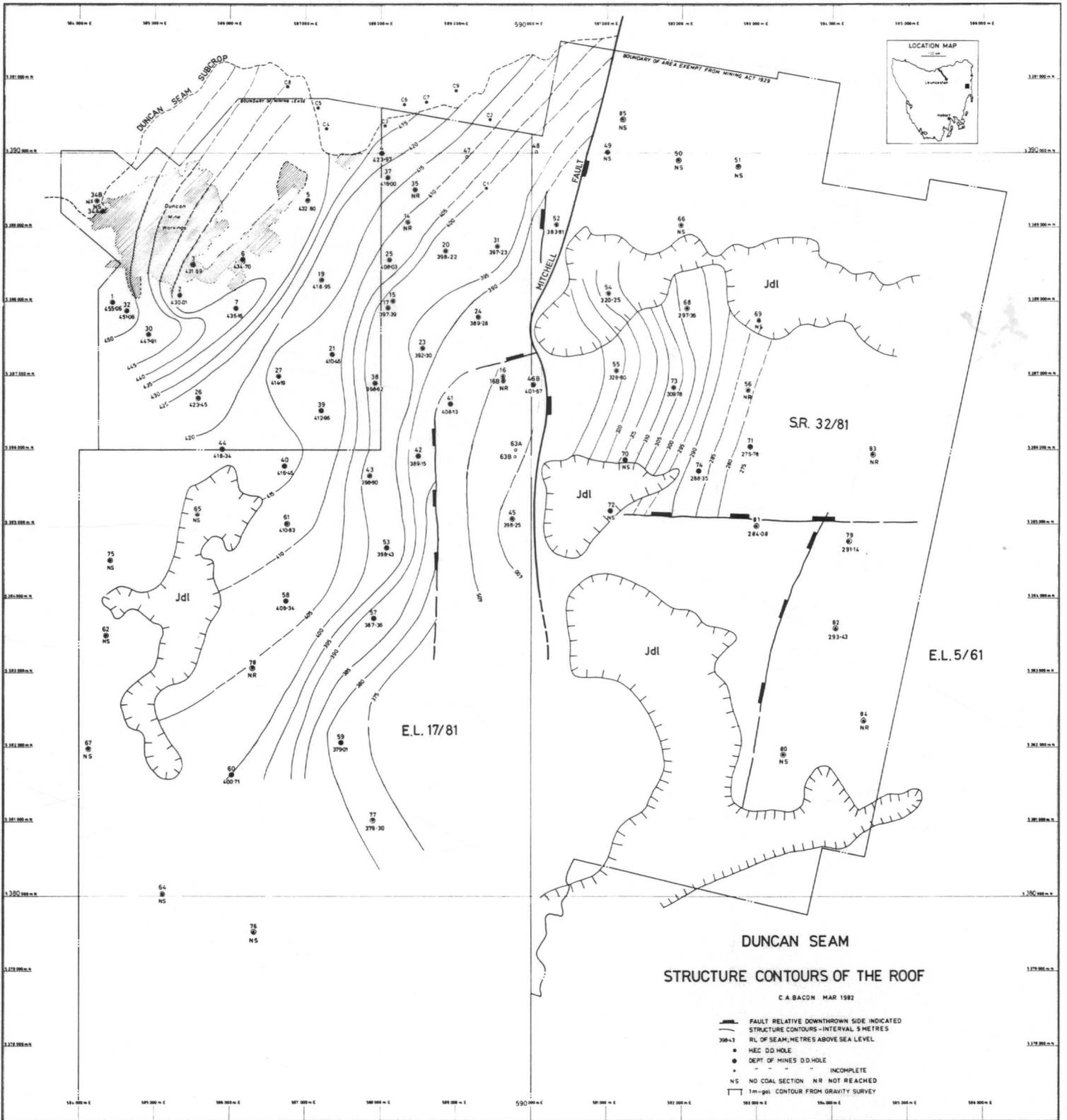


FIGURE 15a

4690/7

5 cm

Specific details of the Duncan Seam are given in Appendix 1 while maps showing the seam thickness, extent of the measured working section, ash content of the total seam, and ash content of the working section are given in Figures 15 - 18. Maps showing structure contours of the roof of the seam and interseam sediment thicknesses between the Duncan and East Fingal seams are given in Figures 15a and 19.

Reserves for the Duncan seam have been calculated and are given in Table 6, while a study of the petrology of the Duncan Seam is given in Appendix 1.

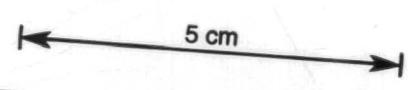
For the purposes of describing the features pertaining to the Duncan and East Fingal Seams in the following comments, the area of investigation has been divided into two parts; west and east of the Mitchell Fault. The area west of the Mitchell Fault is largely, although not entirely, covered by Mining Lease (M.L.) 46/80 and by Exploration Licence (E.L.) 17/81. A small part of the exempt area (e.g. around DDH52) lies west of the Mitchell Fault. The area to the east of the Mitchell Fault is entirely covered by Statutory Regulation (S.R.) 32/81.

Duncan Seam total thickness map (fig. 15b)

The Duncan Seam thins out towards the southern and eastern parts of the area as shown in Figure 15b. The western part of the area investigated is now covered by M.L. 46/80 and E.L. 17/81. The eastern part of the investigated area is referred to as Area S.R. 32/81.

In the area west of the Mitchell Fault (now covered by M.L. 46/80 and E.L. 17/81) the following features may be observed:

- (a) In the north-eastern corner of E.L. 17/81 the Duncan Seam has thinned out to less than one metre in thickness, corresponding with the washout zone of DDH's 49, 85, 50, and 51 on the eastern side of the Mitchell Fault. In DDH 52 the seam is 0.80 m thick and has been partly intruded by dolerite.
- (b) Over most of the mining lease area (M.L. 46/80) the Duncan Seam is 2.0 - 2.5 m thick, apart from a localised thinning of the seam in the vicinity of DDH's 19, 17, and 25 on the eastern boundary of M.L. 46/80 and the adjoining E.L. 17/81. The seam is here, on average, 1.5 m thick, being 1.55 m thick in DDH 25 and 1.32 m thick in DDH 17.
- (c) The apparent thickening of the seam in the south-eastern corner of M.L. 46/80 has been caused by the use of different sampling and logging techniques between various workers. The Duncan Seam in DDH 39 (5.30 m) is composed of roof (2.47 m with an ash content of 85.8%) and a main seam section of 2.83 m (two samples: 1.07 m of 39.1% ash and 1.76 m at 26.3% ash). Similarly with DDH 38, the Duncan Seam interval shown of 5.89 m is made up of a roof section of 3.07 m (of which 2.28 m was recovered), with an ash content of 90.1%; a main seam section (2.49 m of 26.1% ash), and a floor section (0.33 m of 87.1% ash).
- (d) The apparent seam thickness around DDH 57 is also a result of different logging practices. The top 0.97 m of the 3.12 m section represents roof, and the basal 0.43 m represents floor, leaving 1.72 m as the main seam section. No analyses are available for this hole.
- (e) No coal sections (NS) were recorded in the following DDH due to
 - (i) dolerite intruding below the level of the seam: DDH's 65, 75, 62, 67.
 - (ii) seam having washed out: DDH's 76, 64.
 - (iii) collar elevation below the subcrop of the Duncan Seam: DDH's 34A, 34B.
- (f) The Duncan Seam was not reached (NR) in the following DDH's: 35, 14, 16A, 16B, and 78 due to the drilling of the hole being terminated before the seam was intersected. DDH's 47, 48, 63A, and 63B were pre-collared only.



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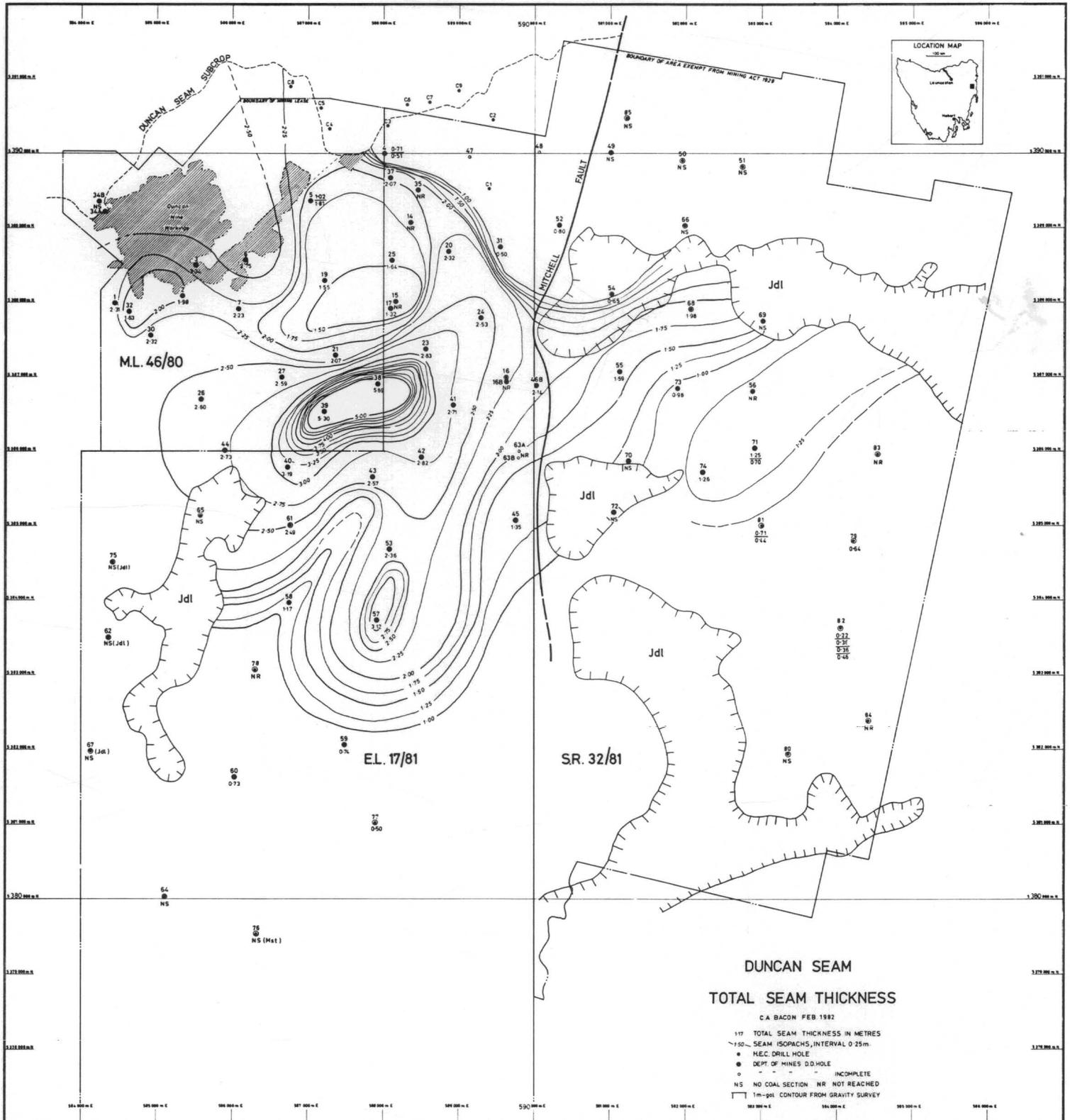


FIGURE 15b

4690/8

On the eastern part of the area investigated (S.R. 32/81, east of the Mitchell Fault) the following features were observed in the Duncan Seam:

- (a) A general thinning of the seam to the south and east; from 1.98 m thick in DDH 68 in the northern part of S.R. 32/81 to 0.98 m in DDH 73. The seam thickens slightly to 1.25 m in DDH 71 and 1.26 m in DDH 74. The seam thinning trend continues further to the south with the seam splitting in DDH 81 (splits 0.71/0.44 m thick) and splitting even more in DDH 82 (splits 0.23/0.30/0.46 m thick).
- (b) No coal section (NS) is recorded in DDH's 80, 49, 85, 50, 51, 54, 66, 69, 70, and 72.

The Duncan Seam is washed out in DDH 80, in the southern part of S.R. 32/81. A substantial washout zone also occurs along the northern slopes of Fingal Tier in S.R. 32/81, with the seam being washed out in DDH's 49, 85, 50, and 51. In some instances (e.g. DDH 49) a small coal-pebble conglomerate is all that remains of the seam.

Substantial areas of dolerite intrusion have limited the extent of the seam in S.R. 32/81. Dolerite has intruded to below the level of the Duncan Seam in DDH's 66, 69, 70, and 72. Dolerite has intruded part of the Duncan Seam in DDH 54, leaving only 0.65 m of charred coal with a dolerite roof. Dolerite has also intruded the roof of the Duncan Seam in DDH 52, leaving 0.80 m of coal with a dolerite roof.

- (c) The Duncan Seam was not reached (NR) in the following holes; DDH 56, 83, and 84, due to the drilling being terminated before the seam was intersected.

Duncan Seam working thickness map (fig. 16)

A working thickness has been defined as parts of the seam between 1.50 and 3.00 m thick with an ash content of less than or equal to 40%.

West of the Mitchell Fault in M.L. 46/80 and E.L. 17/81 the following features were noted:

- (a) There are no working sections (NWS) in the Duncan Seam in the north-eastern corner of E.L. 17/81.
- (b) The Working Section averages between 2.00 m and 2.50 m over most of M.L. 46/80 and northern part of E.L. 17/81.
- (c) A localised thinning of the seam occurs around DDH 17 (seam is 1.32 m thick) compared to a thickness of 1.55 m in DDH 19 and 1.64 m in DDH 25. Around this localised thinning the Duncan Seam is reasonably thick, e.g. 2.07 m thick in DDH 21.
- (d) A localised 'high' in the seam thickness occurs outside the south-eastern corner of M.L. 46/80 in E.L. 17/81, centred around DDH 23 (seam 2.83 m thick), DDH 42 (seam 2.82 m thick), and DDH 39 (2.83 m thick).
- (e) No analyses are available for DDH 57, hence the notation of PWS (possible working section) of 1.72 m.
- (f) Over E.L. 17/81 the working section of the Duncan Seam thins rapidly to the south, not persisting further south than DDH 57 and also thins to the east, to 1.58 m in DDH 46B. To the south of DDH 46B, the seam is only 1.35 m (NWS) in DDH 45.

East of the Mitchell Fault in S.R. 32/81 there are no working sections (NWS) in any of the intersections of the Duncan Seam encountered during drilling.

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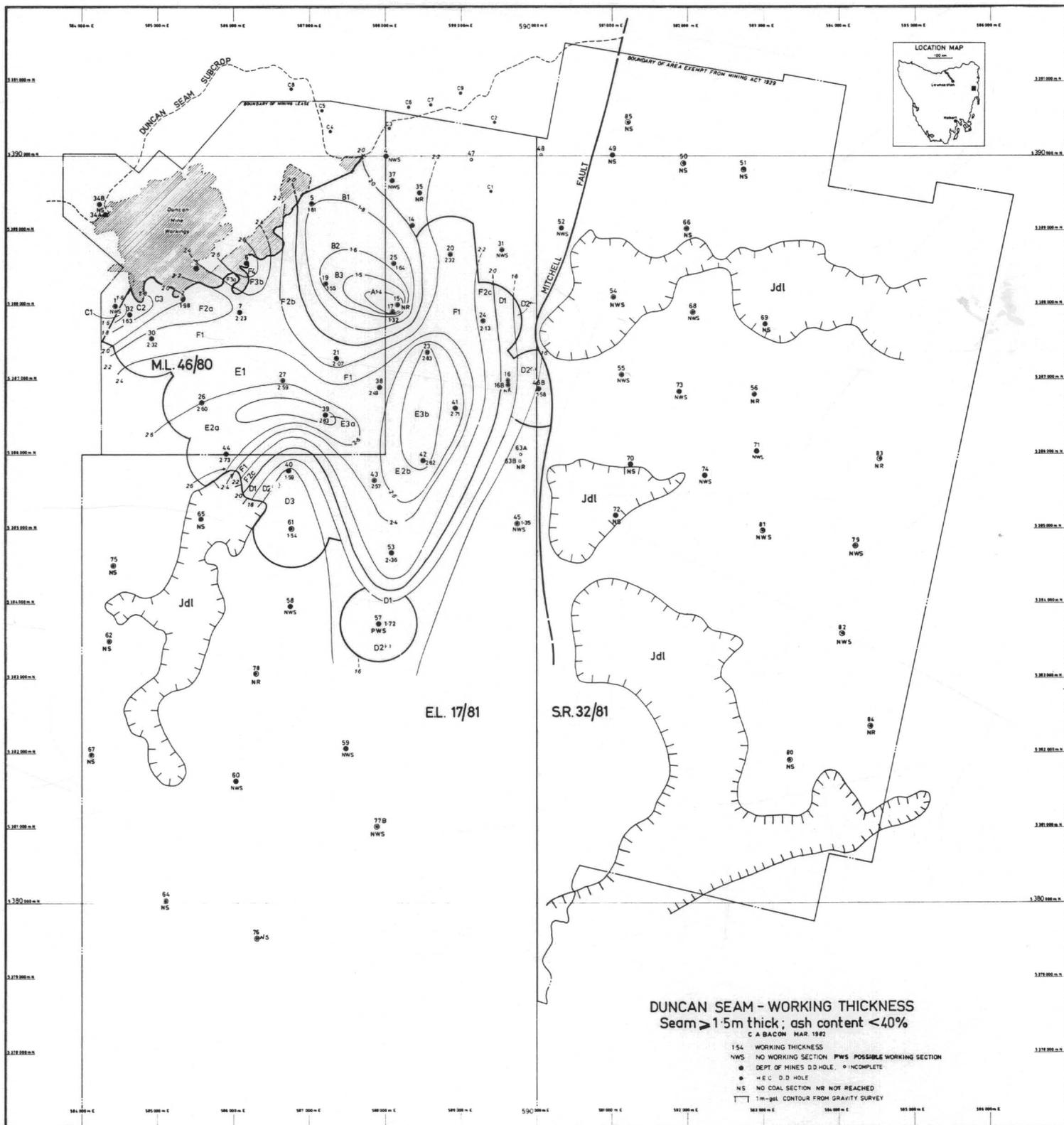
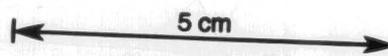


FIGURE 16

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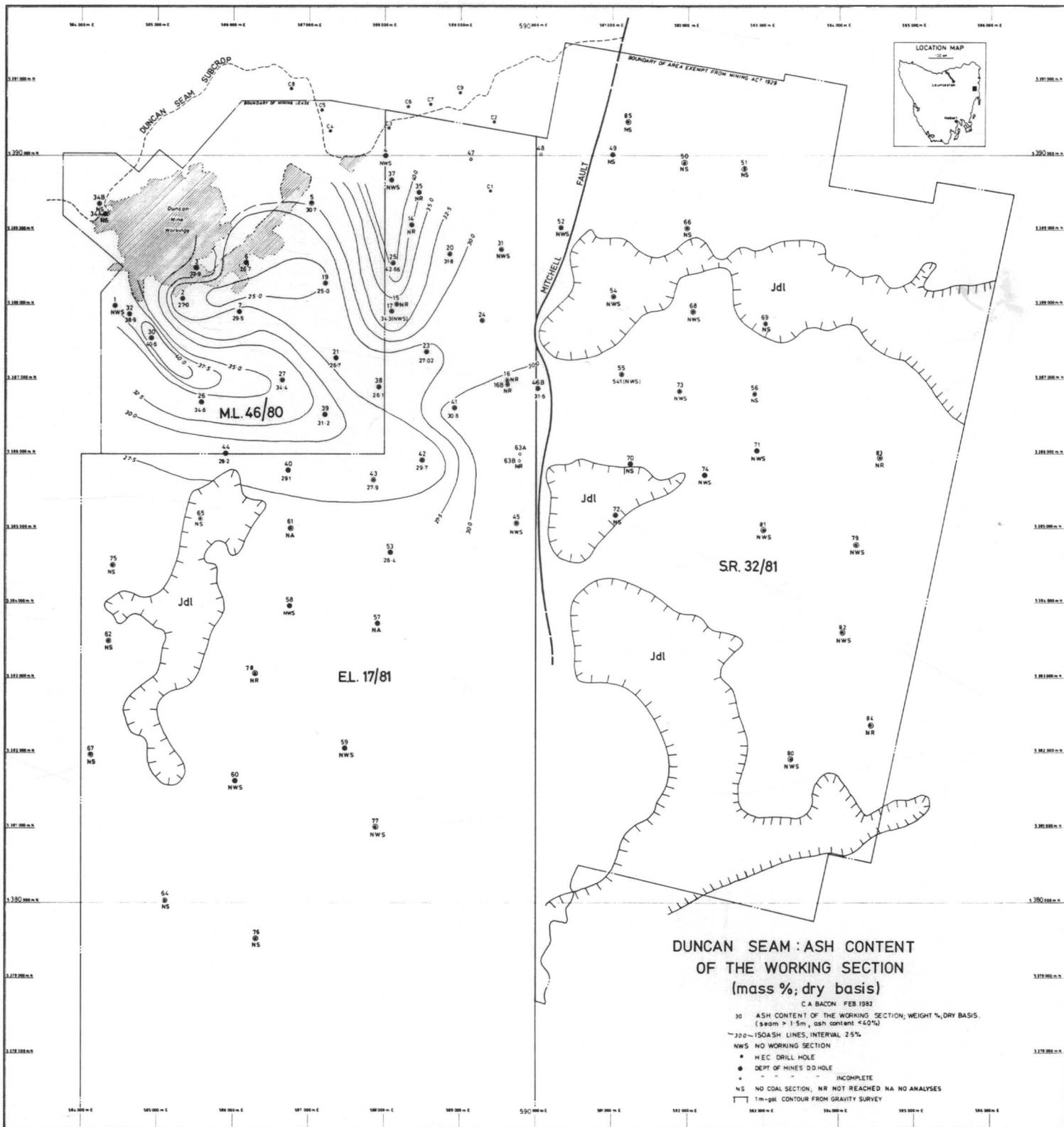


FIGURE 17

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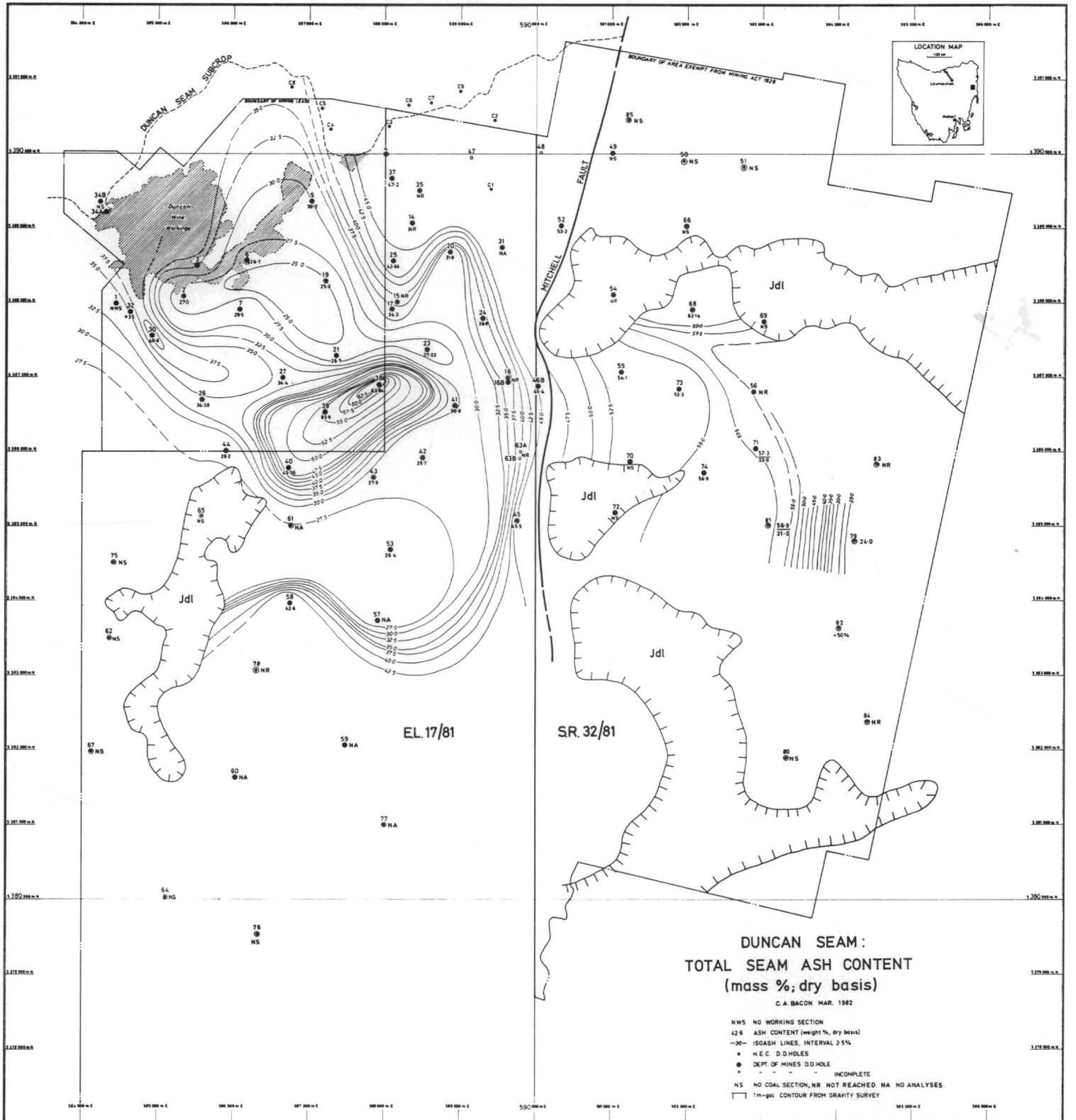


FIGURE 18

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Duncan Seam - ash content of the working section (fig. 17)

West of the Mitchell Fault in M.L. 46/80 and E.L. 17/81 the ash content of the Working Section of the Duncan Seam usually ranges from 25 - 30% (dry basis) with a few localised variations.

(a) Around DDH's 1, 32, and 30 the ash content rises significantly to 38.9% (dry basis) in DDH 32 and to 40.6% (dry basis) in DDH 30. There is no working section in DDH 1, the Duncan Seam being represented by an interbedded sequence of poor quality coal, mudstone, and sandstone 2.37 m thick. The ash content of this interval (which was not sampled) would be more than 40%.

(b) A second area of high ash content is centred around DDH 25 where the seam has an ash content (dry basis) of 42.66%.

East of the Mitchell Fault in S.R. 32/81 there are no working sections (NWS) in any of the intersections of the Duncan Seam encountered during drilling.

Duncan Seam - total seam ash content map (fig. 18)

West of the Mitchell Fault in M.L. 46/80 and E.L. 17/81, the total seam ash content (dry basis) fluctuates quite markedly over short distances.

(a) A patch of low quality coal may be defined around the areas of DDH's 1, 32, and 30 with the ash content being 35 - 40%. This has been discussed above.

(b) An area of reasonably good quality coal is defined by DDH 2 (27% ash), DDH 19 (25% ash), and DDH 21 (26.7% ash).

(c) An anomalous patch of seemingly poor quality coal is centred over DDH 38 (63.04% ash), DDH 39 (85.9% ash), and DDH 40 (49.56% ash). This is a result of one worker calling the carbonaceous mudstone sections above and below the actual coal proper 'roof' and 'floor' of the coal seam, and sampling these accordingly. This artefact, produced by the use of non-uniform logging and sampling techniques over the area of investigation, has been discussed more fully above. The 85.9% ash content in DDH 39, for example, is weighted with the addition of 2.47 m roof with an ash content of 85.8% and a main seam section made of two plies; 1.07 m with 39.1% ash and 1.76 m with 26.3% ash.

(d) No analyses are available for seam intersections in the southern part of E.L. 17/81.

East of the Mitchell Fault in S.R. 32/81 the total seam ash content increases slightly to the east, from 53.2% in DDH 52 and 54.1% in DDH 55 to 57.3% in DDH 71.

(a) DDH 71 and DDH 81 both show two splits for the Duncan Seam, the top split being poor quality but thicker than the lower, better quality split. In DDH 71 the upper split is 1.25 m thick (ash 57.3%) and the lower 0.70 m thick (ash 33.9%), while in DDH 81 the upper split is 0.71 m thick (ash 56.9%) and the lower split is 0.44 m thick with an ash content of 31%.

(b) A patch of good quality coal occurs around DDH 79. However this is very thin (0.64 m of 24% ash coal).

Duncan Seam - structure contours of the roof (fig. 15a)

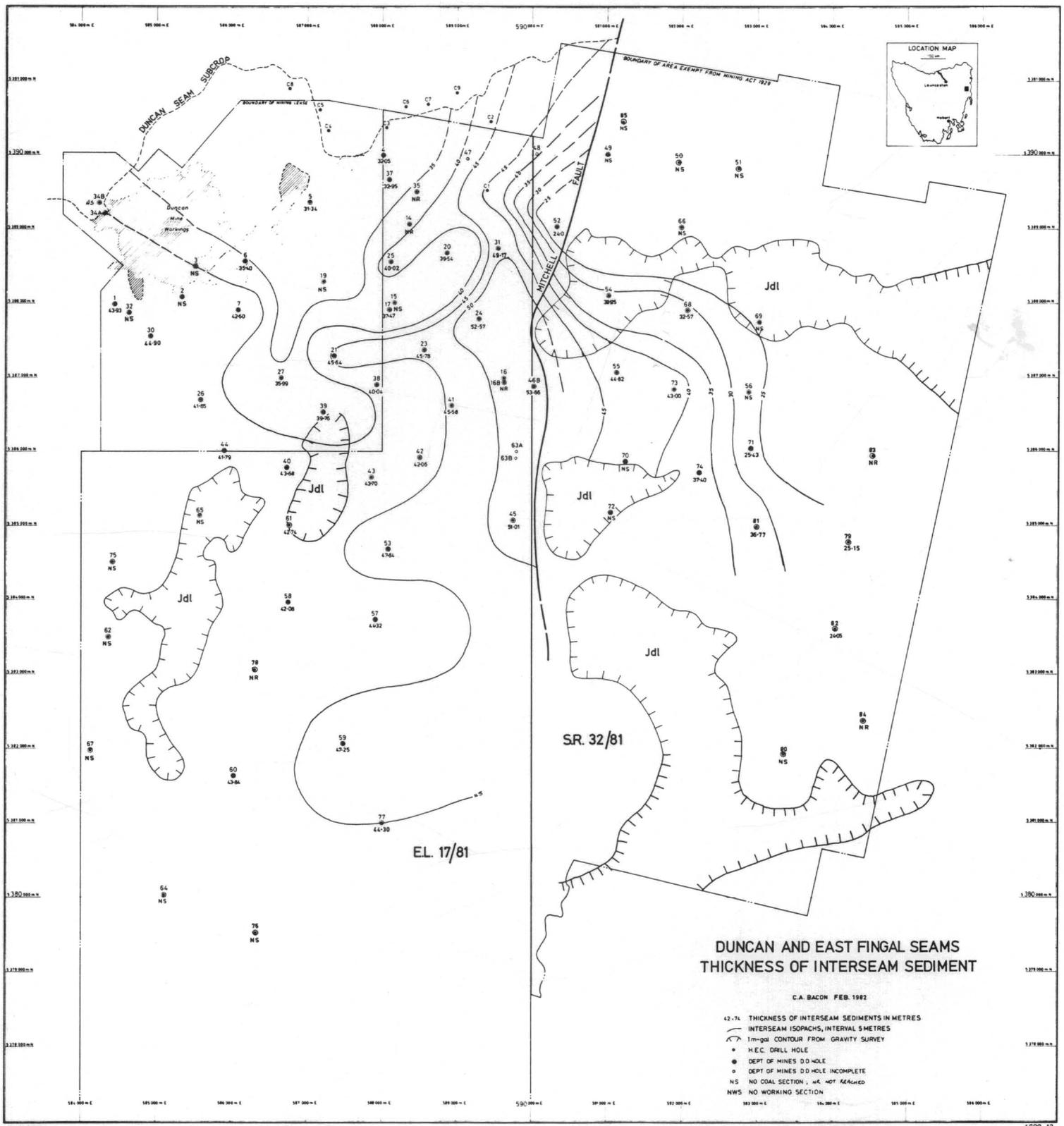
The Duncan Seam dips at 1 - 2° to the south-east over the area of investigation, with localised variations in dip.

West of the Mitchell Fault over the areas largely covered by M.L. 46/80 and E.L. 17/81, the following features were noted:

(a) Small faults occur between the following drill holes:

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5 cm

(i) - A north-south trending fault occurs between DDH's 23, 42, and 53 on the western (downthrown) block and DDH's 41 and 45 on the eastern (upthrown) block. The throw on this fault would appear to range from 10 - 15 m at the northern end (near DDH 41) to 20 - 25 m further south. This fault is informally known as the Newman Fault.

(ii) An east-west trending fault occurs between DDH's 23 and 24 on the northern (downthrown) side and DDH's 41 and 46B on the southern (upthrown) side. This fault, which intersects the Newman Fault, has a maximum throw of 25 m.

The Mitchell Fault on the eastern boundary of the fault block has a maximum throw of 60 m, downthrown to the east. The throw of the Mitchell Fault further north, e.g. around DDH 49, is approximately 40 m.

(iii) The effects of a small fault west of DDH 52 are not obvious as the sedimentary section has been radically contracted in the vicinity of DDH 52. The Duncan and East Fingal interseam sediment thickness is 49.17 m in DDH 31, while one kilometre to the north-east in DDH 52, the same interval is only 24.00 m. If the interseam interval remained constant, the Duncan Seam could be expected at an approximate R.L. of 405 - 410 m and the effect of the small fault could be readily seen. The contraction of the section has obscured the effects of the fault.

In the area east of the Mitchell Fault, covered by S.R. 32/81, the only features of interest are two small faults, one trending east-west between DDH's 74 and 71 on the northern (downthrown) side, and DDH 81 on the southern side. The throw of this fault would be no more than 15 m. A second small fault runs north-south between DDH 81 on the western (downthrown) side and DDH's 79 and 82 on the eastern side. The throw on this fault would be approximately 10 - 15 m. Both these small faults are shown on the gravity interpretation map (fig. 8).

Duncan and East Fingal Seams - thickness of interseam sediments (fig. 19)

Over the area west of the Mitchell Fault the interseam sediment thickness remains reasonably constant at 35 - 40 m, apart from local thinning and thickening. One area of contraction of interseam sediments occurs around DDH 52, where the sediments thin to 24.00 m. Further south around DDH 46B and 51 the sediments thicken to 53.66 m and 51.01 m respectively. East of the Mitchell Fault, the interseam sediments lense from being about 45 m thick (44.82 m in DDH 55) to about 25 m (25.43 m in DDH 71) to the east.

The overall interseam sediment structure shows a 'basin type' depression centred over DDH's 24, 46B, and 51, where the sediments are \pm 50 m thick; the sediments thin slightly to the west and thin drastically to the east and north of this central depression, with the lensing together of the two seams and subsequent shortening of the intervening section.

THE EAST FINGAL SEAM (G)

This seam was named by the Joint Coal Board in an investigation of bore core from a drilling programme undertaken by the Hydro-Electric Commission in 1967. Minor working of this coal has been undertaken in two creeks south-west of the present Duncan Colliery. Two small adits have been driven into outcropping coal, but only a few tonnes have been mined. The East Fingal Seam is similar to the Duncan Seam, but in most of the borehole intersections was found to be split into two seams with a varying

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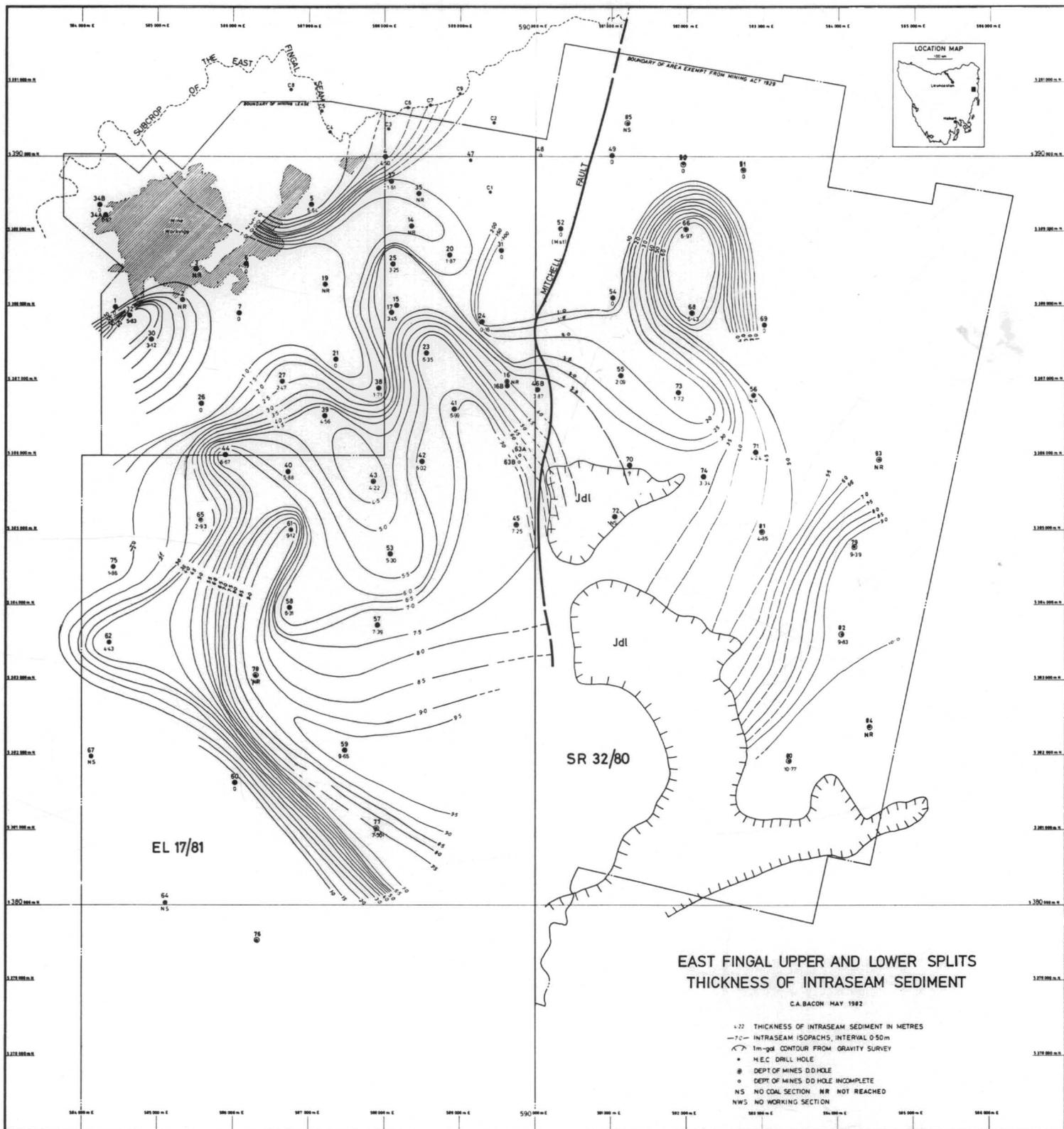
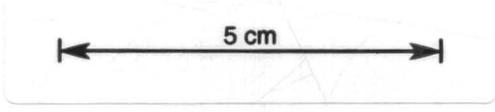


FIGURE 20

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band of intervening sediments. In a given area either, none, or rarely both splits may be of workable thickness and quality. Thickness of East Fingal Upper and Lower Split Intraseam Sediment is shown in Figure 20.

The Upper Split (GU or EFU) is commonly 1 - 2 m thick west of the Mitchell Fault. East of the fault, the Upper Split is considerably thinner, being represented in some cases by a thin mudstone band. Areas of potentially workable coal are shown on Figure 21. Structure contours of the roof of the EFU are given in Figure 22.

The Lower Split (GL or EFL) is commonly 1 - 2 m thick on both sides of the Mitchell Fault. Areas of possible working coal are shown on Figure 23. This seam is correlated with the Dalmayne D Seam of the Shell Company in their area E.L. 5/61 to the east of S.R. 32/81.

Reserves for the patches of potentially workable coal of both splits are given in Chapter 7 (Table 9).

East Fingal Upper and Lower Splits - thickness of intraseam sediment (fig. 20)

West of the Mitchell Fault the following features may be observed in the intraseam sediments:

- (a) substantial thickening of intraseam sediments around DDH's 32 and 30 (5.83 and 3.12 m respectively).
- (b) large area of no seam split south of the Duncan Mine workings - around DDH's 7, 26 and 21.
- (c) thickening of intraseam sediments to the south; 6.67 m in DDH 44 to 9.12 m in DDH 61, 6.31 m in DDH 58 to 9.65 m in DDH 59 and 7.39 m in DDH 57.

East of the Mitchell Fault the intraseam sediments:

- (a) thicken substantially between DDH 54 and DDH 69 (seam not split in these two holes) to 6.97 m in DDH 66 and 6.43 m in DDH 68.
- (b) thicken overall towards the south-east; from 1.72 m in DDH 73 to 4.24 m in DDH 71 to 9.39 m in DDH 79.

East Fingal Upper Split - total seam thickness (fig. 21)

West of the Mitchell Fault the East Fingal Upper Split averages 2.0 m in thickness and undergoes significant and abrupt changes in seam thickness.

- (a) At the Duncan Mine portal DDH 34A and 34B show good intersections of the East Fingal Seam of 3.14 m and 3.09 m respectively. DDH 34A has a band of mudstone 0.57 m thick included in the 3.14 m - the start of a seam split. South of DDH's 34A and 34B the seam deteriorates rapidly to one non-split interval of 0.59 m in DDH 1 and two small splits in DDH 32 (EFU: 0.50 m; EFL: 0.43 m), with an intervening intraseam sediment thickness of 5.83 m.
- (b) A localised 'high' in seam thickness is centred over DDH 5 where the seam is 2.75 m thick.
- (c) An apparently large seam interval of 4.91 m in DDH 52 is in fact largely carbonaceous mudstone, the seam being composed of the following plies: 0.96 m of 82.5% ash; 2.09 m of 53.4% ash; and 1.86 m of 91.1% ash.
- (d) The apparent seam high of 3.02 m in DDH 38 has an ash content of 67.2%.
- (e) The East Fingal Upper Split thins drastically in the western part of E.L. 17/81, west of DDH's 61, 58, 60, and 76, to be only 0.24 m thick in DDH 75 and 0.92 m thick in DDH 62.
- (f) Cross hatched areas A, B, and C show potentially workable coal in the East Fingal Upper Split. It should be noted that in any one area both splits of the East Fingal Seam could not be worked unless there was a seam separation of more than eight metres. The cross hatching includes only those areas where there is known or thought to be a working section, i.e.

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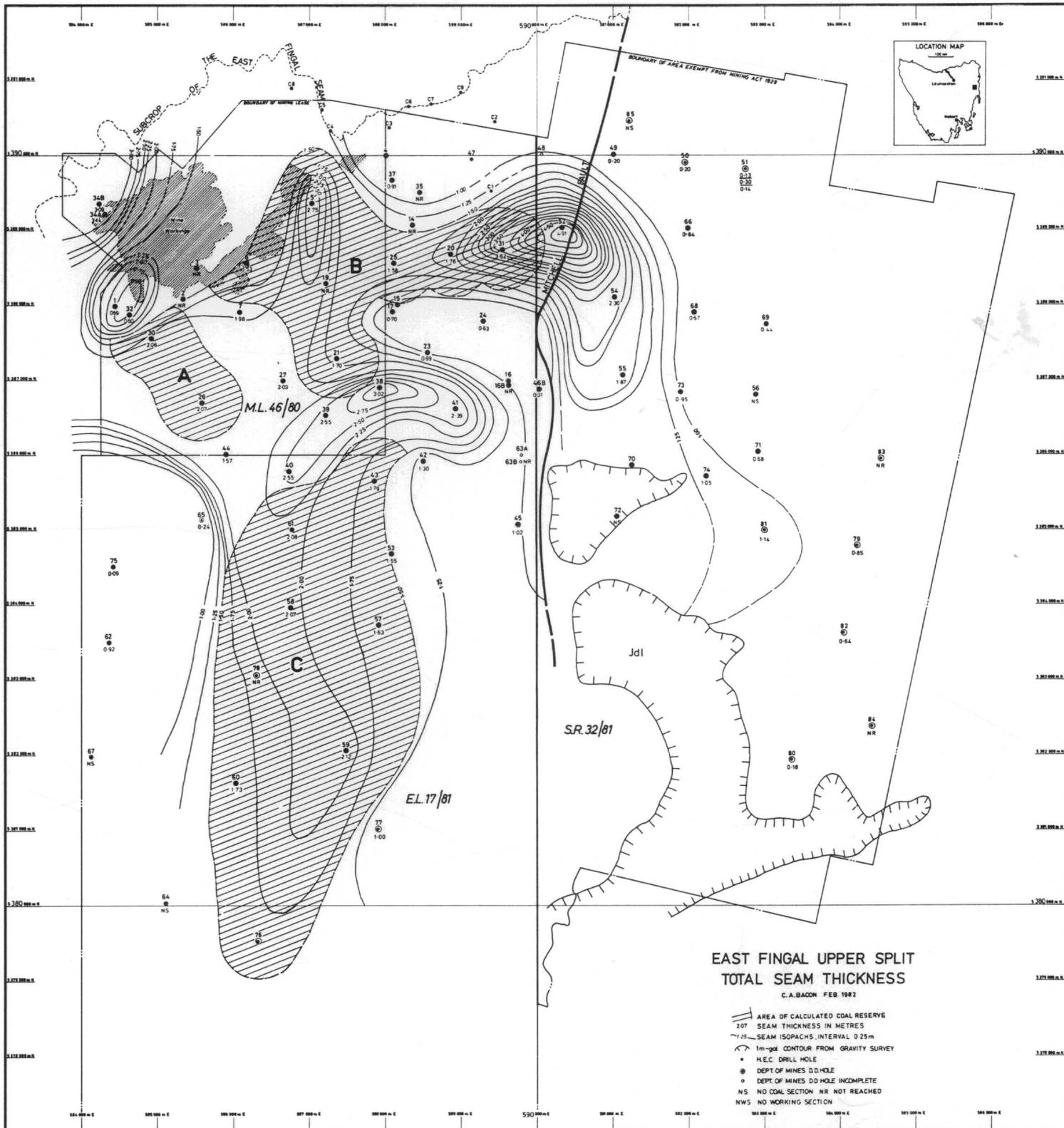
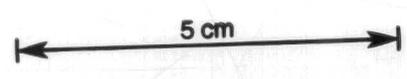


FIGURE 21

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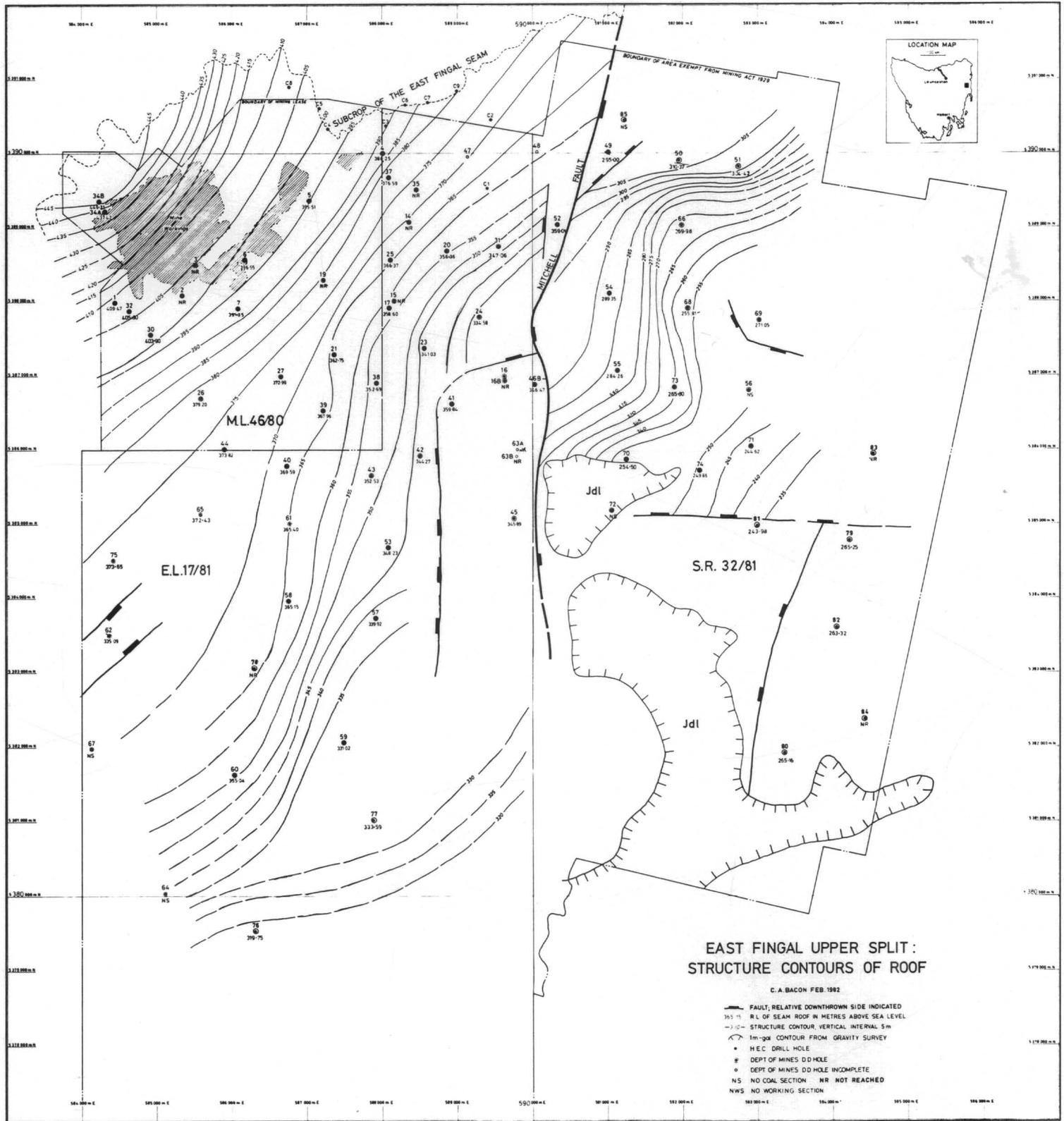
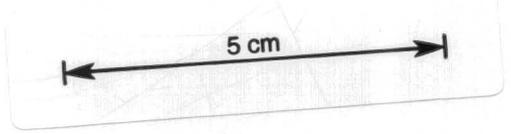


FIGURE 22

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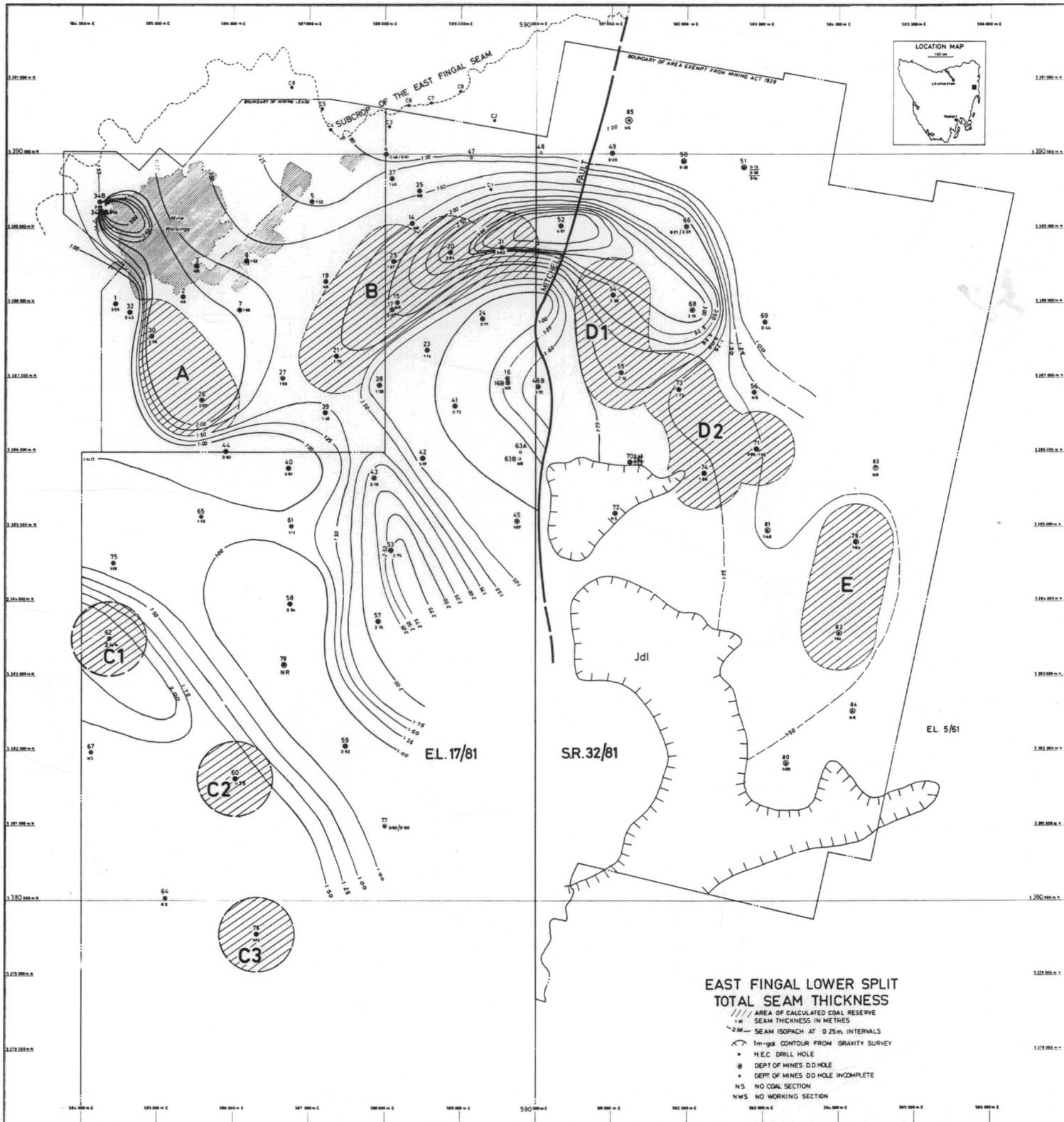
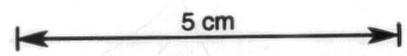


FIGURE 23

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a section of coal seam > 1.5 m thick with an ash content of \leq 40%, and is classed as indicated reserves as in some cases the drill holes are more than one kilometre apart.

East of the Mitchell Fault, the East Fingal Upper Split is quite thin and over most of the area is less than one metre thick. Along the northern slopes of Fingal Tier the seam has deteriorated to a small band of coal, usually about 200 mm thick resting on a metre or so of grey mudstone.

The East Fingal Seam is not present due to:

- (a) Dolerite having intruded below the level of the East Fingal Seam in DDH's 67, 64, and 72.
- (b) The seam having been washed out or not deposited in DDH 85.
- (c) Drilling having been terminated before the seam was intersected in DDH's 2, 3, 19, 35, 14, 15, 16, 16B, 78, 83, and 84.
- (d) The holes having been precollared only; DDH 63A, 63B, 47, and 48.

East Fingal Upper Split - structure contours of the roof (fig. 22)

West of the Mitchell Fault the East Fingal Seam dips at 1 - 2° to the south-east. A few small faults occur.

- (a) A small upthrown fault block cuts off an area enclosing DDH's 41 and 46 from the surrounding area. The north-south trending fault bounding the western side of the fault block has a throw of 15 - 20 m, and is informally known as the Newman Fault.
- (b) A small east-west trending fault between DDH 41 and DDH 46B (upthrown) and DDH 24 and DDH 23 (downthrown) has a maximum throw of 20 - 25 m.
- (c) The Mitchell Fault which forms the eastern boundary of the fault block is downthrown 60 m to the east.
- (d) A small fault occurs to the west of DDH 52, downthrown to the west by approximately 15 - 20 m.
- (e) A small graben encloses DDH 62, which is downthrown some 30 - 35 m.

East of the Mitchell Fault;

- (a) Some local warping occurs in the roof of the seam along the northern slopes of Fingal Tier (DDH 50, 51) and around DDH 72.
- (b) A small fault occurs east of DDH 49, being downthrown 10 - 15 m to the north-west.
- (c) Two faults, located from the results of the gravity survey (fig. 8) occur in the south-eastern part of area S.R. 32/81. An east-west trending fault runs between DDH's 74 and 71 on the northern side and DDH 81 on the southern side. The throw (to the north) of this fault would be only 10 - 15 m. An east-west trending fault also with a throw of 10 - 15 m occurs between DDH 81 on the western (downthrown) side and DDH's 79 and 82 on the eastern side.

East Fingal Lower Split - total seam thickness (fig. 23)

Over the area west of the Mitchell Fault the EFL is, on average, two metres thick with some local variation in seam thickness.

- (a) The non-split East Fingal intersection in DDH 52 of 4.91 is largely carbonaceous mudstone.
- (b) A localised increase in seam thickness centred around DDH 53 (2.73 m) does not show an improvement in seam quality, with the 2.73 m being composed of 1.25 m of 36.9% ash, 0.48 m of 92.9% ash, and 1.02 m of 65.4% ash.
- (c) No analyses are available for DDH 57, which, with a seam intersection of 2.15 m, may contain a possible working section. In view of the poor

quality of the intersection in DDH 53 to the north of DDH 57 this is not considered likely.

(d) No analyses are available for DDH's 62, 60, and 76. Hence the cross hatching indicating area of potential coal reserve is for indicated coal only; the limits of the reserves are 0.5 km from the DDH, conservatively within the one kilometre allowed by definition for indicated reserves.

East of the Mitchell Fault the following features were observed in the East Fingal Lower Split.

(a) Local thickening of the split around DDH's 52 - 68; DDH's 54 and 66 are on the 'edge' of this thickening. The split is only carbonaceous mudstone with minor coaly bands in DDH 52 and in DDH 68 the 3.19 m is composed of 1.02 m of 63.1% ash, 1.07 of 46.9% ash and 1.10 m for which there are no analyses.

(b) There are no analyses for the 2.30 m in DDH 54, and in DDH 55 to the south of DDH 54 the EFL has an ash content of 38.9%.

(c) The seam is split in DDH 66 (0.21 m and 2.07 m), the latter having an ash content of 46.7%.

(d) The EFL thins significantly to the north of S.R. 32/81, to 0.20 m in DDH 49 and DDH 50 and a few small splits (0.13 m/0.30 m/0.14 m) in DDH 51. In this area the East Fingal seam in fact comes together with the H seam, which is represented by four small splits; correlation is not easy and all the splits in the EF (G) seam and the H seam are small.

(e) Overall the EFL is of poor quality in S.R. 32/81; quality improves slightly to the east, such as in DDH 79 where the 1.84 m has an ash content of 33%.

SEAM H

Seam H is commonly split into two thin seams, each usually less than one metre thick. The seam is only poorly and patchily developed, being represented by a mudstone band in at least half the holes drilled. There are no working sections in Seam H in the holes drilled by the Department.

CONCLUSIONS

Whilst the Duncan seam is the only seam in the sequence which is currently being mined, there may be parts of other seams (e.g. East Fingal and D seams) which may be economically workable. The potentially workable patches would most probably not have any adit access, and it is almost certainly not practicable to access such seams by shaft from the surface. There may be a small possibility of access from underground shafts from workings on one seam to another. These seams of high ash content and poor mining access may be suitable for techniques of *in situ* gasification at some future stage; however, little is known about these techniques at the present time.

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Table-3. COMMENTS ON DIAMOND DRILL HOLES, E.L. 17/81 (now part of E.L. 50/82).

DDH	Seams present	Working sections (thickness in metres)	Comments
1	F, G	PWS in F (2.36)	
2	B, C, D, E, F	F (1.70)	D seam = carbonaceous mudstone.
3	D, E, F	F (2.34)	
4	B, C, D, E, F, Gu, G1, H	none	F seam split 0.38/0.46/0.46/ 0.33 m.
5	D, F, Gu, G1	F (1.81) Gu (2.74)	F seam split 0.91/1.81 m/ and three minor splits <300 mm with much core loss.
6	B, C, D, F, G	F (2.75) G (1.53)	
7A	abandoned at 52.12 m in scree.		
7B	A, B, C, D, E, F, G	F (2.23) G (1.98)	G = carbonaceous mudstone
14	abandoned in overburden.		
15	abandoned in dolerite.		
16A	B, C	abandoned at 364.25 m.	
17	E, F, Gu, G1	F (1.32) Gu (0.70) G1 (2.00)	E split (1.34/ 0.80 m).
19	A, B, C, D, E, F, U	F (1.55)	
20	A, B, C, D, F, G	F (2.32) Gu (1.76) G1 (2.94)	
21	C, D, E, F, U, G, H	F (2.07) G (1.70)	C = mudstone; 0.86 m stony coal above G.
23	C, D, E, F, U, Gu, G1, H	F (2.83)	E = mudstone
24	D, E, F, Gu, G1	F (2.13)	G in 3 plies 0.63/0.16/0.55 m in interval of 1.54 m.
25	A, B, C, D, E, F, U, Gu, G1	F (1.64) Gu (1.58) G1 (1.97)	
26	C, D, E, F, G, H	F (2.60) G (2.07)	
27	C, D, E, F, Gu, G1	F (2.59) Gu (2.03) G1 (1.58)	C, D = mudstone
28	G		G (1.94 m) carb- onaceous mudstone and coal.
29	Dolerite intruded at or near level of G seam.		

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Table 3. (continued)

DDH	Seams present	Working sections (thickness in metres)	Comments
30	D, E, F, Gu, Gl, H	F (2.32) G (1.78)	D = mudstone
31	A, B, C, D, E, F, U, G, H	-	F (0.50 m)
32	E, F, G, H	F (1.63)	
34A	G	G (3.14)	) Drilled near) Duncan mine) portal.
34B	G	G (3.09)	
35	Abandoned in dolerite talus at 71.05 m.		
37	A, B, C, D, E, F, U, Gu, Gl, H		
38	C, D, E, F, U, Gu, Gl, H	F (2.49)	
39	C, D, E, F, U, Gu, Gl, H	F (2.83)	C = mudstone.
40	C, D, E, F, Gu, Gl, H	F (1.59)	C, D = largely mudstone. F = 3.19 m, WS = 1.59 m.
41	A, B, C, D, E, F, Gu, Gl	F (2.71)	E = mudstone.
42	C, D, E, F, U, Gu, Gl, H	F (2.82)	E = mudstone.
43	C, D, E, F, Gu, Gl, H	F (2.57) Gu (1.79)	E = mudstone.
44	C, D, E, F, Gu, Gl, H	F (2.73)	H = carbonaceous mudstone.
45	A, B, C, D, F, Gu, Gl, H	D (1.63)	NWS in F or G seams.
53	B, C, D, F, Gu, Gl	F (2.36) Gu (1.55)	Nearly a WS in D (1.45 m).
57	A, B, C, D, E, F, U, Gu, Gl, H	PWS (F) 1.72 PWS (Gu) 1.63 PWS (Gl) 2.15	No analyses available.
58	A, B, C, D, F, Gu, Gl	B (2.08) Gu (2.07)	
59	A, B, C, D, E, F, Gu, Gl, H		No analyses available. B (11.47 m) inter- bedded mudstone/ coal seam split 0.74/0.75 m.
60	A, B, C, D, F, G	PWS (G) 1.73	No analyses available. F seam split 0.17/ 0.73 m.
61	C, D, F, Gu, Gl	PWS (F) 2.49	No analyses.
62	Gu, Gl	PWS (Gl) 2.44	No analyses.

Table 3. (continued)

DDH	Seams present	Working sections (thickness in metres)	Comments
63	Pre-collared only.		
64	C, D, H	PWS (H) 1.84	No analyses. F, G seams not present.
65	Gu, Gl, H	NWS	Dolerite intruded to below level of F seam.
67	No coal seams intersected - intruded by dolerite to below level of G seam.		
75	Gu, Gl	NWS	Dolerite intruded to below level of F seam.
76	C, D, G, H	PWS (D) 1.87 PWS (H) 2.39	No analyses available. D seam split 4.24/ 0.91/1.87 m. F seam washed out.
77A	Abandoned at 132.20 m; no coal seams intersected.		
77B	A, B, C, D, E, F, Gu, Gl, H	PWS (D) 2.30 PWS (H) 2.20	NWS in F or G seams.
78	A, B	PWS (B) 2.12	B (8.30 m) inter- bedded coal/ mudstone.

- NOTE: 1. A working section (WS) is defined as an interval of coal
>1.5 m thick with an ash content of <40%.
2. Seams on Fingal Tier labelled A-H, with
 F = Duncan Seam
 Gu = East Fingal Upper Split
 Gl = East Fingal Lower Split
3. PWS = possible working section.
4. NWS = no working section.

Table 4. COMMENTS ON DIAMOND DRILL HOLES, AREA S.R. 32/81

DDH	Seams present	Working sections (thickness in metres)	Comments
46A	Abandoned		
46B	C, D (split), F, Gu, Gl, H	D (2.13), F (1.58), Gl (1.70)	
47	Pre-collared only		
48	Pre-collared only		
49	C, H (split)	Seam C 16.89 thick but no working sec- tions	F seam represen- ted by a thin mudstone band; G seam 200 mm thick.
50	C (split), D, E, G, H (split)	No analytical data	F seam not pres- ent; G = mud- stone interval containing 200 mm coal.
51	B, C (split), D (split), E, G (3 splits), H	No analytical data	F seam not pres- ent. G seam = three small splits 0.13/0.30/0.14 m thick.
52	F, G, H	No working sections	Dolerite intruded to top of F seam.
54	F, G, H	PWS in G seam (2-3m). No analyses.	Dolerite intruded to top of F seam.
55	B, C, D (split), F, Gu, Gl	D (2.17), Gu (1.87), Gl (2.13)	
56	B, C, D, E	No working sections	F seam not reached.
63A	Pre-collared only		
63B	Pre-collared only		
66	E, Gu, Gl, H	No working sections	F seam 200 mm thick.
68	E, F, Gu, Gl, H	No working sections	Dolerite intruded to top of E seam.
69	G, H	No working sections	Dolerite intruded to just above G seam.
70	G (split)	No working sections	Dolerite intruded to level of G seam.
71	B, D, E, F (split), Gu, Gl, H	Gl (1.55)	
72	No coal; dolerite intruded to below G seam		
73	B, C, D (split), E, F, Gu, Gl	D (1.76)	

Table 4. (continued)

DDH	Seams present	Working sections (thickness in metres)	Comments
74	A, B, C, D, E, Gu, G1	D (2.17)	
79	A (split), B, C, D, E, F, Gu, G1, H	D (2.08), G1 (1.84)	
80	D, Gu, G1	No working sections	F seam not present (eroded or not deposited).
81	A, B, C, D, E, F (split), Gu, G1	D (2.12)	F seam = two small splits 0.71/0.44 m.
82	A (split), B, C, D, E (split), F (split), Gu, G1, H	No analytical data	F seam = two small splits 0.36/0.46 m in mudstone intervals.
83	A, B	No analytical data	Drilling stopped before C seam reached.
84	A (split), C	No analytical data	Drilling stopped before D seam reached.
85	B, C, D, H (split)	No analytical data	F and G seams not present.

NOTE: 1. A working section (WS) is defined as an interval of coal >1.5 m thick with an ash content of <40%.

2. Seams on Fingal Tier labelled A-H, with

F = Duncan Seam
Gu = East Fingal Upper Split
G1 = East Fingal Lower Split

3. PWS = possible working section.

7. COAL RESERVES

V.M. Threader
C.A. Bacon

The Department of Mines has adopted the nomenclature for reserves as developed by the Standing Committee on Coalfield Geology of New South Wales, and used in a modified form by the Joint Coal Board of New South Wales and the Queensland Department of Mines. The nomenclature used by the Department of Mines is set out below:

- (1) *Measured reserves* are those for which the density of points of observation is sufficient to give control on quality, thickness, depth and other relevant conditions, and to allow for both a reliable estimate of the reserves and the planning of their extraction:
 - (a) the observation points are spaced at about one kilometre apart;
 - (b) where geological conditions are favourable it may be possible to assume knowledge of reserves for a distance from workings without additional observation points by extrapolation of known trends within the worked area. In such cases the distance will not be greater than 0.5 km from the last points of observation within the workings.

- (2) *Indicated reserves* are those for which the density of points of observation is sufficient to allow for a realistic estimate of the reserves, and for which there is reasonable expectation that the reserves could be raised to the measured category with further information:
 - (a) generally, the points of observation are spaced not greater than two kilometres apart;
 - (b) where geological conditions are favourable Indicated Reserves may extend for a distance beyond workings. This distance will not be greater than one kilometre from the last points of observation within the workings, and the calculations should take account of known trends within the worked area.

- (3) *Inferred reserves* are those for which there is a poor cover of information, so that only an uncertain estimate of reserves can be made. Further information will either raise these reserves to a higher category or show that part or all of them does not exist. The reserve categories are:
 - (a) Very large - in excess of 10 000 million t;
 - (b) Large - 100 million to 10 000 million t;
 - (c) Small - 20 million to 100 million t;
 - (d) Very small - less than 20 million t.

MINING RECOVERY

Coal reserves are never fully recoverable. In bord and pillar mining, a fraction of each coal pillar must always be left to delay roof collapse sufficiently for safe withdrawal of men and machinery. This fraction is a matter of judgment to meet local conditions and could vary from <10 to >20% of the pillar.

Contingencies such as faulting, variations in thickness and quality of seam and poor roof conditions could vary the total recovery from 30% to 80%.

Improving the predictability of mining conditions would necessitate decreasing the borehole interval. This is not practicable on Fingal Tier where most of the coalfield is overlain by a dolerite sheet of 200 - 400 m thickness and boreholes can be as deep as 600 m and the cost per hole on a contract basis is as much as \$30 000.

The borehole interval in this project was one kilometre over most of the area and two kilometres over the remainder. However, the variable nature of the seams does not allow for reliable planning of their extraction from the drilling data, although the borehole spacing over the area for which reserves were calculated was one kilometre or less. The ideal conditions for the category 'measured reserve' for the Duncan Seam are not met even with boreholes of spacings 0.5 km or less.

In the following statement of reserves, mining recovery and washery yield are not considered except in the most general terms.

COAL RESERVE STATEMENT - DUNCAN SEAM

The Duncan Seam is the only seam currently being mined on Fingal Tier and is continuous over a large part of the revoked Fingal Exempt Area (now covered by M.L. 46/80 and E.L. 50/82) and a sizeable portion of the seam is considered to be economically extractable at current prices (see also discussion of seam character in Chapter 6, and Figures 15a - 18.)

To arrive at an estimate of *IN SITU MEASURED* reserves, a calculation was made within the following parameters:

- (1) From the total seam thickness a 'working section' has been defined where possible. This is an interval of coal between 1.5 m and 3.0 m thick with an ash content of < 40%.
- (2) The area of calculation is devoid of major faulting.
- (3) The areas between isopachs of the working section (fig. 16) have been calculated by planimeter in steps of 0.2 m.
- (4) The density of coal has been taken as 1600 kg/m³.

The *IN SITU MEASURED COAL RESERVES* for the Duncan ('F') Seam are:

	Area (ha)	Volume of coal (x 10 ⁶ m ³)	Mass at RD = 1.6 (x 10 ⁶ t)
Exempt Area (now revoked and covered by E.L. 50/82)	1144.6	22.3	35.7
Mining Lease 46/80	908.9	20.3	32.5
<u>Total</u>	<u>2053.5</u>	<u>42.6</u>	<u>68.2</u>

This reserve estimate diminishes according to the percentage mining recovery and the washery yield.

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If the parameters were adjusted to include coal in seams down to one metre thick and up to 60% ash, the total seam estimate would be 110 million tonnes of coal in the mining lease area and the now revoked exempt area.

Table 5. CALCULATION OF MEASURED COAL RESERVE ESTIMATE - DUNCAN SEAM*

Map area	Total area (ha)	Mining Lease (ha)	Av. contour interval	Volume (m ³ x 10 ⁴)	
				Total area	Mining Lease
B1	118.0	85.2	1.9	224.2	161.88
B2	117.6	95.0	1.7	199.92	161.50
B3	45.8	38.8	1.5	7.0	58.2
C1	2.6	2.6	1.6	4.16	4.16
C2	12.4	12.4	1.7	21.08	21.08
C3	23.6	23.6	1.9	44.84	44.84
D1	126.0	3.2	1.9	239.4	6.08
D2 (a)	4.6	-	1.7	7.82	-
D2 (b)	88.8	-	1.7	150.96	-
D2 (c)	126.4	-	1.7	214.88	-
D3	85.6	-	1.6	136.96	-
E1	279.6	199.0	2.5	699.0	497.5
E2 (a)	128.0	112.0	2.7	345.6	302.4
E2 (b)	102.0	2.4	2.7	275.4	6.48
E3 (a)	28.0	28.0	2.8	78.4	80.08
E3 (b)	65.2	-	2.8	182.56	-
F1	401.7	168.7	2.3	923.91	388.01
F2 (a)	43.2	43.2	2.1	90.72	90.72
F2 (b)	100.0	68.8	2.1	21.0	144.48
F2 (c)	138.0	9.6	2.1	289.8	20.16
F3 (a)	2.6	2.6	2.5	6.5	6.5
F3 (b)	10.0	10.0	2.5	25.0	25.0
F4	3.8	3.8	2.6	9.88	9.88
Totals	2053.5	908.9		4262.99	2028.95

With an RD of 1.6, the calculated amounts of coal are:

- Total area - 68.2078 x 10⁶ t
- Mining Lease - 32.4632 x 10⁶ t

* See Figure 16

The calculation on which the reserve estimate is made is given in Table 5.

The conversion of coal volume to mass requires a density factor. This has been chosen as 1.6 (equivalent to an ash content of 30%). The estimated reserve increases as the density factor increases, i.e. as the coal ash increases.

COAL RESERVES STATEMENTS

'D' Seam

The 'D' Seam (not to be confused with the Duncan or 'F' seam) occurs some 40 - 80 m stratigraphically above the Duncan Seam over most of the area of investigation.

Tentative indicated coal reserves have been calculated for part of the 'D' seam, using the following parameters:

- (1) The seam must be more than 1.5 m and less than 3.0 m thick.
- (2) Areas where the ash content is known to be more than 40% have been excluded from the area of calculation. Analyses are not available for all seam intersections, so there is no quality control over parts of the indicated reserve.
- (3) No consideration has been given to mining access.

Table 8. CALCULATION OF INDICATED COAL RESERVES - 'D' SEAM

Map area	Area (km ²)	Average seam thickness (m)	Volume (m ³ x 10 ⁶)	RD	Tonnes
A (Revoked Exempt Area - now E.L. 50/82)	19.92	2.00	39.84	1.6	63.744
B (in S.R. 32/81)	11.68	2.00	23.36	1.6	37.376
					101.120

There is an indicated coal reserve of 101 million tonnes in the 'D' seam.

Only a small portion, if any, of this reserve may be recoverable due to either:

- (i) difficulty of access
- (ii) poor coal quality (analytical data is limited).

Table 7. CALCULATION OF INDICATED COAL RESERVES - EAST FINGAL SEAM
UPPER SPLIT

Map area	Area (km ²)	Average seam thickness (m)	Volume (m ³ x 10 ⁶)	RD	Tonnes x 10 ⁶
A	1.748	2.00	3.496	1.6	5.5936
B	6.292	1.75	11.011	1.6	17.6176
C	13.100	1.75	22.925	1.6	36.6800
			37.432		59.8912

Note: Areas A, B, C lie within the revoked exempt area now covered by
E.L. 50/82

LOWER SPLIT

Map area	Area (km ²)	Average seam thickness (m)	Volume (m ³ x 10 ⁶)	RD	Tonnes x 10 ⁶
A	1.812	2.0	3.6240	1.6	5.7984
B	4.252	2.0	8.5040	1.6	13.6064
C1	0.7817	2.4	1.8762	1.6	3.00192
C2	0.7817	1.7	1.3289	1.6	2.12624
C3	0.7817	1.7	1.3289	1.6	2.12624
			16.6620		26.6592
D1	1.740	2.20	3.328	1.6	5.3248
D2	2.280	1.70	3.876	1.6	6.2016
E	2.040	1.90	3.876	1.6	6.2016
			11.080		17.7280

Areas A, B, C1, C2, C3 in revoked exempt area (now E.L. 50/82)

Areas D1, D2, E in area S.R. 32/81

East Fingal Seam

Tentative indicated coal reserves have been calculated for parts of the East Fingal Seam (Table 7) using the following parameters:

- (1) The seam must be more than 1.5 m and less than 3.0 m thick.
- (2) Areas where the ash content is known to be > 40% have been excluded from the area of calculation. Analyses are not available for all seam intersections and so there is no quality control over parts of the reserve.
- (3) No consideration has been given to mining access.

Whilst tentative indicated reserves have been given for both splits of the East Fingal Seam it should be noted that as the seam is in some parts, not split, some of the coal is included in the reserves of each split. The East Fingal Seam Intraseam Sediment Map (fig. 20) shows areas of non-splitting of the seam. Mining of both splits would in any case, not be possible over almost the whole of the investigated area due to the thinness of the intraseam sediments.

The East Fingal Seam reserves should be thought as 'Upper Split Reserves' or 'Lower Split Reserves' but should not be added together when being included in assessment of the total coal reserves of the area.

SUMMARY OF COAL RESERVES

Duncan Seam 'F'

Area	Measured (x 10 ⁶ t)	Indicated (x 10 ⁶ t)
M.L. 46/80	35.7	-
E.L. 50/82	32.5	-
S.R. 32/81	-	-
	<hr style="width: 50px; margin: 0 auto;"/>	
	68.2	

'D' Seam

E.L. 50/82	-	63.7
S.R. 32/81	-	37.4
		<hr style="width: 50px; margin: 0 auto;"/>
		101.1

East Fingal Seam - Upper Split (GU)

M.L. 46/80)	-	59.9
and E.L. 50/82)		
S.R. 32/81	-	-
		<hr style="width: 50px; margin: 0 auto;"/>
		59.9

East Fingal Seam - Lower Split (GL)

M.L. 46/80)	-	26.7
and E.L. 50/82)		
S.R. 32/81	-	17.7
		<hr style="width: 50px; margin: 0 auto;"/>
		44.4

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Total *in situ* measured and indicated reserves for the area of investigation
(x 10⁶ t)

Duncan Seam	:	68.2
D Seam	:	104.8
East Fingal Upper Split (over part of E.L. 50/82 and M.L. 46/80)	:	59.9
East Fingal Lower Split (over S.R. 32/81)	:	17.7
		<hr/>
Total		250.6
		<hr/>

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[9 December 1983]

Petrology of the Duncan Seam

M. Smyth

A pillar sample of the Duncan seam from the Duncan mine, Fingal, has been supplied to the CSIRO Fuel Geoscience Unit for petrographic analysis by the Tasmania Department of Mines. The Duncan seam is presently the only coal seam being worked in Tasmania and has not been analysed previously for its petrographic composition.

The seams of the Triassic coal measures in Tasmania are thought to have formed separately in interconnected depressions (Noldart, 1975).

ANALYSES

The pillar sample of the Duncan seam supplied was 1.87 m thick and the coal has been divided into fourteen subsections on the visual estimation of variations in its lithotypes. In fact, there was very little change in the macroscopic appearance of the coal, most of it being extremely dull.

Each subsection was crushed to -1 mm, mounted in plastic, and the surface polished for petrographic analyses in reflected light under oil immersion. Both maceral and microlithotype analyses have been carried out in accordance with the recommendations of the International Committee for Coal Petrology. Measurements of the average reflectance of the vitrinite have also been done using green light at a wavelength of 546 nm and with a measuring area of three square micrometres.

RESULTS

Results of the maceral analyses are given in Tables 8 and 9, which indicate the maceral groups, and the breakdown of these, respectively. The maceral groups are plotted on Figure 24, the components of the exinite group on Figure 25 and of the intertinite group on Figure 26.

Results of the microlithotype analyses are given in Table 10 and are plotted on Figure 27.

The average reflectance of the vitrinite is 0.57%. Since many reflectances are given in terms of maximum reflectance, the average reflectance can be converted using the equation:

$$\bar{R}_{\max} = 1.066 \bar{R}_{\text{av}} \quad (\text{Ting, 1978}).$$

Mean maximum reflectance of the coal is 0.61%, placing it in the high volatile C bituminous coal rank range (Stach *et al.*, 1975).

DISCUSSION

The coal from the Duncan seam has an extremely low vitrinite content and high intertinite content. It has the distinction of being the dullest, or most inertinite-rich coal analysed so far by CSIRO, out of about 150 Australian seams. What little vitrinite occurs is highest in the subsections B and O (fig. 24) both of which overlie a dirt band. This feature of relatively high vitrinite above a dirt band is found in most Australian coal seams (Smyth and Cook, 1976).

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Table 8. MACERAL GROUPS IN THE DUNCAN SEAM

Subsec- tion	Lab. No.	Thickness (mm)	Total vitrin- ite	Total exinite	Total intertin- ite	Total minerals
A	78675	50	15	2	70	13
			18	2	80	mmf
B	78676	50	42	2	31	25
			57	2	41	mmf
C	78677	140	5	3	52	40
			8	5	87	mmf
D	78678	220	9	7	70	14
			10	8	82	mmf
E	78679	120	7	6	73	14
			8	7	85	mmf
F	78680	100	1	6	79	14
			1	7	92	mmf
G	78681	150	3	7	72	18
			4	8	88	mmf
H	78682	100	4	3	77	16
			4	4	92	mmf
J	78683	180	3	5	84	8
			3	6	91	mmf
K	78684	180	3	6	82	9
			3	7	90	mmf
L	78685	120	13	6	71	10
			14	7	79	mmf
M	78686	200	5	6	67	22
			7	8	85	mmf
N	78687	150	11	4	76	9
			12	4	84	mmf
O	78688	70	33	5	53	9
			36	5	59	mmf
Whole seam		1830	8	5	72	15
			9	6	85	mmf

mmf = mineral matter free
tr = trace

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Cutinite is the dominant exinite maceral in the seam (fig. 25), as has been found typically in other Australian Triassic coal seams (Cook, 1975).

Semifusinite is the dominant inertinite maceral in all subsections (fig. 26), except for C and M. Both of these subsections also have high mineral contents.

The average mineral matter content of the seam, 15% (Table 8), is high. The most abundant mineral is clay which occurs as bands, lenses, infilling cell lumens in both vitrinite and semifusinite, small scattered aggregates and grains and rarely in vermicular form. Carbonate is locally abundant as calcite veins towards the top of the seam. Quartz occurs in most subsections as isolated grains, generally 50 μm or less in size. There are rare grains of pyrite in the coal, but not sufficient for even one to be counted, indicating that pyrite is <0.2% of the coal by volume.

The microlithotype compositions of the subsections are closely related to those of the macerals. Vitrite-plus-clarite is highest in subsections B and O; changes in durite and microite correspond with those in the inertodetrinite abundances, and semifusite-plus-fusite components vary with semifusinite-plus-fusinite. The much lower proportion of minerals counted as microlithotypes than as macerals indicates that the mineral matter is often less than 50 μm in size, and is dispersed through the coal.

The Triassic coal measures of Tasmania are tentatively correlated with the Nymboida Coal Measures in New South Wales and the Ipswich Coal Measures in Queensland (Noldart, 1975). The seams from the above coal measures all have moderate to high vitrinite contents and so are very different petrographically from the Duncan seam.

Although geological age does not necessarily have any bearing on the petrography of a coal seam, the seam which the Duncan most resembles is the Triassic Callide seam from the Callide Basin. The Callide seam, where analysed petrographically, has a vitrinite content of 16% and the petrographic profile of its microlithotypes is similar to that of the Duncan seam, with extremely low vitrite-plus-clarite and intermediates contents. The main difference between the Callide and Duncan seams is that the Callide is about ten times as thick as the Duncan.

Figures given for typical analyses of coal from the Duncan mine show volatile matter of 31.6% (d.a.f.) (Noldart, 1975). At the rank given by the reflectivity of the vitrinite in the seam, a volatile yield of about 44% (d.a.f.) might be expected from a coal with the more usual higher amount of vitrinite. The low volatile yield from the Duncan seam is another indication of its very inertinite-rich nature, which in turn means that the coal formed under more oxidising conditions than is usual in a coal-forming environment.

Dull coal, or durain, enriched in semifusinite and fusinite with variable quantities of mineral sediment, is considered by Smith (1962) to be due to the flooding of a bog surface by oxygenated water. The flood waters would carry mud and charred wood and provide an environment in which the processes of decay were largely aerobic. Although this type of coal formed only a small part of the seams described by Smith, such a description fits almost the whole of the Duncan seam. Where the mineral matter is extremely high, inertodetrinite is more abundant than semifusinite, but otherwise the coal is composed largely of semifusinite with a high mineral content.

Table 9. MACERAL COMPOSITION OF THE SUBSECTIONS OF THE DUNCAN SEAM

Subsection	Lab. No.	Thickness (mm)	Vitrinite	Sporinite	Cutinite	Lipto-detrinite resinite	Micrinite	Inerto-detrinite	Semi-fusinite	Fusinite	Clay	Carbonate	Pyrite	Quartz
A	78675	50	15	-	2	-	1	15	48	6	13	-	-	tr
B	76	50	42	-	2	-	-	9	19	3	25	-	tr	tr
C	77	140	5	1	2	-	-	32	20	tr	39	-	-	1
D	78678	220	9	2	4	1	-	17	52	1	11	2	-	1
E	79	120	7	2	3	1	tr	21	51	1	12	1	-	1
F	80	100	1	2	3	1	-	25	54	tr	13	tr	-	1
G	78681	150	3	2	4	1	tr	31	41	tr	16	tr	-	2
H	82	100	4	1	2	tr	tr	21	55	1	13	2	-	1
J	83	180	3	1	3	1	-	17	65	2	7	1	-	tr
K	78684	180	3	1	4	1	tr	19	63	tr	8	tr	-	1
L	85	120	13	2	3	1	tr	19	51	1	9	tr	-	1
M	86	200	5	2	3	1	1	36	30	tr	20	-	-	2
N	87	150	11	1	3	tr	1	17	57	1	9	-	-	-
O	78688	70	33	2	2	1	2	15	36	tr	8	-	tr	1
<i>Composites</i>														
Whole seam (calc)		1830	8	1	3	1	tr	23	48	1	14	tr	tr	1
Whole seam mmf			10	1	4	1	tr	27	56	1	-	-	-	-

mmf = mineral matter free

tr = trace

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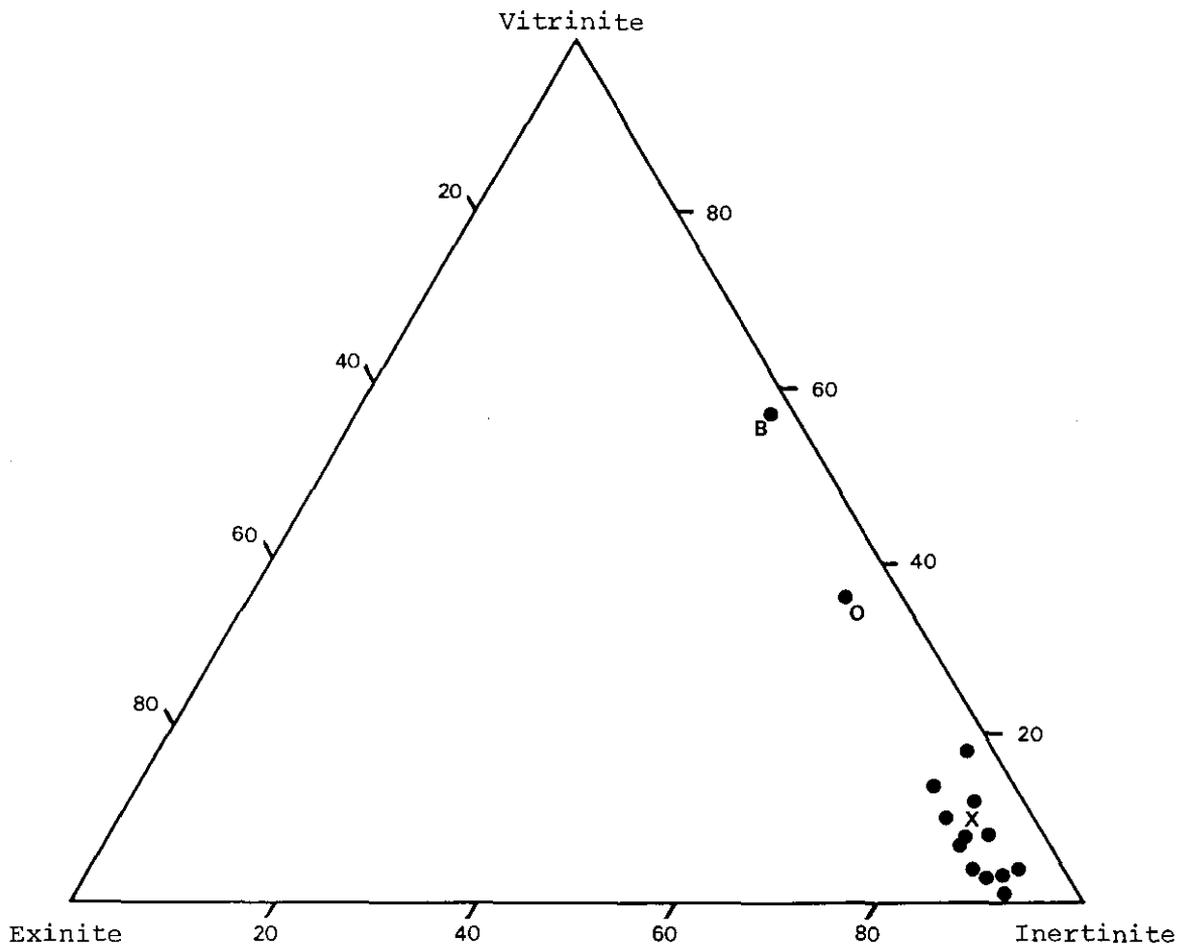
Table 10. MICROLITHOTYPE COMPOSITIONS OF THE SUBSECTIONS OF THE DUNCAN SEAM

Subsection	Lab. No.	Thickness (mm)	Vitrite	Clarite	Intermediates	Durite	Microite	Semi-fusinite & fusinite	Shaly coal	Clay	Carbonate	Quartz
A	78675	50	12	-	8	4	5	58	11	2	-	tr
B	76	50	32	5	13	2	2	16	14	16	-	tr
C	77	140	4	tr	tr	5	41	8	14	27	-	l
D	78	220	4	2	10	11	14	51	6	5	l	tr
E	78679	120	4	-	4	15	31	37	6	2	l	-
F	80	100	-	-	1	6	37	42	5	4	-	l
G	81	150	2	tr	2	11	38	34	7	5	tr	l
H	82	100	2	-	2	7	31	42	6	6	3	l
J	78683	180	2	tr	2	17	16	58	3	1	l	l
K	84	180	1	-	3	11	22	58	3	2	tr	-
L	85	120	7	-	10	13	22	39	6	2	-	l
M	86	200	4	tr	11	12	36	18	12	6	-	l
N	87	150	8	tr	12	10	13	51	4	2	-	-
O	78688	70	26	-	16	12	10	27	6	3	-	tr
<i>Composites</i>												
Whole seam		1830	5	tr	6	11	24	40	7	6	tr	l
Whole seam mmf			6	tr	7	13	28	46	-	-	-	-

mmf = mineral matter free

tr = trace

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Subsections B, O different. Both occur above a dirt band

X = seam composite

Figure 24. Maceral compositions of the subsections of the Duncan Seam (in groups).

5 cm

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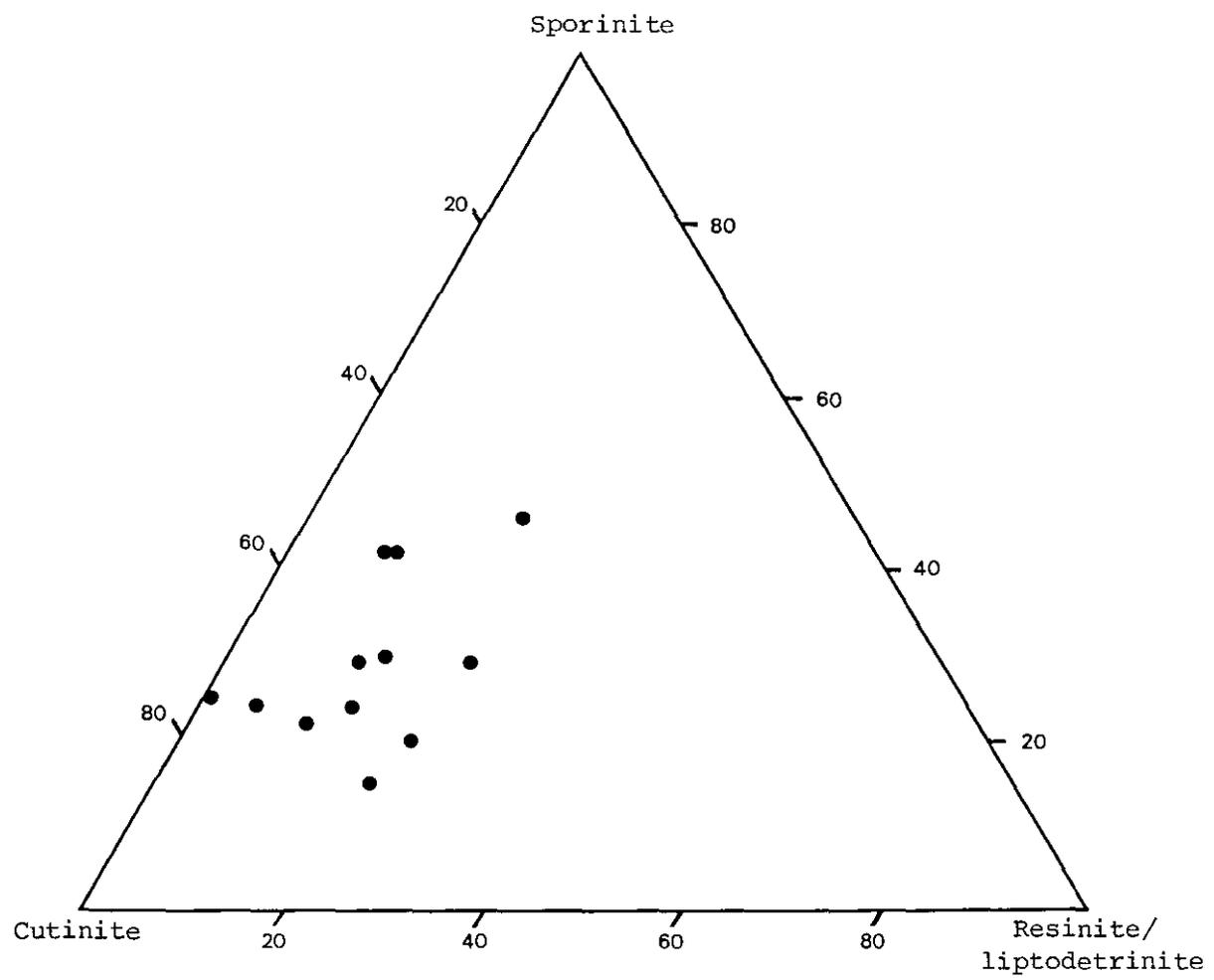
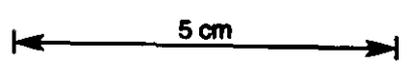
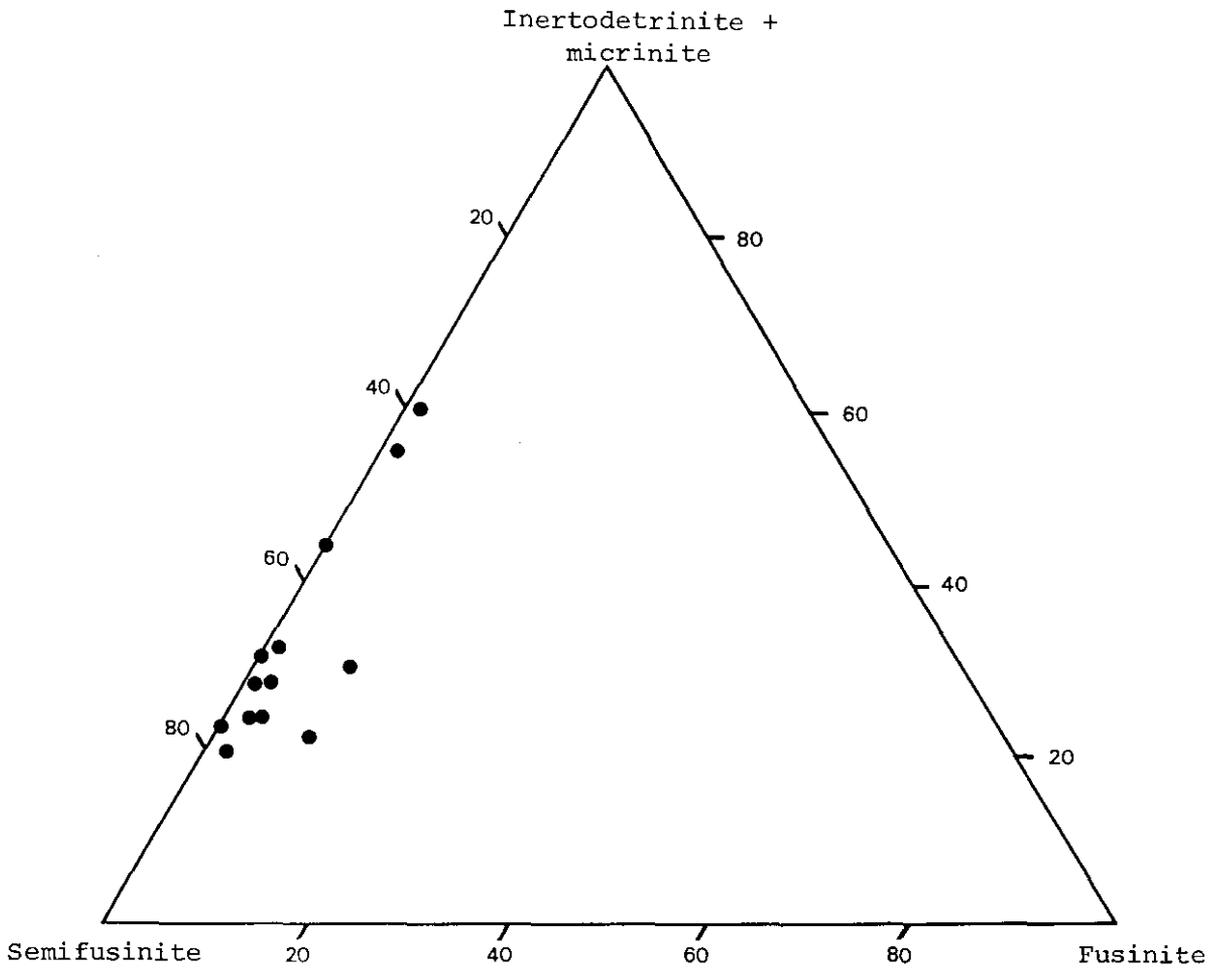


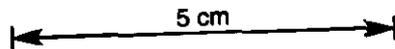
Figure 25. Exinite composition of the subsections of the Duncan Seam.





Subsections C, M different. Both have high mineral matter

Figure 26. *Inertinite composition of the subsections of the Duncan Seam.*



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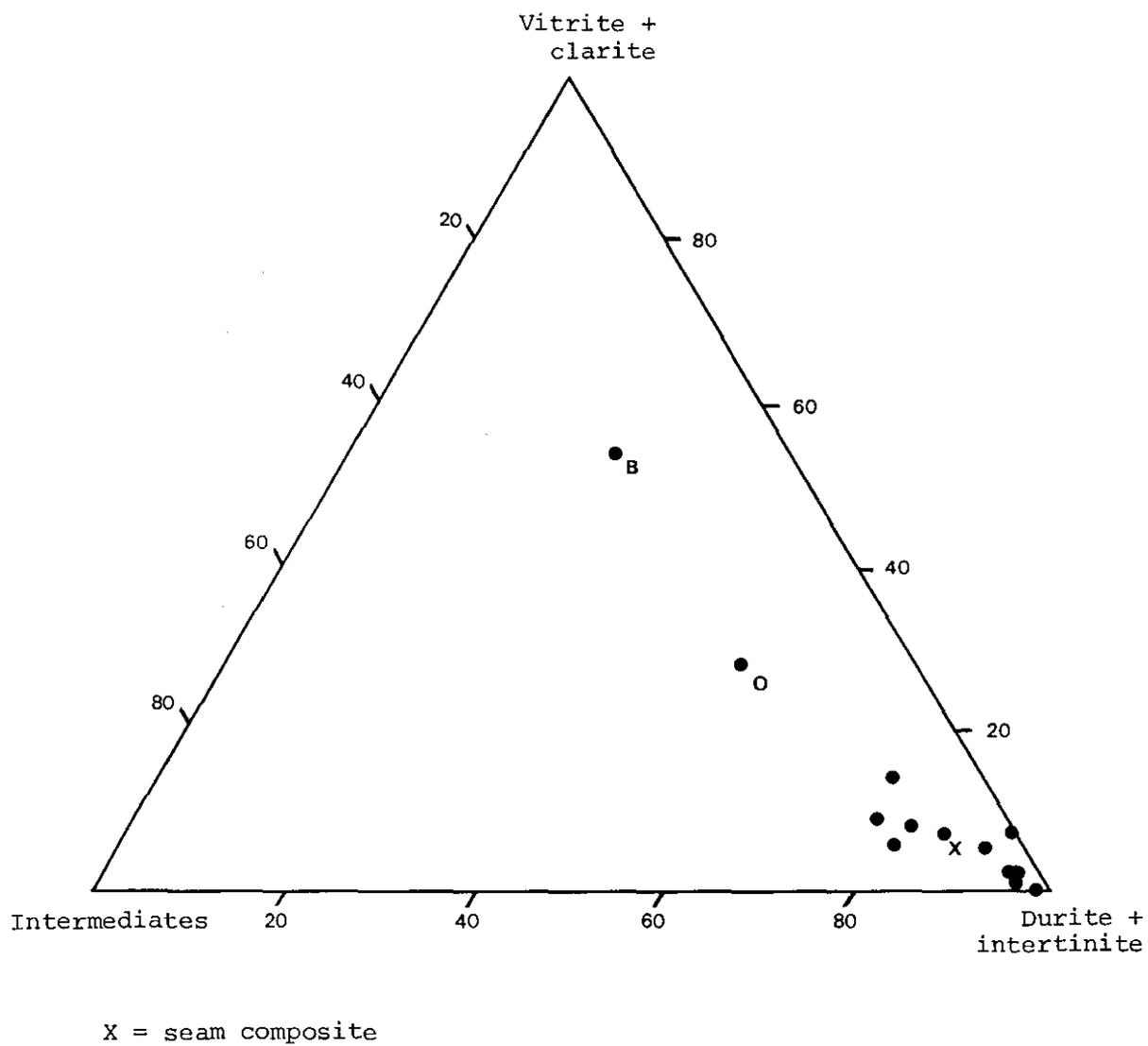


Figure 27. *Microlithotype compositions of the subsections of the Duncan Seam.*

APPENDIX 2

Ancillary information relating to:

- (1) Location of drill holes and collar elevations (Table 11)
- (2) Dolerite, quartzose sandstone, glaciomarine basement, and total hole depth in each drill hole (Table 12).

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Table 11. COLLAR ELEVATIONS AND AMG CO-ORDINATES OF DIAMOND DRILL HOLES, FINGAL TIER

Hole No.	AMG Reference (m)		Level (m)	Hole No.	AMG Reference (m)		Level (m)
	Easting	Northing			Easting	Northing	
1	584 453	5 387 990	525.5	42	588 516	5 385 917	813.1
2	585 344	5 388 092	608.7	43	587 864	5 385 657	785.1
3	585 529	5 388 506	641.9	44	585 907	5 386 010	668.5
4	588 032	5 389 999	546.8	45	589 749	5 385 088	707.8
5	587 035	5 389 374	575.8	46A	590 032	5 386 888	772.9
6	586 187	5 388 579	739.8	46B	590 029	5 386 893	773.0
7	586 095	5 387 915	619.7	47	589 126	5 389 948	587.3
8	589 793	5 399 657	560.5	48	590 064	5 390 018	610.6
9	588 701	5 401 002	450.2	49	591 006	5 390 003	598.5
10	587 995	5 400 162	527.9	50	591 939	5 389 903	563.2
11	587 821	5 400 073	500.2	51	592 737	5 389 825	534.3
12	587 816	5 399 779	574.9	52	590 324	5 389 038	795.8
13	591 967	5 401 970	536.4	53	588 076	5 384 684	795.1
14	588 384	5 389 039	662.0	54	591 021	5 388 112	711.8
15	588 142	5 387 979	766.3	55	591 126	5 387 069	626.4
16	589 656	5 386 946	837.0	56	592 886	5 386 808	701.0
16B	589 652	5 386 933	834.1	57	587 913	5 383 734	803.0
17	588 085	5 387 885	777.5	58	586 755	5 383 968	637.9
18	579 211	5 376 590	664.5	59	587 494	5 382 058	802.3
19	587 233	5 388 295	847.2	60	586 038	5 381 636	725.2
20	588 884	5 388 677	811.0	61	586 760	5 385 011	639.3
21	587 379	5 387 365	758.5	62	584 367	5 383 489	704.5
22	586 294	5 373 414	407.4	63A	589 819	5 386 004	751.2
23	588 575	5 387 335	804.6	63B	589 792	5 385 902	746.4
24	589 313	5 387 760	830.8	64	585 114	5 380 032	626.0
25	588 094	5 388 535	784.1	65	585 601	5 385 115	572.7
26	585 602	5 386 673	733.8	66	591 979	5 389 037	778.2
27	586 664	5 386 968	745.7	67	584 136	5 381 975	742.0
28	582 264	5 386 855	442.0	68	592 064	5 387 912	779.1
29	582 003	5 385 109	686.4	69	593 017	5 387 754	715.1
30	584 953	5 387 560	519.4	70	591 243	5 385 885	603.6
31	589 551	5 388 735	828.9	71	592 905	5 386 048	653.9
Cornwall				72	591 054	5 385 192	580.8
1	596 328	5 400 593	624.8	73	591 885	5 386 843	706.8
Cornwall				74	592 215	5 385 722	643.0
2	596 125	5 400 132	624.5	75	584 421	5 384 507	585.2
32	584 649	5 387 867	533.3	76	586 327	5 379 532	745.8
33	593 770	5 398 700	509.3	77	587 891	5 381 024	732.4
34A	584 310	5 389 219	478.0	78	586 301	5 383 073	646.5
34B	584 228	5 389 354	466.4	79	594 214	5 384 798	675.7
35	588 478	5 389 500	630.8	80	593 300	5 381 907	592.2
36	594 048	5 398 509	436.2	81	593 053	5 385 006	647.5
37	588 097	5 389 662	596.3	82	593 978	5 383 650	588.6
38	587 950	5 386 903	810.2	83	594 484	5 385 832	675.7
39	587 224	5 386 540	778.7	84	594 343	5 382 402	639.1
40	586 728	5 385 786	724.3	85	591 218	5 390 466	533.8
41	588 949	5 386 618	812.4				

HEC Drilling

C1 EP89408953
 C2 EP89449046
 C3 EP88059038

C4 EP90338727
 C5 EP87169060
 C6 EP88159066

C7 EP88609069
 C8 EP86769090
 C9 EP89999084

Table 12. DATA RELATING TO DOLERITE THICKNESS, QUARTZOSE SANDSTONE, AND GLACIOMARINE BASEMENT

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Parmeener Super-Group thickness (m)
1	525.5	27.0*	498.5	216.41	309.09	n.r.	-	217.93	217.93	-	>190.93
2	608.7	60.35*	548.35	n.r.	-	n.r.	-	184.0	184.0	-	>123.65
3	641.9	88.39*	553.51	n.r.	-	n.r.	-	216.71	216.71	-	>128.82
4	546.8	12.48*	534.32	245.06	301.74	254.2	292.6	-	330.12	9.14	241.72
5	575.8	6.10*	569.7	n.r.	-	n.r.	-	269.60	269.60	-	>263.50
6	739.8	129.54	610.26	432.21	307.59	451.1	288.7	-	457.81	18.89	321.56
7A	619.7	9.14*	610.56	n.r.	-	n.r.	-	52.12	52.12	-	>42.98
7B	619.7	30.49*	589.21	312.93	306.77	341.58	278.12	-	351.74	28.65	311.09
14	662.0	300*(?)	362(?)	n.r.	-	n.r.	-	n.r.	300(?)	-	-
15	766.3	74.7	691.6	n.r.	-	n.r.	-	n.r.	74.7	-	-
16A	837.0	263.0	574	n.r.	-	n.r.	-	364.25	364.25	-	>101.25
16B	834.1	≈260	≈574.1	n.r.	-	n.r.	-	(?)	(?)	-	-
17	777.5	323.46	454.04	497.09	280.41	n.r.	-	505.29	505.29	-	>181.88
19	847.2	246.90	600.3	n.r.	-	n.r.	-	313.15	313.15	-	>66.25
20	811.0	246.81	564.19	n.r.	-	n.r.	-	465.54	465.54	-	>218.78
21	758.5	282.54	475.96	482.41	276.09	491.94	266.56	-	502.40	9.53	209.40
23	804.6	341.01	463.59	544.59	260.01	545.96	258.64	-	553.63	1.37	204.95
24	830.8	385.91	444.89	n.r.	-	n.r.	-	523.26	523.26	-	>137.35
25	784.1	193.83	590.27	498.46	285.64	511.02	273.08	-	525.93	12.56	317.19
26	733.8	240.80	493.0	446.60	287.2	n.r.	-	459.22	459.22	-	>218.42
27	745.7	259.91	485.79	454.20	291.5	478.53	267.17	-	487.96	24.33	218.62
30	519.4	27.0*	492.4	213.35	306.05	231.85	287.55	-	254.85	18.50	204.85
31	829.6	302.29	527.31	559.59	270.01	565.99	263.61	-	575.98	6.40	263.70
32	533.3	40.2*	493.1	224.49	308.81	256.02	277.28	-	274.67	31.53	215.82
34A	478.0	-	-	n.r.	-	n.r.	-	65.32	65.32	-	>65.32
34B	466.4	-	-	n.r.	-	n.r.	-	47.18	47.18	-	>47.18
35	630.8	94.6*	536.2	n.r.	-	n.r.	-	n.r.	94.60	-	-

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Table 12. (continued)

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Permian Super-Group thickness (m)
37	596.3	48.88*	547.42	295.81	300.49	309.16	287.14	-	311.72	13.35	260.28
38	810.2	340.19	470.01	535.14	275.06	552.14	258.06	-	558.59	17.00	211.95
39	778.7	295.21	483.49	492.35	286.35	518.30	260.4	-	522.26	25.95	223.09
40	724.3	235.69	488.61	442.55	281.75	461.23	263.07	-	465.80	18.68	225.54
41	812.44	227.82	584.62	539.22	273.22	569.98	242.46	-	584.93	30.76	342.16
42	813.1	338.90	474.2	540.96	272.14	570.94	242.16	-	576.83	29.98	232.04
43	785.1	315.01	470.09	503.02	282.08	n.r.	-	506.03	506.03	-	>191.02
44	668.5	178.16	490.34	338.99	329.51	402.64	265.86	-	407.23	63.65	224.48
45	707.8	126.00	581.8	440.25	267.55	468.74	239.06	-	471.22	28.49	342.74
46A	772.9	38.08	734.82	n.r.	-	n.r.	-	-	38.08	-	-
46B	773.0	199.89	573.11	513.72	259.28	545.85	227.15	-	547.21	32.13	345.96
47	587.33	44.16*	543.17	n.r.	-	n.r.	-	n.r.	44.16	-	-
48	610.56	45.68*	564.88	n.r.	-	n.r.	-	n.r.	45.68	-	-
49	598.52	165.15	433.37	395.77	202.75	408.87	189.65	-	414.04	13.10	243.72
50	563.20	79.00	484.20	343.52	219.68	366.60	196.60	-	368.30	23.08	287.60
51	534.30	59.00*	475.30	n.r.	-	n.r.	-	261.00	261.00	-	>202.00
52	795.8	411.93	383.87	538.93	256.87	552.82	242.98	-	557.42	13.89	140.89
53	795.1	212.70	582.4	n.r.	-	n.r.	-	467.85	467.85	-	>255.15
54	711.8	391.55	320.25	511.86	199.94	524.09	187.71	-	530.45	12.23	132.54
55	626.4	98.01	528.39	427.91	198.49	441.84	184.56	-	470.65	13.93	343.83
56	701.0	198.05	502.95	n.r.	-	n.r.	-	405.44	405.44	-	>207.39
57	803.4	247.86	555.54	551.31	252.09	570.17	233.23	-	573.80	18.86	322.31
58	637.9	9.00*	628.9	360.0	277.9	392.16	245.74	-	399.00	32.16	383.16
59	802.3	232.13	570.17	548.5	253.8	n.r.	-	572.68	572.68	>24.18	>342.68
60	725.2	134.34	590.86	453.79	271.41	n.r.	-	-	474.00	-	>339.66
61	639.3	150.10	489.20	364.50	274.80	394.96	244.34	-	462.00	30.46	244.86
62	704.5	338.15	366.35	442.72	261.78	450.76	253.74	-	452.83	8.04	112.61

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Table 12. (continued)

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Permian Super-Group thickness (m)
63A	751.2	24.38*	726.82	n.r.	-	n.r.	-	n.r.	24.38	-	-
63B	746.4	16.76*	729.64	n.r.	-	n.r.	-	n.r.	16.76	-	-
64	626.0	124.20	501.80	369.00	257.00	392.81	233.19	-	397.02	23.81	268.61
65	572.70	155.20	417.50	293.20	279.50	n.r.	-	-	301.00	-	>145.80
66	778.2	426.17	352.03	n.r.	-	n.r.	-	581.61	581.61	-	>155.44
67	742.00	432.88	309.12	480.99	261.0	n.r.	-	-	488.81	-	>48.11
68	779.1	452.6	326.5	602.75	176.35	614.11	164.99	-	620.69	11.36	161.51
69	715.1	441.82	273.28	537.42	177.68	n.r.	-	546.11	546.11	-	>104.29
70	603.6	349.18	254.42	406.15	197.45	n.r.	-	416.27	416.27	-	>67.09
71	653.9	234.30	419.6	n.r.	-	n.r.	-	489.50	489.50	-	>255.20
72	580.8	342.65	238.15	373.15	207.35	382.40	198.40	-	391.00	8.95	39.75
73	706.8	196.56	511.24	n.r.	-	n.r.	-	496.69	496.69	-	>301.13
74	≈643.0	176.93	466.07	430.43	212.57	477.21	165.79	-	481.23	46.78	300.28
75	585.20	209.15	376.05	291.53	293.67	339.75	245.45	-	374.15	48.22	130.63
76	745.8	301.28	444.52	508.71	237.09	543.42	202.38	-	549.83	34.71	248.55
77A	732.40	34.90	697.50	n.r.	-	n.r.	-	132.20	132.20	-	-
77B	732.40	160.00	572.40	n.r.	-	n.r.	-	445.00	445.00	-	>285.00
78	646.50	31.88	614.62	n.r.	-	n.r.	-	148.80	148.80	-	>116.92
79	675.70	152.89	522.81	490.95	184.75	496.93	178.77	-	502.00	5.98	344.04
80	592.20	236.52	355.68	417.94	174.26	426.81	165.39	-	438.70	8.87	190.29
81	647.50	105.97	541.53	n.r.	-	n.r.	-	438.62	438.62	-	>332.65
82	588.60	59.40	529.20	408.78	-	426.27	-	-	428.13	-	368.73
83	675.70	93.35	582.35	n.r.	-	n.r.	-	296.03	296.03	-	>202.68
84	639.10	133.10	506.00	n.r.	-	n.r.	-	253.89	253.89	-	>120.79
85	533.80	84.77*	449.03	n.r.	-	n.r.	-	283.05	283.05	-	>250.75

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Table 12. (continued)

Hole number	Collar elevation (m.a.s.l.)	Depth to base of dolerite (talus*) (m)	Dolerite (talus*) base R.L. (m.a.s.l.)	Depth to top of quartzose sandstone unit (m)	Quartzose sandstone surface R.L. (m.a.s.l.)	Depth to Permian (m)	Permian surface R.L. (m.a.s.l.)	Depth of hole terminating in Triassic sediments (m)	Total depth of hole (m)	Quartzose sandstone thickness (m)	Upper Permian Super-Group thickness (m)
<i>MT NICHOLAS</i>											
8	560.5	0.10*	560.4	215.37	345.13	227.46	333.04	-	250.70	12.09	227.36
9	450.2	0	0	87.58(?)	362.62(?)	88.39	361.81	-	236.52	0.81(?)	88.39
10	527.9	43.28*	484.62	n.r.	-	n.r.	-	-	43.28	-	-
11	500.2	42.06*	458.14	n.r.	-	n.r.	-	139.57	139.57	-	>97.51
12	574.9	44.60*	530.3	208.82	366.08	218.19	356.71	-	223.93	9.37	173.59
13	536.4	1.52*	534.88	n.r.	-	n.r.	-	228.50	228.50	-	>226.98
33	509.3	15.62*	493.68	188.73	320.57	198.34	310.96	-	199.56	9.61	182.72
36	436.2	11.50*	424.7	n.p.	-	124.30	311.9	-	133.26	-	112.80
<i>MERRYWOOD</i>											
18	664.5	371.50	293	n.r.	-	n.r.	-	424.80	424.80	-	>53.3
<i>LOCHABER</i>											
22	407.4	0	407.4	n.r.	-	n.r.	-	228.56	228.56	-	>228.56
<i>VERTICAL ACRE</i>											
28	442.0	0	442.0	116.26	325.74	150.57	291.43	-	160.48	34.31	150.57
29	686.4	346.10	340.3	394.02	292.38	424.63	261.77	-	431.43	30.61	78.53

Note: n.r. = not reached n.p. = not present

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APPENDIX 3

Coal seam intersections and analyses; E.L. 17/81 (Table 13)
and S.R. 32/81 (Table 14)

Table 13. COAL SEAM INTERSECTIONS AND ANALYSES, E.L. 17/81 (now E.L. 50/80)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)							
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)		
1	70.41	72.77	455.06	F	2.31	98	2.36	uncertain	lss	mst								
	548 116.00	116.59	409.47	G	0.58	100	0.59	-	mst	mst	6.3	33.3	22.4	44.3	0.28	21.4		
2	1450 176.99	178.69	430.01	F	1.70	100)		1.70	flss		5.0	23.2	28.6	48.2	0.3	26.3		
	1451 178.71	178.99		F	0.28	100)	1.98			lss	4.1	49.9	26.5	25.5	-	-		
3	3640 156.36	156.97	485.54	D	0.56	95	0.56	-	lss	mst	4.7	25.7	28.8	45.6	0.42	23.5		
	3641 187.48	188.21	454.42	E	0.61	95	0.61	-	lss	shale	5.1	56.0	-	-	-	-		
	3642 210.21	211.56	431.69		1.27	95)			lss		4.3	23.7	26.3	49.9	0.63	23.8		
	3643 211.56	211.91		F	0.31	95)	2.34	2.34			3.3	42.8	28.5	28.6	0.28	17.1		
	3644 211.91	212.55		F	0.43	67)				mst	3.5	48.2	22.6	29.8	0.28	15.0		
4	232 43.08	43.69	503.62	C	0.23	30	0.61	-	lss	mst	4.1	30.8	24.1	45.1	0.30	21.0		
	308 71.07	71.93	475.63	D	0.77	90	0.86	-	mst	mst	6.2	35.3	23.3	41.4	0.35	19.3		
	309 72.69	73.99	474.01	D	1.17	90	1.30	-	mst	mst	4.9	19.4	32.3	48.3	0.53	25.1		
		101.40	101.70	445.40	E	0.27	90	0.30										
		113.69	114.45	433.01	F	0.68	70		-	shale	clay	3.1	62.4	14.6	22.9	-	-	
		122.73	123.44	423.97	F	0.38	53	0.71	-	mst	mst	3.8	47.9	18.7	33.4	-	-	
		127.89	128.40	418.81	F	0.46	97	0.51	-	mst	mst	3.7	52.3	19.6	28.0	-	-	
		129.69	130.02			0.18	53	0.33										
		160.45	160.91	386.25	Gu	0.46	100	0.46	-	lss	shale	3.5	27.4	28.1	44.5	0.46	22.0	
		165.51	166.12	381.19	G1	0.61	100	0.61	-	mst	mst	3.5	29.3	24.2	46.4	0.80	22.2	
		177.75	178.16	368.95	H	0.41	100	0.41	-	mst	lss	3.7	37.4	26.6	36.0	-	-	
		180.14	180.75	366.56	H	0.61	100	0.61	-	mst	shale	3.4	22.6	26.1	51.3	0.40	24.5	
		186.15	186.61	360.55	H	0.46	100	0.46	-	mst	lss	2.8	-	-	-	-	-	
5	1 96.62	97.54	479.18	D	0.76	83	0.92	-	lss	shale	6.0	36.5	-	-	-	-		
	2 99.67	100.89	476.13	D	1.22	100	1.22	-	shale	mst	4.9	26.3	28.7	45.0	0.41	22.9		
	3 143.00	144.02	432.80	F	0.91	90)	1.02	-	lss	coal	3.9	26.8	26.3	46.8	0.34	23.3		
	4 147.14	148.95	428.66	F	1.80	90)	1.81	1.81	mst	clay	4.3	30.7	23.5	45.8	0.76	21.3		
	5 180.29	183.03	395.51	Gu	0.81	37	2.74	2.74	lss	mst	3.2	35.8	23.3	40.8	-	-		
	6 188.67	189.89	387.13	G1	1.02	83	1.22	-	mst	mst	3.7	48.2	19.6	32.2	-	-		

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses* (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
6	827/1	219.76	220.52	519.99	C	0.73	)			lss	clay	-	57.3	-	-	-	-
	/2	220.68	221.87	519.07	C	1.07	85)	2.11	-	clay	coal	-	43.3	-	-	-	-
	/3	248.62	249.63	491.13	D	0.76	76	1.01	-	mst	mst						
	774/1	305.05	305.97	434.70	F	0.69	)			coal		4.4	22.3	23.3	54.4	-	23.5
	/2	305.97	306.88		F	0.69	90	2.75	2.75			3.3	19.8	27.5	52.6	-	24.9
	/3	306.88	307.80		F	0.69	)				coal	2.9	38.0	26.9	35.1	-	19.0
		341.25	341.63		minor	0.38	100	0.38	-								
	827/4	343.20	344.73	396.55	G	1.52	99	1.53	1.53	mst	mst	-	39.4	-	-	-	-
		354.48	354.89		minor	0.41	100	0.41	-								
	7B	682317	183.54	185.01	436.16	F	1.47	100)	2.23	2.23	cmst		4.72	24.4	27.3	51.0	-	23.2
682318		185.01	185.77		F	0.76	100)				lss	3.80	39.4	38.4	27.2	-	18.4
		225.33	225.78		minor	0.25	100	0.25	-								
		228.37	230.35	391.33	G	1.98	100	1.98	-	mst	lss	-	-	-	-	-	-
		237.29	237.72		minor	0.43	100	0.43	-								
16A	1	328.80	328.96	508.20	B	0.16	100)			cmst		-	26.9	-	-	-	23.9
	2	328.96	329.47		B	0.51	100)	2.10	-				58.5	-	-	-	-
	3	329.47	330.38		B	0.91	100)						25.5	-	-	-	23.2
	4	330.38	330.90		B	0.52	100)				mst		58.9	-	-	-	-
Composite																	
	1-4	328.80	330.90	508.20	B	2.10	100	2.10	-	cmst	mst	1.4	42.0	16.4	40.1	-	-
	5	356.43	357.30	480.60	C	0.87	100)	1.50	1.50	cmst	mst	-	48.8	-	-	-	-
	6	357.30	357.93		C	0.63	100)					-	25.8	-	-	-	22.6
Composite																	
	5-6	356.43	357.93	480.60	C	1.50	100	1.50	1.50	cmst	mst	2.5	38.5	23.2	35.8	-	-
17	1	348.98	350.32	428.52	E	1.27	95	1.34	-	lss	mst	4.5	24.8	27.3	47.6	-	24.9
	2	354.34	355.14	423.16	E	0.80	100	0.80	-	silt	mst	4.1	28.7	27.1	44.2	-	24.3
	3	380.11	381.43	397.39	F	1.32	100	1.32	-	coal	lss	4.1	34.3	25.8	39.9	-	18.8

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
17	4	418.90	419.60	358.60	Gu	0.70	100	0.70	-	silt	mst	3.7	38.8	21.4	40.0	-	17.2
	5	423.05	425.05	354.45	G1	2.00	100	2.00	2.00	mst	mst	3.6	26.3	22.9	49.8	-	24.3
19	1	428.25	428.80	418.95	F	0.52	95)	1.55	1.55	mst	mst	5.5	32.6	21.0	46.3	-	-
	2	428.80	429.80		F	0.95	95)					5.1	21.6	28.6	49.8	-	-
20		364.72	365.85	446.28	D	1.05	94	1.13	-	mst	mst	6.6	20.7	32.2	47.1	-	29.4
		412.78	413.94	398.22	F	1.16	100)	2.32	2.32	mst		5.3	34.7	21.8	43.5	-	20.7
		413.94	415.10		F	1.16	100)				cmst	5.5	28.9	27.3	43.8	-	24.4
		454.64	456.40	356.36	Gu	0.88	53	1.76	1.76	cmst	cmst	5.0	33.5	21.3	45.2	-	21.5
		458.27	459.45	352.73)	G1	1.08	92	1.18)	2.94	sst/ mst		4.9	25.0	24.9	50.1	-	24.7
		459.55	460.21	351.45)	G1	0.56	91	0.66)			sst/ mst	5.2	38.2	21.8	40.0	-	20.0
21		348.04	349.07	410.46	F	1.03	100)	2.07	2.07	mst		5.3	26.8	25.1	48.1	-	25.5
		349.07	350.11		F	1.04	100)				mst	4.4	26.5	29.1	44.4	-	25.1
		388.05	389.07		minor	0.86		1.02	stony coal								
		395.75	396.51	362.75	G	0.76	100)			lss		4.2	30.2	22.2	47.6		23.0
		396.51	397.45		G	0.94	100)	1.70	1.70		lss	4.1	24.1	25.7	50.2		24.4
		414.46	415.28	344.04	H	0.82	98	0.82		mst	mst	4.5	35.6	23.6	40.8		21.8
23	1	366.04	366.47		D	0.43	99)	1.12	-	mst	clay	3.2	35.8	25.4	38.8		18.8
	2	366.55	367.16		D	0.61	100)			clay	must	2.7	19.1	32.1	48.8		24.5
	3	373.13	374.15		D	1.02	100	1.02		mst	mst	2.5	36.1	28.2	35.7		19.5
	4	374.90	375.85		D	0.80	84	0.95		mst		2.7	29.6	28.9	41.2		21.5
	5	410.33	411.08		F	0.75	100	0.75	-			2.7	29.0	26.8	44.1		22.3
	6	412.30	413.29	392.30	F	0.89	90)					2.6	27.7	25.8	46.5		21.7
	7	413.29	414.36		F	0.97	100)	2.83	2.83			1.9	20.2	31.1	48.7		24.8
	8	414.36	415.13		F	0.70	90)					2.5	36.2	27.6	36.2		19.8
	9	453.57	450.56	351.03	Gu	0.94	99	0.99	-			-	-	-	-		-
	460.91	461.11	343.69	G1	0.20	100)					4.8	39.4	21.6	39.0		18.4	

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses* (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
23	10	461.13	461.44		G1	0.30	98)	1.14	-			4.7	30.0	22.2	47.7		20.9
cont.	11	461.44	461.71		G1	0.27	98)					3.8	60.6	15.0	24.3		10.2
	12	461.80	462.05		G1	0.25	98					5.6	46.1	23.0	30.9		15.6
24	1	397.23	397.46	433.57	D	0.23	100	0.23	-	mst	mst	3.6	39.9	18.9	41.2		18.5
	2	397.55	398.23	433.25	D	0.68	100	0.68	-	mst	mst	3.2	27.0	25.9	46.7		22.2
	3	401.44	401.58	429.36	D	0.14	100)	1.05	-	clay	clay	2.4	20.0	33.8	46.2		24.3
	4	401.63	402.49		D	0.85	99)			clay	shale	3.4	27.1	28.9	44.0		21.5
	5	441.12	441.22	389.28	F	0.10	100)			mst		3.0	21.8	29.6	48.6		24.6
	6	441.52	442.18	370.45	F	0.66	100)					3.1	31.6	23.4	45.0		20.5
	7	442.18	442.91		F	0.73	100)	2.13)	2.13			1.9	19.4	29.7	50.9		25.1
	8	442.91	443.65		F	0.74	100)	)			mst	1.5	35.2	30.6	34.2		20.1
	9	496.22	496.85	334.58	Gu	0.63	100	0.63	-	mst	clay	3.1	28.0	25.7	46.3		22.1
	10	497.01	497.17	333.79	G1	0.16	100)	0.77		clay	clay	3.8	35.0	20.2	44.8		19.3
	11	497.23	497.78		G1	0.55	100)		-	clay	mst/silt	2.9	29.4	26.3	44.3		21.7
25	1	376.07	376.45	408.03	F	0.31	99)	)		lam		4.2	51.2	18.3	30.5		14.1
	2	376.45	376.99		F	0.53	)	1.64)	1.64			4.0	23.5	30.2	46.3		24.5
	3	376.99	377.14		F	0.15	)	)			coal	3.5	44.6	27.8	27.6		18.0
	4	377.28	377.71		F	0.42	)	)		coal	mst	3.4	33.2	28.3	38.5		21.4
	5	417.73	418.42	366.37	Gu	0.69	100 )	)		lss/		3.4	37.3	22.3	40.4		19.3
	6	418.42	418.61		Gu	0.19	)	)		mst							
	7	418.64	418.73		Gu	0.09	)	1.58)	1.58	sb	sb	2.6	40.8	28.1	31.1		19.2
	8	418.76	418.89		Gu	0.13	)	)		sb	sb	3.7	52.9	25.2	21.9		13.7
	9	418.92	419.10		Gu	0.18	)	)		sb	sb	3.2	22.1	27.2	50.7		25.3
	10	419.13	419.31		Gu	0.18	)	)		sb	silt	2.7	31.7	33.1	35.2		21.8
	11	420.98	421.71	363.12	G1	0.73	100)	)		sb	sb	2.8	48.1	20.6	31.3		15.8
	12	421.73	422.06		G1	0.33)	1.97)	1.97	mst	sb	3.4	26.5	25.1	48.4		23.5
	13	422.21	422.95		G1	0.74))		sb	lss	4.1	30.9	22.8	46.3		21.9
										sb	lss	3.6	22.5	30.1	47.4		25.4

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working Thickness (m)	Roof† rock	Floor† rock	Proximate analyses* (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
46-95	26	1	310.35	310.57	423.45	F	0.22	100)	)	lss/silt	mst	3.8	26.8	34.4	38.8	23.2
		2	310.70	311.07		F	0.37	)	)	mst	sb	4.9	28.7	26.1	45.2	22.6
		3	311.08	311.68		F	0.60	)	2.60)	2.60	sb	4.2	29.6	27.8	42.6	21.5
		4	311.68	312.18		F	0.50	)	)			4.5	29.8	26.6	43.6	22.0
		5	312.18	312.55		F	0.37	)	)			5.2	28.0	24.0	48.0	22.3
		6	312.55	312.60		F	0.05	)	)			4.0	44.9	28.0	27.1	18.0
		7	312.60	312.95		F	0.35	)	)		mst	4.4	38.5	23.9	37.6	19.3
		8	354.60	354.89	379.20	G	0.28	99)	)	mst	sb	4.1	42.5	19.2	38.3	15.8
		9	355.02	355.19		G	0.16	)	2.07)	2.07	sb	4.0	33.9	22.5	43.6	19.1
		10	355.19	355.65		G	0.45	99)	)			3.7	32.7	22.9	44.5	20.4
		11	355.65	355.95		G	0.28	)	)		sb	3.7	54.7	18.5	26.8	12.9
		12	356.13	356.44		G	0.30	)	)	sb		3.5	27.5	25.9	46.6	22.0
		13	366.44	356.55		G	0.10	)	)			3.6	55.0	17.1	27.9	12.6
		14	356.55	356.67		G	0.12	)	)		mst	4.3	30.6	21.9	47.5	20.7
27	1	331.51	332.02	414.19	F	0.51	100	0.51	-	mlss	mst	2.4	40.7	22.6	36.7	19.4
	2	334.13	334.28	411.57	F	0.15	100)			cmst	sb	3.3	48.3	30.6	21.1	
		334.36	334.44		F	0.08	100)			sb	sb	3.3	22.8	15.2	62.0	24.6
	3	334.51	334.81		F	0.30	100)	2.59	2.59	sb						
	4	334.81	335.11		F	0.30	100)				sb	3.4	26.6	24.7	48.7	23.5
	5	335.19	335.37		F	0.15	81)			sb		3.2	24.1	26.2	49.7	24.7
	6	335.37	336.04		F	0.55	82)					2.9	24.1	29.8	46.1	25.2
	7	336.04	336.72		F	0.55	82)				cmst	2.4	29.0	27.2	43.7	23.4
	8	372.71	372.84	372.99	Gu	0.13	)			mst	sb	4.6	37.5	24.1	38.4	19.7
		372.88	373.07		Gu	0.19	)			sb						
	9	373.07	373.47		Gu	0.40	)					4.8	42.0	18.9	39.1	17.5
10	373.47	373.93		Gu	0.46	100)					6.5	56.3	20.3	24.3	-	
11	373.93	374.00		Gu	0.07	100)	2.03	-		calc.	4.4	59.5	18.9	21.6	-	
	374.04	374.36		Gu	0.31	100)			calc.	sb	-	-	-	-	-	

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working Thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)				
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
27	374.42	374.67		Gu	0.23	95)			sb	sb	-	-	-	-	-
cont.	374.70	374.74		Gu	0.04	100)			sb	cmst	-	-	-	-	-
12	377.21	377.41	368.49	G1	0.20	100)			mst	sb	4.2	48.7	17.8	33.4	
13	377.44	377.61		G1	0.17	100)	1.58	-	sb	sb	4.0	44.8	19.6	35.6	
14	377.65	377.80		G1	0.15	100)			sb	sb	4.1	38.4	21.2	40.5	18.4
15	377.87	378.79		G1	0.36	39)			sb	mst	3.2	29.5	27.7	42.8	22.4
28	62.51	64.45	379.49	G	1.94	100	1.94	-	mst	silt	-	-	-	-	-
30	1	71.49	71.77	447.91	F	0.28	100)		lss		5.2	28.2	23.0	48.8	-
	2	71.77	72.01		F	0.24	100)				4.3	56.1	17.2	26.7	
	3	72.01	72.35		F	0.33	97)	2.32	2.32		3.8	35.9	21.6	42.5	
		72.35	72.49		F	0.13	90)			mst	clay				
	4	72.49	72.87		F	0.37	98)			clay		4.3	27.7	26.0	46.3
		72.87	72.90		F	0.03	100)								
	5#	72.90	73.81		F	0.88	98)			mst		3.9	25.0	29.2	45.8
Composite	71.49	73.81(excl. mst bands)			1.77	96	?	?			3.7	20.8	27.7	51.5	
Total seam including dirt bands					2.25	96	2.31	2.31	lss	mst	-	40.6	-	-	
6#	118.71	119.14	400.69	G	0.42	98)			mst		4.8	45.1	15.4	39.5	
7#	119.14	119.62		G	0.47	97)	2.08				3.9	44.0	19.0	37.0	
8#	119.62	120.79		G	1.14	97)				mst	3.5	32.5	24.5	43.0	
Composite	119.01	120.79			1.78	100	1.78	1.78			5.2	16.8	27.6	55.6	
# Dirt bands excluded from analysis															
Total seam including dirt bands				G	2.03	99	2.08	-	mst	mst	-	42.6	-	-	
31	1	309.92	310.23	518.98	A	0.31	100		mst	mst	7.6	71.8	3.8	24.4	
	-	310.23	310.35		A	0.12	100	mst band							
2		310.35	310.83		A	0.48	100		mst	mst	8.3	74.5	7.2	18.3	
	-	310.83	311.10		A	0.27	100	mst band							
3		311.10	312.74		A	1.64	100		mst	mst	6.5	86.3	6.4	7.3	
	-	312.74	313.24		A	0.50	100	mst band							

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam inter-val (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)								
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)			
31	4	313.24	313.96		A	0.72	100												
cont.	5	335.71	335.81	493.19	B	0.10	100		mst	cmst	4.1	77.0	6.6	16.4					
	-	335.81	336.53		B	0.72	100	clay band	clay	clay	9.7	76.4	11.4	12.2					
	6#	336.53	337.89		B	1.36	100		clay	sb	2.5	38.9	19.8	41.3					
	-	337.89	337.91		B	0.02	100	stone band											
	7#	337.91	338.61		B	0.70	100		sb	mst	3.3	57.5	15.2	27.3					
	-	338.61	339.42		B	0.81	100	mst band											
	8#	339.42	340.09		B	0.67	100		mst	mst	2.3	70.3	10.3	19.4					
	# Stone bands excluded from analysis																		
	-	340.09	340.43		B	0.34	100	mst band											
	9#	340.43	340.86			0.43	100		mst	mst	5.7	73.9	10.3	15.8					
Total seam		335.71	340.86		B	5.15	100	5.15	-		Float conc. 17.1% at 1.6 not sampled (81% coal)								
		358.28	364.02		C	5.69	99	5.74	-										
	-	385.72	387.02		D	1.32	99	1.34	-										
		389.05	390.03		D	0.98	100	0.98	-										
		431.67	432.17	396.73	F	0.50		0.50	-	lss	mst	-	-	-	-				
		481.84	483.31	347.06	G	1.47	100			mst		-	36.2	-	-				
		483.31	483.64		G	0.33	100	mst band				-	100	-	-				
		483.64	485.46		G	1.82	100		1.82	mlss		-	32.8	-	-				
Composite		481.84	485.46		G	3.62	100	3.62		mst	mlss	-	41.6	-	-				
32	1#	82.24	83.09	451.06	F	0.85	100	1.63	1.63	mst	mst	5.3	43.4	21.5	35.1				
	2#	83.17	83.87		F	0.70	100			mst	silt/mst	5.6	27.8	27.0	45.2				
Composite 1 & 2	Heavy liquid separated at 1.6 t/m ³ ; mass 57.9%										6.9	20.9	28.9	50.2					

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam* (m)	Recovery		Seam inter-val (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
32	3	184.69	186.05	348.61	?H	1.36	100	1.36	mst	mst	3.4	23.5	32.4	44.1		
cont.																
# Stone bands excluded from analysis																
34A	1	40.58	41.00	437.40	G	0.44	100)		mst	mst	5.3	54.3	16.4	29.3		
	2	41.28	41.82		G	0.54	)	3.14	-	mst shale	5.5	27.6	23.5	48.9	
	3	42.39	43.72		G	1.33	)			shale shale	5.1	23.8	24.0	52.2	
Composite																
	1-3	40.58	43.72	(float conc. 65.5% at 1.6)								8.7	17.9	27.0	55.1	
(excluding mudstone bands)																
46-98	34B	1	29.09	29.18		0.09	100)		mst	-		65.5				
		2	29.18	29.22		0.04	100)		-	-		44.8				
		3	29.22	29.51		0.28	97)		-	clay		30.4				
		4	29.54	29.69		0.14	93)		clay	sb		36.2				
		5	29.70	29.93		0.21	91)		sb	mst		33.4				
		6	29.96	30.01		0.04	80)		mst	sb		44.0				
		7	30.02	30.24		0.20	91)		sb	mst		30.2				
		8	30.26	30.42		0.15	94)	3.09	mst	-		36.1				
		9	30.42	30.46		0.04	100)		-	mst		61.4				
		10	30.47	30.60		0.12	92)		mst	-		38.8				
		11	30.60	30.69		0.07	78)		-	sb		50.4				
		12	30.82	30.87		0.05	100)		sb	sb		52.7				
		13	30.88	31.07		0.17	89)		sb	mst		21.7				
		14	31.11	31.24		0.11	85)		mst	-		56.9				
		15A	31.24	31.48		0.21	88)		-	-		16.9				
	15B	31.48	31.72		0.21	88)		-	-		27.1					
	15C	31.72	31.95		0.15	65)		-	-		14.5					
	15D	31.95	32.18		0.15	65)		-	silt		15.7					
Composite																
			Float, conc.		52.1% at 1.6						18.0	28.6	53.4			
	cycl. 2, 6, 9, 11, 12		Sink conc.		47.9% at 1.6						31.3	26.6	42.1			

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam inter-val (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
37	1	77.05	77.22	519.25	B	0.17	100)		mlss		4.6	66.1	-	-		
	2	77.22	77.53		B	0.31	) 0.86	-			4.2	68.9	-	-		
	3	77.53	77.59		B	0.06	)				4.1	40.2	25.4	34.4		
	4	77.59	77.91		B	0.32	)			mst	3.9	72.1	-	-		
	5	78.76	78.83	517.54	B	0.07	100)		mst	mst	3.2	45.1	29.8	25.1		
	6	79.17	79.52		B	6.35	)		mst	mst	3.0	29.1	24.9	46.0		
	7	79.62	79.90		B	0.28	) 1.37	-	mst	mst	2.5	22.2	32.0	45.8		
	8	79.95	80.12		B	0.17	)		mst	mst	2.6	46.4	22.4	31.2		
	9	80.23	80.33		B	0.10	)		mst	mst	4.7	63.5	-	-		
	10	80.36	80.54		B	0.18	)		mst	mst	1.5	47.8	27.6	29.6		
	11	103.55	103.70	492.75	C	0.15	100) 3.73	-	mlss		3.1	27.5	26.2	46.3		
	12	103.70	103.76		C	0.06	)			shale	2.8	37.4	25.7	36.9		
	13	103.81	104.01		C	0.20	)		shale		2.5	26.1	26.1	47.8		
	14	104.01	104.06		C	0.05	)			mst	2.2	44.6	20.1	35.3		
	15	104.10	104.19		C	0.09	100)		mst	shale	4.6	67.3	-	-		
	16	104.20	104.30		C	0.10	100)		shale	shale	4.7	66.2	-	-		
	17	104.33	104.39		C	0.06	100)		shale		4.1	55.5	-	-		
	18	104.39	104.67		C	0.28	100)			mst	2.0	20.3	33.6	46.1		
	19	104.71	104.89		C	0.18	)		mst		1.8	25.3	26.4	48.3		
	20	104.89	104.96		C	0.07	)			sb	2.4	34.1	23.8	42.1		
	21	104.99	105.08		C	0.09	)			cmst	3.4	70.2	-	-		
	22	105.08	105.32		C	0.17	)			shale	1.8	32.9	21.7	45.4		
	23	105.43	105.52		C	0.09	100)				5.9	71.9	-	-		
	24	105.52	105.96		C	0.42	95)			sb	4.8	27.4	25.0	47.6		
	25	105.97	106.41		C	0.42	95)		sb		4.8	37.2	22.4	40.4		
	26	106.41	106.52		C	0.11	100)				4.5	51.6	-	-		
	27	106.52	106.65		C	0.13	100) 3.73	-			5.1	66.3	-	-		
	28	106.65	106.99		C	0.32	94)				4.5	19.5	27.1	53.4		
	29	106.99	107.28		C	0.28	97)			mst	4.3	52.9	-	-		
	30	131.37	131.49	464.93	D	0.12	100)		shale		4.5	16.1	38.2	45.7		

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
37	31	131.49	131.53		D	0.04	100	0.85	-			9.3	70.9	-	-		
cont.	32	131.53	131.55		D	0.02	100			clay		5.3	17.6	38.5	43.9		
	33	131.63	132.22		D	0.59	100			clay	mst	4.7	17.8	23.8	58.4		
	34	171.00	171.48	425.30	F	0.48	100	0.78	-	mlss		3.9	19.0	30.1	50.9		
	35	171.48	171.78		F	0.30	100				mst	2.5	48.7	24.4	26.9		
	36	180.30	180.48	416.00	F	0.16	89			silt		4.7	59.1	-	-		
	37	180.48	181.26		F	0.78	100	2.07	-		mst	3.8	27.4	22.5	50.1		
	38	181.67	181.84		F	0.17	100			mst	mst	4.6	44.5	23.7	31.8		
	39	181.86	182.23		F	0.37	100			mst		3.1	25.4	26.0	48.6		
	40	182.23	182.37		F	0.13	93				mst/silt	3.3	43.0	24.1	32.9		
46-100	41	186.22	186.64	410.08	F	0.42	100	0.54	-	shale		3.5	24.8	32.0	43.2		
	42	186.64	186.76		F	0.12	100				flss	3.8	61.1	-	-		
	43#	219.71	220.62	376.59	Gu	0.91	100	0.91	-	mlss	mst	3.2	43.4	25.0	31.6		
	44#	222.23	223.66	374.07	Gl	1.42	99	1.43	-	mst	silt	3.8	24.3	29.2	46.5		
38	1A	340.19	341.37	470.01	C	1.14	97			Jdl		-	74.4	-	-	-	
	1B	341.37	342.64		C	1.27	100	6.00	-			-	69.5	-	-	-	
	1C	342.64	344.63		C	1.99	100					-	65.0	-	-	-	
	1D	344.63	346.19		C	1.56	100				mst	-	90.6	-	-	-	
	2	365.55	366.75	444.65	D	1.20	100	1.20	-	mlss	silt		38.9	25.5	35.6	-	
	3A	411.58	414.65	398.62	F	2.28	74			mlss			90.1	-	-	-	
	3B	414.65	417.14		F	2.49	100	5.89	2.49				26.1	-	-	-	
	3C	417.14	417.47		F	0.33	100				fmlss		87.1	-	-	-	
	4A	457.51	460.53	352.69	Gu	3.02	100	3.02	-	mst	cmst		67.2	-	-	-	
-	462.24	463.32	347.96	Gl	1.08	100	1.08	-	mst	silt		-					
39	1A	365.71	368.18	412.96	F	2.47	100			mlss			85.8				
	1B	368.18	369.25		F	1.07	100	5.30	2.83		mst		39.1				
	1C	369.25	371.01		F	1.76	100						26.3				
	2A	410.77	412.13	367.90	Gu	1.36	100	2.55	-	mst			53.9				

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
39	2B	412.13	413.32		Gu	1.19	100)			mst		55.3					
cont.	3A	417.88	418.59	360.79	G1	0.71	100)			mst		52.2					
	3B	418.59	419.36		G1	0.77	100)	1.48	-		mst	45.5					
	4A	436.02	437.16	342.65	H	1.14	100)	1.54	-	mst		84.0					
	4B	437.16	437.56		H	0.40	100)				mst	56.7					
40	1A	307.84	308.29	416.46	F	0.45	100)			mlss		-	65.5	-	-		
	1B	308.29	309.88		F	1.45	91)	3.19	1.59			-	29.1	25.1	45.8		
	1C	309.88	311.03		F	1.15	100)				mst	-	72.2	-	-		
	2A	354.71	356.23	369.59	Gu	1.52	100)	2.55	-	mst		-	70.2	-	-		
	2B	356.23	357.26		Gu	1.03	100)				mst	-	40.9	20.6	38.5		
	2C	363.14	363.95	361.16	G1	0.81	100	0.81	-	mst	silt	-	34.7	-	-		
	3	381.02	382.65	343.28	H	1.63	100	1.63	-	mst	mst	-	81.0	-	-		
41	1A	280.15	280.35	532.25	A	0.20	100)			shale		1.6	24.6	9.7	65.7		
	1B	280.35	280.77		A	0.42	100)	1.22	-			4.0	58.6	-	-		
	1C	280.77	280.91		A	0.14	100)					5.7	88.2	-	-		
	1D	280.91	281.37		A	0.46	100)				silt	4.4	55.8	-	-		
Composite	1A-1D	280.15	281.37		A	1.22	100	1.22	-	shale	silt	4.0	-	-	-		
	2A	300.35	300.92	512.05	B	0.57	100)			fmlss		7.0	78.7	-	-		
	2B	300.92	301.74		B	0.82	100)					8.0	83.2	-	-		
Composite	2A,2B	300.35	301.74		B	1.39	100)					8.0	81.4	-	-		
	3	301.74	302.20		B	0.46	100)					4.6	36.7	28.4	34.9		
	4	302.20	302.78		B	0.58	100)					6.6	77.3	-	-		
	5A	302.78	303.25		B	0.47	100)	5.55	-			4.3	55.8	-	-		
	5B	303.25	303.88		B	0.63	100)					4.4	71.1	-	-		
	6A	303.88	304.92		B	1.04	100)					3.6	42.2	27.6	30.2		
	6B	304.92	305.45		B	0.53	85)					4.5	31.6	33.7	34.7		
	7	305.45	305.90		B	0.45	100)					4.2	58.6	-	-		

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)				
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
41	8	326.31	327.45	486.09	C	1.14	100)	1.14	-	mlss	clay	7.7	77.2	-	-
cont.	9	328.47	329.38	483.93	C	0.91	100)	1.81	-	clay		5.2	54.3	-	-
	10	329.38	330.28		C	0.90	100				mst	4.9	44.3	27.9	27.8
	11	335.15	336.46	477.25	C	1.31	100	1.31	-	flss/ silt	flss/ silt	6.8	34.8	33.4	31.8
	12A	351.90	362.84	450.50	D	0.94	100)	1.79	-	mst		5.4	37.0	31.5	31.5
	12B	362.84	363.69		D	0.81	95)				mst	4.7	49.9	27.8	22.3
	13A	404.27	404.64	408.13	F	0.37	100)			mlss		5.7	36.4	30.0	33.6
	13B	404.64	405.84		F	1.20	100)	2.71	2.71			5.0	27.4	29.8	42.8
	13C	405.84	406.98		F	1.14	100)				mst	3.7	32.6	31.0	36.4
	Composite														
	13A-C	404.27	406.98		F							4.5	30.8	30.3	38.9
	14A	452.56	453.39	359.84	Gu	0.83	100)			mst/ silt		6.5	45.1	27.4	27.5
	14B	453.39	454.30		Gu	0.72	79)	2.39	-			10.0	76.4	-	-
	14C	454.30	454.95		Gu	0.65	100)				mlss	3.7	82.8	-	-
	15	461.94	462.67	350.46	G1	0.73	100	0.73	-	mlss	flss	5.3	30.4	29.5	40.1
42	1A	352.78	353.82	460.32	C	1.04	100)			mlss		6.1	58.3	-	-
	1B	353.82	355.95		C	2.13	100)	3.30	-			4.5	46.6	25.6	27.8
	1C	355.95	356.08		C	0.13	100)				mst	4.4	79.2	-	-
	2A	376.03	376.55	437.07	D	0.52	100)	1.69	-	mst		4.6	78.3	-	-
	2B	376.55	377.72		D	1.17	100)				silt	4.9	32.4	32.6	35.0
	3A	385.36	386.65	427.74	D	1.29	100)	1.43	-	mst		4.9	41.1	28.4	30.5
	3B	386.65	386.79		D	0.14	100)				mst	4.2	72.1	-	-
	4A	423.95	424.44	389.15	F	0.49	100)			mst		3.8	40.6	29.6	29.8
	4B	424.44	425.72		F	1.28	100)	2.82	2.82			3.8	24.4	28.6	47.0
	4C	425.72	426.77		F	1.05	100)				mst	3.1	31.9	30.3	37.8
	5A	468.83	470.13	344.27	Gu	1.30	100	1.30	-	cmst/ mlss	mst	3.6	47.1	24.0	28.9
	5B	476.15	477.32	336.95	G1	1.17	100	1.17	-			4.5	59.7	-	-

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
46-103	43 1A	315.64	316.64	469.46	C	1.00	100)			Jdl		7.7	77.6	-	-	
	1B	316.64	317.49		C	0.85	100)					5.5	65.9	-	-	
	1C	317.49	318.85		C	1.16	85)	4.20	-			3.2	38.9	13.9	47.2	
	1D	318.85	319.46		C	0.61	100)					2.1	79.2	-	-	
	1E	319.46	319.84		C	0.38	100)				mst	2.9	91.5	-	-	
	2A	335.38	335.84	449.72	D	0.46	100)	1.36		mlss		3.4	67.9			
	2B	335.84	336.74		D	0.90	100)				silt	3.0	24.9	32.1	43.0	
	3A	386.30	387.67	398.80	F	1.37	100)	2.57	2.57	mlss		2.8	27.8	29.1	43.1	
	3B	387.67	388.87		F	1.20	100)				mst	2.3	28.7	29.6	41.7	
	4	432.57	434.36	352.53	Gu	1.79	100	1.79	1.79	mst	mst	2.5	39.9	25.5	34.6	
	5A	438.58	439.65	346.52	G1	1.07	100)	2.15		mst		4.7	50.8	-	-	
	5B	439.65	440.73		G1	1.08	100)				mst	4.9	72.7	-	-	
	6A	457.45	459.50	327.65	H	2.05	100)	2.40		mlss		5.6	78.9	-	-	
6B	459.50	459.85		H	0.35	100)				mst	5.6	81.9	-	-		
44	1A	250.16	251.51	418.34	F	1.35	100)	2.73	2.73	mlss			33.8	29.8	36.4	
	1B	251.51	252.89		F	1.38	100)				shale		38.6	26.6	34.8	
	2A	294.68	295.73	373.82	Gu	1.05	100)	2.62		mlss			57.5	-	-	
	2B	295.73	297.30		Gu	1.57	100)		1.57		mst		48.9	26.7	26.4	
	2C	303.97	304.77	364.53	G1	0.80	100	0.80	-	flss	mst		not sampled			
45	1A	199.04	200.42	508.76	B	1.38	100)			fmlss	flss	6.4	76.9			
	1B	200.42	201.28		B	0.86	100)	4.68	-			3.1	55.2			
	1C	201.28	202.95		B	1.57	94)					8.3	83.2			
	1D	202.95	203.72		B	0.77	100)					5.1	37.0	28.6	34.4	
	2A	206.23	207.20	501.57	B	0.96	100)			mst	mst	6.9	83.2			
	2B	207.20	208.36		B	1.16	100)	2.73	-			4.5	53.3			
	2C	208.36	208.96		B	0.60	100					4.0	62.1			
	3A	227.13	227.79	480.67	C	0.66	100)			mlss	mst	5.6	59.8	-	-	
	3B	227.79	228.81			1.02)	2.83	-			7.2	69.2	-	-	
	3C	228.81	229.96			1.15)					4.4	51.6	-	-	

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)							
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)		
45	4A	251.42	252.22	456.22	D	0.80	100)	1.94	-	mlss	-	5.7	77.3					
cont.	4B	252.22	253.36			1.14	100)			-	flss	6.4	32.7	33.3	34.0			
	5	260.64	262.27	447.16	D	1.63	100	1.63	1.63	mst	mst	5.6	36.5	31.0	32.5			
	6	309.55	310.90	398.25	F	1.35	100	1.35	-	mlss	cmst	3.8	45.5	25.8	28.7			
	7	361.91	362.94	345.89	Gu	1.03	100	1.03	-	silt	silt	4.7	43.3	23.8	32.9			
	8	370.19	371.26	337.61	G1	1.07	100	1.07	-	fmlss	silt	5.9	48.0	25.2	26.8			
	9	388.75	389.32	319.50	H	0.57	100	0.57	-	flss/ silt	silt	0.9	48.8	24.7	26.5			
53	1A	285.16	286.59	509.94	B	1.43	100)			shale	-	-	79.4	-	-			
	1B	286.59	288.20		B	1.61	100)					-	75.6	-	-			
	1C	288.20	289.73		B	1.53	100)					-	82.9	-	-			
	1D	289.73	290.45		B	0.72	100)					-	61.3	-	-			
	1E	290.45	290.83		B	0.38	100)	10.95	-			-	88.0	-	-			
	1F	290.83	291.39		B	0.56	100)					-	58.3	-	-			
	1G	291.39	291.75		B	0.36	100)					-	90.2	-	-			
	1H	291.75	292.38		B	0.63	100)					-	87.7	-	-			
	1I	292.38	294.01		B	1.63	100)					-	52.1	-	-			
	1J	294.01	296.11		B	2.10	100)				-	silt	2.3	48.9	21.0	30.1		15.1
	2A	318.33	319.44	476.77	C	1.11	100)				fmlss	-	-	79.1	-	-		
	2B	319.44	320.68		C	1.24	100)	5.67					-	69.0	-	-		
	2C	320.68	321.58		C	0.90	100)						-	59.8	-	-		
	2D	321.58	323.01		C	1.23	100)						3.3	36.3	24.1	39.6		19.9
	2E	323.01	324.00		C	0.99	100)				-	mst	-	74.0	-	-		
	3A	341.27	341.84	453.83	D	0.57	100)	2.02			mlss	-	-	88.7	-	-		
3B	341.84	343.29		D	1.45	100)		1.45		-	silt	4.2	34.8	26.0	39.2		20.7	
4	396.67	399.03	398.43	F	2.36	100	2.36	2.36		fmlss	cmst	2.3	28.3	26.4	45.3		23.1	
5A	446.87	448.42	348.23	Gu	1.55	100	1.55	1.55		mst	cmst	2.8	40.5	21.0	38.5		18.5	
5B	453.72	454.97	341.38	G1	1.25	100)	2.75	-		mst		3.8	36.9	21.1	42.0		19.8	
5C	454.97	455.45		G1	0.48	100)						-	92.9	-	-		-	
5D	455.45	456.47		G1	1.02	100)					mst	-	65.4	-	-		-	

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
46-105	57 1	289.53	290.35	513.87	A	0.82	100	0.82		fmlss	mst						
	2A	307.72	309.27	495.68	B	1.55	100)			fmlss							
	2B		310.68		B	1.41)										
	2C		312.32		B	1.64)										
	2D		313.38		B	1.06	)	9.50	?								
	2E		315.35		B	1.97)										
	2F		317.22		B	1.87	)				mst						
	3A	341.18	342.79	462.22	C	1.61	100)			mlss							
	3B	342.79	344.98		C	2.19	)	3.80	?		mst						
	4	366.55	367.08	436.85	D	0.53	100	0.53	-	mlss	fmlss						
	5	375.32	376.59	428.08	E	1.27	100	1.27	-	mst	mst						
	6A	416.04	416.23	387.36	F	0.19	100)	3.12	(roof)	fmlss							
	6B		417.01		F	0.78	)		(roof)								
	6C		418.73		F	1.72	)		1.72			4.3	26.6	22.2	46.9		
	6D		419.16		F	0.43	)		(floor)		fmlss		88.0				
	7	452.09	452.39	351.31		0.30	100	0.30	-	flss	flss						
	8A	463.48	464.22	339.92	Gu	0.74	100)		?	mst	)	4.2	44.2	17.3	34.3		
	8B	464.22	465.11			0.89	)	1.63		.	mst)						
9A	472.50	473.37	330.90	G1	0.87	100)	2.15		mlss)							
9B		473.95			0.58	)		?		)	3.8	63.9	11.4	20.9			
9C		474.65			0.70	)				mst)							
10A	489.65	490.30	313.75	H	0.65	100)	1.35		flss/								
						)		-	silt	silt							
10B	490.30	491.00			0.70)											
58	1A	45.57	46.11	592.33	Above A	0.52	96)			fmlss	silt						not analysed
	1B	46.11	47.35		A	1.22	98)	3.55	-			-	94.3	-	-		
	1C	47.35	48.00		A	0.62	95)					-	66.9	-	-		
	1D	48.00	49.12		A	1.12	100)					-	94.8	-	-		
	2	90.01	91.29	547.89	A	1.28	100	1.28	-	mlss	mst	-	61.0	-	-		

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
58	3A	112.91	114.48	524.99	B	1.57	100)			cmst	fmlss	-	77.7	-	-	
cont.	3B	114.48	115.38		B	0.90	100)					-	76.7	-	-	
	3C	115.38	115.96		B	0.41	71)	8.38	-			-	90.7	-	-	
	3D	115.96	117.37		B	1.42	100)					-	57.9	-	-	
	3E	117.37	119.21		B	1.84	100)					-	58.8	-	-	
	3F	119.21	121.29		B	2.09	100)		2.09			2.1	38.0	26.2	35.8	19.0
	4A	144.48	145.87	493.42	C	1.39	100)		-	fmlss	mst	3.2	41.0	24.8	34.2	17.9
	4B	145.87	146.27		C	0.40	100)	1.79				-	66.0	-	-	-
	5	174.30	175.37	463.60	D	1.02	99)	1.02	-	mst	mst	-	32.7	-	-	
	6	185.01	185.77	452.89	D	0.76	100)	0.76	-	fmlss	mst	-	50.3	-	-	
	7	229.56	230.73	408.34	F	1.17	100)	1.17	-	mst	mst	3.0	42.6	19.5	37.9	17.5
	8	272.75	274.93	365.15	Gu	2.07	100)	2.07	2.07	fmlss	mst	1.7	35.4	23.4	41.2	20.1
	9	281.24	282.08	356.66	Gl	0.84	100)	0.84	-	flss	mst	-	37.9	-	-	
	59	1A	294.37	295.17	507.93	A		100)		fmlss	mst					
		1B	295.17	296.10		A		100)								
		2A	313.43	314.60	488.87	B		100)		mlss						
		2B	314.60	315.71		B		100)								
		2C	315.71	316.76		B		100)								
		2D	316.76	318.32		B		100)	11.47							
		2E	318.32	319.84		B		100)								
		2F	319.84	321.01		B		100)								
		2G	321.01	322.11		B		100)								
		2H	322.11	322.98		B		100)								
		2I	322.98	324.44		B		100)			mst					
		2J	324.44	324.90		B		100)								
		3A	346.88	348.01	455.42	C	1.06	97)								
		3B	348.01	348.85		C		100)	6.03	mlss						
		3C	348.85	349.93		C		100)								
		3D	349.93	351.87		C		100)								
		3E	351.87	352.91		C		100)			mst					

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam inter-val (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
59	4	377.74	378.70	424.56	D	0.96	100	0.96		mst	mst						
cont.	5	384.46	385.94	417.84	D	1.48	100	1.48		silt	mst						
	6	401.23	402.35	401.07	E	1.12	100	1.12		mlss	silt						
	7	423.29	424.03	379.01	F	0.74	100	0.74		flss	mst						
	8	429.39	430.14	372.91	F	0.75	100	0.75									
	9	451.33	451.73	350.97	U	0.40	100	0.40		mst	flss						
	10A	471.28	472.02	331.02	Gu	0.74	100)	2.12		mst	)	3.6	38.0	20.0	38.4		
	10B	472.02	473.40		Gu	0.38	100)			)	silt)						
	11	483.05	483.67	319.25	G1	0.62	100	0.62		flss/	mst/						
										silt	silt						
	12	492.42	493.37	309.88	H	0.95	100	0.95		silt	fmlss	5.5	74.3	10.7	9.5		
	13	497.73	499.00	304.57	H	1.27	100	1.27		mlss	mst	3.7	57.9	17.1	21.3		
	14	501.86	503.22	300.44	H	1.36	100	1.36		mst	mst						
	15	511.44	515.47	290.86	?	4.03	100	4.03	?	fmlss	fmlss						
	60	182.39	185.52	542.81	A	3.13	100	3.13	?	fmlss	mst						not sampled
		211.45	215.60	513.75	B	4.15	100	4.15	?	mst	mst						
		238.76	240.52	486.44	C	1.69	97	1.69	?	fmlss	mst						
		280.88	281.91	444.32	D	1.03	100	1.03		mst	mst						
		283.20	285.53	442.00	D	2.33	100	2.33		mst	mst						
		290.87	291.60	434.33	D	0.73	100	0.73		mst	shale						
		293.77	294.89	431.43	D	1.12	100	1.12		mst	mst						
		322.90	323.07	409.30	F	0.11	65	0.17		mst	mst						
		324.79	325.52	400.71	F	0.73	100	0.73		mst	flss						
	1	369.36	371.09	355.84	G	1.73	100	1.73	1.73	fmlss	flss/	3.4	36.4	22.5	37.7		
										mst							
	61	152.18	153.03	487.12	?C	0.85	100	0.85		Jdl	mst						
		178.66	179.68	460.64	?D	1.02	100	1.02		flss/	mst						
										mst							
		189.00	189.67	450.30	?D	0.67	100	0.67		shale/	mst						
										mst							

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)								
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)			
61	4A	228.47	228.67	410.83	F	0.20	100)	2.69)		mlss)								
cont.	4B	228.67	229.62		F	0.95	)	)			)	4.1	31.1	23.5	41.3		
	4C	229.62	231.16		F	1.54	)	)	2.49(?))								
	5A	273.90	274.66	365.40	Gu	0.76	100)	2.08	2.08	flss	mst)	4.4	35.1	20.2	40.3				
	5B	274.66	275.98		Gu	1.32	99))								
	6A	285.10	285.61	354.20	G1	0.51	100)	1.13	-	fmlss	flss)	4.6	52.2	15.5	27.7				
	6B	285.61	286.33		G1	0.62))								
	62	1	364.06	364.98	340.44	Gu	0.92	100	0.92	-	mst	mlss					not sampled		
		2	369.41	371.85	335.09	G1	2.44	100	2.44	?	mst	silt							
	64	1	140.94	141.72	485.06	C	0.78	100	0.78	-	mst	mst					not sampled		
		2A	189.58	190.46	436.42	D	0.88	100	0.88	-	mlss	mst							
		2B	193.50	194.04		D	0.54	100			mst	mst							
		2C	194.42	194.83		D	0.41	100			mst	shale							
		2D	196.07	196.98		D	0.91	100			shale	mst							
		3	199.54	200.43		D	0.89	100			mst/	mst							
											flss								
			314.08	315.92	311.92	H	1.84	100	1.84	?	mst	silt							
			320.05	320.49	305.95	H	0.44	100	0.44		mst	silt							
			F and G seams not present																
	65		200.27	200.51	372.43	Gu	0.24	100	0.24									not sampled	
			203.44	204.62	369.26	G1	1.18	100	1.18		mst	mst							
			268.60	268.79	304.10	minor	0.19	100	0.19										
	67		No coal seams present																
	75		211.55	211.64	373.65	Gu	0.09	100	0.09										
			213.50	214.63	371.70	G1	1.10	98	1.13		mst	mst							
			226.23	226.31		minor	0.08	100	0.08										
			242.66	242.92		minor	0.26	100	0.26										
			286.24	286.40		minor	0.16	100	0.16										

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
75 cont.	337.28	337.41		minor	0.13	100	0.13										
76 1	301.28	302.64	444.52	C	1.36	100	1.36		Jdl	mst							
2A	350.47	352.34	395.33)	D	1.87	)		1.87?	flss								
2B	352.34	353.55	)	upper	1.21	)	4.24										
2C	353.55	354.56	)	split	1.01)											
2D	354.56	354.71	)		0.15	)				mst							
2E	356.83	357.63	388.97)	D	0.80	)			mst								
2F	357.63	357.74	)	lower split	0.11	)	0.91	-		mst							
3	426.05	427.78	319.75	G	1.73		1.73	?	mst	mst							
4	445.27	446.62	300.53	H	1.35		1.35		flss/ silt	fmlss							
5A	451.78	453.03	294.02	H	1.25	)			mst/ silt								
5B	453.03	455.33		H	2.30	)	5.11	?									
5C	455.33	456.14		H	0.81)											
5D	456.14	456.89		H	0.75)											
77B	123.00	132.00	609.00	above	6.00	66	9.00	?									
	173.50	173.70	558.50	A	0.20	100	0.20	-									
	212.00	212.40	520.00	A	0.40	100	0.40	-									
	218.00	219.00		A	1.00	100	1.00	-									
	239.00	248.00	493.00	B	9.00	100	9.00	?									
	273.00	277.00	459.00	C	4.00	100	4.00	?									
	305.40	306.00	426.60	D	1.60	100	1.60	?									
	308.50	310.80		D	2.30	100	2.30	?									
	325.90	326.90	406.10	E	1.00	100	1.00	-									
	353.70	354.20	378.30	F	0.50	100	0.50	-									
	398.50	399.60	333.50	Gu	1.10	100	1.10	-									

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Table 13. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
77B	407.10	407.60	324.90	G1	0.50	100	0.50	-								
cont.	409.30	409.80	322.70	G1	0.50	100	0.50	-								
	418.51	418.80	313.49	minor	0.29	100	0.29	-								
	426.00	430.70	306.00	H	4.70	100	4.70	?								
78	54.88	55.18	591.62	above A	0.30	100	0.30	-								
	55.78	55.98	590.72	above A	0.20	100	0.20	-								
	56.43	56.78	590.07	above A	0.35	100	0.35	-								
	99.68	101.30	546.82	A	1.62	100	1.62	?								
	123.70	132.00	522.80	B	8.30	100	8.30	?								

* For discussion of coal seams see Section 6. F = Duncan seam; U = unnamed seam between F and G; G = East Fingal seam; u = upper; l = lower.

† lss = lithic sandstone; mst = mudstone; sb = stone band; lam = laminite; silt = siltstone; cmst = carbonaceous mudstone; mst/silt = interbedded mudstone/siltstone; m = medium-grained; f = fine-grained; fm = fine to medium-grained; Jdl = Jurassic dolerite; calc = calcite; clay = claystone.

x Moist = moisture; VCM = volatile carbonaceous matter; FC = fixed carbon; TS = total sulphur; SE = specific energy.

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Table 14. COAL SEAM INTERSECTIONS AND ANALYSES, AREA S.R. 32/81

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses* (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
46	1A	284.01	285.66	488.99	C	1.65	100)			mlss	mst	-	82.6				
	1B	285.66	287.04		C	1.38	)		-			-	83.7				
	1C	287.04	288.46		C	1.42	)	5.19				-	82.0				
	1D	288.46	289.20		C	0.74	)					-	62.1				
	2	316.64	317.96	456.36	D	1.29	98	1.29	-	mst	silt	-	45.7	11.0	43.3		
	3A	320.81	321.95	452.19	D	1.14	100)	2.13	2.13	mst	mst	-	38.9	13.8	47.3		
	3B	321.95	322.94		D	0.99	100)					-	44.5	13.0	42.5		
	4A	371.33	372.91	401.67	F	1.58	100)	2.14	1.58	mlss	mst	-	31.6	23.1	45.3		
	4B	372.91	373.47		F	0.56	100)					-	84.7				
	5A	426.53	426.84	346.47	Gu	0.31	100	0.31	-	mlss	mst	-	31.6	18.4	50.0		
	5B	430.71	432.48	342.29	G1	1.70	100	1.70	1.70	mst	mst	-	39.4	19.7	40.9		
	6	443.26	444.92	329.74	H	1.26	100	1.26	-	mst	mlss	-	82.4				
	49	1A	191.32	192.79	407.20	C	1.47	100)			mlss		-	73.0	-	-	
1B		192.79	194.48		C	1.69	100)					-	48.3	20.5	31.2		
1C		194.48	196.70		C	2.22	100)					-	76.1	-	-		
1D		196.70	198.80		C	2.10	100)					-	64.9	-	-		
1E		198.80	200.93		C	2.13	100)	16.89				-	45.8	17.8	36.4		
1F		200.93	202.31		C	1.38	100)					-	92.9	-	-		
1G		202.31	204.82		C	2.51	100)					-	82.5	-	-		
1H		204.82	207.27		C	2.45	100)		2.45			-	35.2	24.9	39.9		
1J		207.27	208.21		C	0.94	100)			-	silt	-	76.2	-	-		
2		329.73	332.71	268.79	H	2.98	100	2.98	-	mlss	flss/ mst	-	43.5	21.5	35.0		
3A		352.32	352.79	246.20	H	0.47	100)	1.87	-	mst	clay	-	91.1	-	-		
3B		352.79	354.19		H	1.40	100)		-			-	45.9	18.9	35.2		
Note: F (Duncan) seam represented by thin mudstone band G only 200 mm thick at R.L. 294.30 m.																	
50	-	109.83	110.63	453.37		0.80	100	0.80	-	shale	mst						
	1A	140.66	142.67	422.54	C	2.01)	9.80		fmlss	-	6.2	75.7	-	-		

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
50	1B	142.67	144.12	C	1.45	)			fmlss	-	5.2	54.6				
cont.	1C	144.12	147.38	C	3.26	)					6.5	77.2				
	1D	147.38	148.75	C	1.37	)					5.0	53.9				
	1E	148.75	150.46	C	1.71	)					7.9	65.3				
	2A	153.93	155.36	409.27	C	1.43	)	4.81	mst	-	6.9	78.6				
	2B	155.36	157.95	C	2.59	)					5.6	53.8				
	2C	157.95	158.74	C	0.79	)			-	shale	4.5	54.6				
	3	179.44	180.17	383.76	D	0.73		0.73	-	fmlss	mst	8.7	49.4	18.1	32.5	
	4	206.79	207.80	356.41		1.01		1.01	-	mlss	mst	7.1	33.0	21.6	45.4	
	-	252.83	253.78	310.37	G	0.95	(mudstone interval containing 200 mm of dull coal)									
	-	278.16	278.74	285.04	H	0.58		0.58	-	fmlss	mst	-	-			
	5	283.28	284.78	279.92	H	1.46		1.46	-	mst	mst	4.8	57.8			
	-	287.28	287.83	275.92	H	0.55		0.55	-	mst	mst	-	-			
	-	297.03	297.67	266.17	H	0.64		0.64	-	mst	silt	-	-			
	6	308.47	309.71	254.73	below H	1.24		1.24	-	mst	silt	4.1	57.9			
					H											
	51	1A	93.60	95.70	B	1.90	100)	2.29	-		-	80.5				
		1B	95.70	97.09	B	1.39	)				-	68.8				
		2A	123.06	123.99	C	0.93	)				9.8	89.4				
		2B		125.40	C	1.35	95)				6.7	69.6				
		2C		126.99	C	1.59	)				6.7	74.3				
		2D		128.32	C	1.33	)				7.4	81.4				
		2E		129.37	C	1.05	)	9.85	-		5.5	73.4				
		2F		130.04	C	0.67	)				6.9	34.7	24.5	30.8		
		2G		130.72	C	0.68	)				5.2	62.3				
		2H		131.94	C	1.22	)				5.3	87.4				
		2I		132.91	C	0.97)				5.7	66.9				
		3A	136.83	138.24	C	1.41)				7.1	76.0				
		3B		138.51	C	0.27)	3.25	-		7.4	88.7				
		3C		139.09	C	0.58)				3.9	65.1				

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof† rock	Floor† rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
51	3D	140.08		C	0.99	)					5.7	50.3				
cont.	4	143.27	144.28	C	1.01	100	1.01	-								
	5	164.09	165.14	D	1.05	100	1.05	-								
	6	168.43	169.45	D	1.02	100	1.02	-								
	7	251.35	252.25	H	0.90	100	0.90	-								
Not sampled:																
		61.09	61.52	?	0.43	100	0.43	-								
		189.58	190.80	E	0.22	100	0.22	-								
		229.88	230.01	333.32	G	0.13	100	0.13	-							
		230.77	231.07		G	0.30	100	0.30	-							
		232.81	232.95		G	0.14	100	0.14	-							
52	1	411.99	412.80	383.81	F	0.80	100	0.80	-	Jdl		3.8	58.2	9.3	32.5	11.84
	2A	436.79	437.75	359.01	minor	0.96	100)	4.91	-	silt	mst	3.8	82.5			
	2B	437.75	439.84		minor	2.09	100)		-			4.0	53.4	20.1	26.5	13.61
	2C	439.84	441.70		minor	1.86	100)		-			3.3	91.1			
	3	494.86	495.69	300.94	minor	0.83	100	0.83	-	mst	mst	3.8	49.7	16.1	34.2	15.01
54	-	391.55	392.20	320.25	F	0.65	100	0.65	-	Jdl	mst		-			
		422.45	424.75	289.35	G	2.30	100	2.30	?	lss	lss		-			
	1A	463.12	464.31	248.68	H	1.19	100	1.19	-	mst	mst		56.7	-	-	-
	1B	466.17	467.49		H	1.03	78	1.32	-	mst	silt		39.3	22.7	38.0	
55	1A	181.13	181.68	445.27	B	0.55	100)	5.32	-	mlss	-		67.5			
	1B	181.68	183.59		B	1.91	)						61.8			
	1C	183.59	185.89		B	2.30	)						46.7	17.3	36.0	
	1D	185.89	186.45		B	0.56	)			-	shale		72.7			
	2A	212.52	214.28	413.88	C	1.76	100)	4.38		mst	-		74.9			
	2B	214.28	214.67		C	0.39	)						91.3			
	2C	214.67	216.68		C	2.01	)		-				60.7			
	2D	216.68	217.00		C	0.32)			-	mst		81.8			
	3	244.08	245.39	382.32	D	1.31	100	1.31	-	mlss	mst		45.2	20.9	33.9	

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
55	4	249.99	252.16	376.41	D	2.17	100	2.17	2.17	mst	shale		39.5	25.9	34.6	
cont.	5	297.60	299.19	328.80	F	1.59	100	1.59	-	mlss	mst		54.1			
	6A	342.14	344.01	284.26	Gu	1.87	100	1.87	1.87	fmlss	silt		29.7	19.7	51.1	
	6B	346.10	348.23		Gl	2.13	100	2.13	2.13	silt	flss		38.9	22.6	38.5	
	7	365.61	366.52	260.79	H	0.91	100	0.91	-	silt	mst		51.1			
56	2	249.32	249.81	451.68	minor	0.49	100	0.49	-	flss	cmst	3.0	58.8	14.2	31.0	
	3A	302.60	303.50	398.40	B	0.89	99)	2.21	-	mlss	clay	5.3	45.2	24.8	30.0	
	3B	303.50	304.81		B	1.30	99)		-			5.7	52.1	24.1	23.8	
	3C	305.58	307.61		B	1.95	94	2.03	-	clay	mst	4.8	69.2	18.2	12.6	
	4A	330.08	331.30	370.92	C	1.22	100)	3.34	-	mflss	mst		82.0			
	4B	331.70	333.42		C	2.12	100)		-				74.0			
	5A	365.04	365.74	335.96	D	0.70	100	0.70	-			9.9	74.6	23.7	1.7	
	5B	366.61	368.04		D	1.43	100	1.43	-			5.2	49.2	25.4	25.4	
	6	381.04	381.57	319.43	E	0.53	100	0.53	-	fmlss	mst	-	22.1			
66	1	442.97	443.85	335.23	E	0.88	100	0.88	-	mlss	shale	6.1	30.1	24.3	45.6	
		489.23	489.51	288.97	U	0.28	100	0.28	-	mlss	mst					
		491.59	491.99		U	0.40	100	0.40	-	mst	mst					
	2	508.22	509.06	269.98	Gu	0.84	100	0.84	-	mst	mst	5.7	46.6	18.0	35.4	
		516.03	516.24	262.17	Gl	0.21	100		-	mst	mst					
	3	517.71	519.78	260.49	Gl	2.07	100	2.07	-	mst	flss/ silt	4.4	46.8	19.9	33.3	
	4	549.85	551.08	228.35	H	1.23	100	1.23	-	mlss	fmlss	4.6	53.0	-		
		F (Duncan) seam at R.L. 310.10 m, 200 mm thick, not sampled.														
68	1	452.71	453.51	326.39	E	0.80	100	0.80	-	Jdl	flss	3.8	67.8	10.4	21.8	
	2A	481.74	482.56	297.36	F	0.80	97)	1.98	-	mlss	mst	4.9	51.4	23.0	25.6	
	2B	482.56	483.72		F	1.16	)		-			4.6	69.3	19.2	11.5	
	3	516.29	516.86	262.81	Gu	0.57	100	0.57	-	flss	flss	10.2	56.7	21.8	21.5	
	4A	523.29	524.31	255.81	Gl	1.02	100)	3.19)	-	mflss	flss	4.7	63.1	19.4	17.5	
	4B	524.31	525.38		Gl	1.07	100))	-			3.3	46.9	22.2	30.9	

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
68	4C	525.38	526.48		G1	1.10	100)	-									
cont.	5	556.13	557.43	222.97	H	1.30	100	1.30	-	mst	silt	3.9	53.4	21.1	25.5		
69	1	444.05	445.56	271.05	G	1.51	100	1.51	-	mst	mst	3.5	49.1	25.3	25.6		
	2	476.69	477.13	238.41	H	0.44	100	0.44	-	mst	flss	2.9	24.8	31.9	43.3		
70	-	349.18	349.61	254.50	G	0.43	100	0.43	-	Jdl	cmst	-	-	-	-		
		353.04	350.28		G	0.64	100	0.64	-	mst	mst						
		355.85	356.27		G	0.42	100	0.42	-	mst	mst						
71	1A	267.67	270.00	386.23	B	2.33	100)	4.93	4.93	mlss	mst	4.8	51.2	18.6			
	1B	270.00	270.34		B	0.33	97)					8.8	89.9	-			
	1C	270.34	272.60		B	2.23	99)					4.5	68.2	-			
	2	328.70	331.60	325.20	D	2.90	100	2.90	-	mst	mst	6.4	46.7	20.1			
	3	346.92	347.58	306.98	E	0.66	100	0.66	-	mst	cmst	5.0	48.4	18.3			
	4	378.12	379.37	275.78	F	1.25	100	1.25	-	mlss	mst	4.4	57.3	-			
	5	383.15	383.85		F	0.70	100	0.70	-	mst	mst/ coal	4.6	33.9	25.3			
	6	463.88	404.50	250.02	U	0.62	100	0.62	-	mst	mst/ silt	3.5	79.9				
	7	409.28	409.86	244.62	Gu	0.58	100	0.58	-	mst/ silt	flss/ silt	4.4	59.2				
	8	414.10	415.17	239.80	G1	0.95	100	0.95	-	mlss	silt	4.5	56.3				
	9	417.00	418.55	236.90	G1	1.55	100	1.55	1.55	silt	mst/ silt	4.6	36.4	19.5			
	10	432.85	433.35	221.05	Ha	0.50	100	0.50	-	mst	mst	4.4	64.8				
	11	438.50	439.45	215.40	Hb	0.95	100	0.95	-	mst	mst	3.6	55.0				
72	No coal; dolerite intruded to below the level of the G (East Fingal) seam.																
73	1A	285.40	286.35	421.40	B	0.95	100)	4.78	-	mlss		4.6	29.7	29.6	40.7		
	1B	286.35	287.32		B	0.97	100)					5.7	69.4	23.4	12.2		
	1C	287.32	288.48		B	1.16	100)					6.0	74.2	19.6	6.2		

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam inter-val (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses* (dry basis)						
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)	
73	1D	288.48	289.04		B	0.56	100)					3.7	52.3	26.7	21.0		
cont.	1D	288.48	289.04		B	1.14	100)			-	mlss	4.5	49.5	26.9	23.6		
	2	316.52	317.35	390.28	C	0.83	100	0.83	-	silt	silt	5.4	40.4	31.0	28.6		
	3	344.44	345.44	362.36	D	1.00	100	1.00	-	mlss	mlss/ mst	10.2	50.3	30.6	19.1		
	4	350.24	352.00	356.56	D	1.76	100	1.76	1.76	mst	fmlss	6.2	31.7	33.2	35.1		
	5	365.80	367.07		E	1.27	100	1.27	-	fmlss	flss	5.0	48.2	24.7	27.1		
	6	397.02	398.00	309.78	F	0.95	100	0.98	-	mlss	cmst	4.7	53.3	25.0	21.7		
	7	441.00	441.95	265.80	Gu	0.95	100	0.95	-	mst	silt	4.3	53.3	21.9	19.8		
	8A	443.67	444.52	263.13	G1	0.85	100)	1.73	-	lss	mst	4.2	53.5	22.4	24.1		
	8B	444.52	445.00		G1	0.88	100)					1.5	24.0	28.5	47.5		
46-116	74	1	230.07	231.05	412.93	A	0.98	100	0.98	-	mst	cmst	-	77.0			
		2A	244.33	244.88	398.67	B	0.55	100)	5.35	-	mlss	cmst		78.8			
		2B	244.88	246.71		B	1.83	)						51.2		
		2C	246.71	249.00		B	2.29	)						69.9		
		2D	249.00	249.68		B	0.66	)						84.0		
		3A	273.01	274.30	369.99	C	1.29	100)	2.86	-	mlss	flss/ mst		73.9			
		3B	274.30	275.87			1.57	)		-				56.1		
		4	303.64	306.81	339.36	D	2.17	100	2.17	2.17	mst/ coal	mst	3.6	31.9	27.6	40.5	
		5	354.64	355.90	288.36	F	1.26	100	1.26	-	mlss	mst		56.0			
		6A	393.14	393.66	249.86	Gu	0.52	100)	1.05	-	mst	flss		85.2			
		6B	393.66	394.19		Gu	0.53	)						81.2		
		6C	395.18	396.61		Gu	1.43		1.43	-				51.0			
		7A	399.95	401.25	243.05	G1	1.30	100	1.80	-	flss	mst/ flss	5.0	39.4	18.3	42.2	
		7B	401.25	401.75		G1	0.50						4.3	30.6	24.0	45.4	

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses* (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
79	1	218.74	219.38	456.96	A	0.63	100	0.64	-	flss	mst	5.4	58.6	-	-	
	2	226.46	227.71	449.24	A	1.25	100	1.25	-	mst	fmlss	5.9	69.0	-	-	
	3A	274.00	274.95	401.70	B	0.95	100)	6.52		fmlss	-	2.6	63.6	-	-	
	3B		275.98		B	1.03	)					2.8	84.0	-	-	
	3C		277.00		B	1.02	)					2.4	49.5	-	-	
	3D		278.03		B	1.03	)					2.7	70.4	-	-	
	3E		278.35		B	0.32	)					4.1	90.7	-	-	
	3F		279.36		B	1.01	)					2.2	69.1	-	-	
	3G		280.52		B	1.16	)			-	mst	2.1	58.1	-	-	
	4	307.28	307.89	368.42	C	0.61	100	0.61	-	mst	clay	6.7	42.0	21.6	34.4	
46-117	5A	333.90	334.80	341.80	D	0.90	100)	4.17	2.08	fmlss	-	8.2	59.0	-	-	
	5B		336.88		D	2.08	)					6.6	31.9	26.6	41.5	
	5C		336.98		D	0.10	)					4.7	79.8	-	-	
	5D		338.07		D	1.09	)			-	mst	5.2	50.3	23.7	26.0	
	6	350.35	351.46	325.35	E	1.11	100	1.11	-	fmlss	flss	5.1	39.3	22.3	38.4	
7	384.56	385.30	291.14	F	0.64	100	0.64	-	cmst	mst	2.6	24.0	30.7	45.3		
8	410.45	411.30	265.25	Gu	0.85	100	0.85	-	flss	mst	5.4	44.2	19.3	36.3		
9	420.69	422.53	255.01	G1	1.84	100	1.84	1.84	mst/ silt	mst	4.8	33.0	22.8	44.2		
10	442.46	443.57	233.24	H	1.11	100	1.11	-	mst	mst	5.4	57.2	-			
80	1	244.35	246.22	347.85	D	1.87	100	1.87	?	fmlss/ mst	mst	4.0	75.1			
	-	327.04	327.22	265.16	Gu	0.18	100	0.18	-			-	-	-	-	
	2	338.09	339.18	254.11	G1	1.09	100	1.09	-	cmst	mst	6.9	59.9			
3	347.65	347.92	244.55	minor	0.27	100	0.27	-			3.2	33.6	24.9			
81	1	198.56	199.69	448.94	above A	1.13	100	1.13	-	shale	mst	4.3	52.6			
	2	226.90	227.92	420.60	A	1.02	100	1.02	-	shale	mst	6.8	77.6			
	3A	249.15	251.09	398.35	B	1.94	100)	4.83	?	fmlss		5.0	64.1			

Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam inter-val (m)	Working thickness (m)	Roof rock [†]	Floor rock [†]	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
81	3B	252.88		B	1.79	)		-			8.8	90.5				
cont.	3C	253.98		B	1.10	)			-	cmst	4.7	58.6				
	4	278.05	280.90	369.45	C	2.85	100	2.85	?	cmst	mst	7.1	67.3			
	5A	310.76	311.51	336.74	D	0.75	100)	3.20	?	fmlss	-	5.5	79.0			
	5B		311.96		D	0.45	)					6.7	37.0			
	5C		312.41		D	0.45	)		2.12			6.2	72.0			
	5D		313.63		D	1.22	)					6.3	27.3			
	5E		313.96		D	0.33	)			-	mst	3.5	62.9			
	-	329.79	330.75	317.71		0.96	100	0.96	-	fmlss	mst	-	-			
	6A	363.42	364.13	284.08	F	0.71	100	0.71	-	mst	mst	4.2	56.9			
	6B	366.51	366.95	280.99	F	0.44		0.44	-	mst	flss	5.3	31.0	25.3	43.7	
	7	403.52	404.66	243.98	Gu	1.14	100	1.14	-	fmlss	flss/ mst	5.5	49.5	16.4	34.1	
	8A	409.51	409.82	237.99	G1	0.31	100)	1.48	?	cmst	-	5.0	49.6	15.8	34.7	
	8B		409.95		G1	0.13	)					3.2	72.2	-	-	
	8C		410.99		G1	1.04	)			-	mst	4.8	46.4	17.9	35.7	
82		148.88	149.49	439.72	above	0.81	100	0.81	-	fmlss	mst	5.2	37.0	26.0	37.0	
	-	163.51	164.15	425.09	A	0.64		0.64	-	flss	mst	-	-			
	-	165.84	166.38	422.76	A	0.54		0.54	-	mst	mst	-	-			
	2A	187.65	188.80	400.95	B	1.15	100	4.18	-	mst	-	4.4	60.0			
	2B	188.80	189.73		B	0.93				-	-	4.7	72.3			
	2C	189.73	191.28		B	1.55				-	-	4.5	46.3	20.9	32.8	
	2D	191.28	191.83		B	0.55				-	mst	2.6	76.4			
	3A	219.42	219.80		C	0.38	100	1.68	-	mst	-	5.1	64.0			
	3B	219.80	220.97		C	0.13	98			-	-	5.0	44.4			
	3C	220.97	221.10		C	0.13	100			-	mst	3.6	56.6			
	4A	246.22	246.41	342.38	D	0.21	100	3.25	3.06	fmlss		6.8	79.8			
	4B	246.41	247.43		D	0.81	80			-	-	5.7	35.7	24.5	39.8	

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)				
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
82	4C	247.43	247.85	D	0.42	100			-	-	4.4	44.8	21.6	33.6	
cont.	4D	247.85	248.75	D	0.90				-	-	4.4	34.2	25.2	40.6	
	4E	248.75	249.47	D	0.62				-	mst	3.7	41.7	23.4	39.4	
	4B-4E	composite		D							4.6	38.5	23.8	37.7	19.88
	4B-4E	Fl.7 composite		D							4.5	21.7	28.5	49.8	
	5	263.88	265.14	324.72	E	1.26	1.26	-	fmlss	mst	4.6	33.0	21.4	45.6	
	6	268.08	268.71	320.52	E	0.63	0.63	-	flss	mst	3.8	52.9	-	-	
	-	294.95	295.17	293.65	F	0.22	0.22	-	mst	mst					
	-	295.47	295.83	293.13	F	0.36	0.36	-	mst	mst					
	7	297.59	297.95	291.01	F	0.36	0.36	-	mst	mst	4.4	36.1	24.4	39.5	
	-	300.75	301.21	287.85	F	0.46	0.46	-	mst	mst	-	-	-	-	
	8	325.26	325.92	263.34	Gu	0.64	0.64	-	fmlss	mst	4.8	46.1	18.6	35.3	
	9A	335.80	336.70	252.80	G1	0.90	1.94	1.94	mst		4.1	34.9	19.6	46.0	
	9B	336.70	336.84		G1	0.14	0.14	-	-		2.4	69.9	-	-	
	9C	336.84	337.74		G1	0.90	0.90	-	-	flss	4.4	28.0	24.7	47.3	
	9A-9C	composite		G1							4.0	35.4	21.7	42.9	20.48
	9A-9C	Fl.7 composite		G1							3.8	21.8	23.4	54.8	
83		185.16	185.90	490.54	above A	0.74	100	0.74	-						
		186.85	187.91	488.85	above A	1.06		1.06							
		192.65	193.49	483.05	above A	0.34		0.34	-						
		197.15	200.55	478.55	above A	3.40		3.40	?						
		221.29	228.67	454.41	above A	7.78		7.78	?						
		230.60	232.28	445.10	above A	1.68		1.68	?						

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Table 14. (continued)

DDH Sample No.	From (m)	To (m)	R.L. roof (m)	Seam*	Recovery		Seam interval (m)	Working thickness (m)	Roof [†] rock	Floor [†] rock	Proximate analyses ^x (dry basis)					
					(m)	(%)					Moist (%)	Ash (%)	VCM (%)	FC (%)	TS (%)	SE (MJ/kg)
83 cont.	235.48	235.95	440.22	above	0.47		0.47	-								
				A												
	254.51	262.03	421.19	A	7.52		7.52	?								
	281.34	289.20	394.36	B	7.86		7.86	?								
84	187.99	188.17	451.11	A	0.18	100	0.18	none								
	194.33	195.17	444.77	A	0.84	100	0.84	none								
	233.07	233.82	406.03	C	0.75	100	0.75	none								
85	86.51	87.27	447.53	B	0.76	100	0.76	none								
	109.38	124.05	338.15	C	14.67	100	14.67	?								
	147.83	148.32	343.48	D	0.49	100	0.49	none								
	235.78	236.36	298.02	H	0.58	100	0.58	none								
	240.30	241.60	293.50	H	1.30	100	1.30	none								
F (Duncan) and G (East Fingal) seams not present																

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* For discussion of coal seams see Section 6. F = Duncan seam; U = un-named seam between F and G; G = East Fingal seam; u = upper; l = lower.

† lss = lithic sandstone; mst = mudstone; sb = stone band; lam = laminite; silt = siltstone; cmst = carbonaceous mudstone; mst/silt = interbedded mudstone/siltstone; m = medium-grained; f = fine-grained; fm = fine to medium-grained; Jdl = Jurassic dolerite; calc = calcite; clay = claystone.

x Moist = moisture; VCM = volatile carbonaceous matter; FC = fixed carbon; TS = total sulphur; SE = specific energy.

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APPENDIX 4

A study of Duncan mine coal*

H.K. Wellington

As very little has been determined on Fingal coal apart from proximate analyses a sample of this material was sent to ACIRL for a number of additional tests.

When it was found that shale in a pile of coal left in the open was breaking down apparently more rapidly than the coal material it was decided to investigate the nature of this break down.

All test work has been done in accordance with practices employed in this laboratory for many years. However it should be noted that these practices do not in many instances conform to currently published methods of bodies such as the Standards Association of Australia.

SAMPLE HANDLING AT LABORATORY

Three tonnes of coal (Reg. No. 791905) were taken from the Duncan mine bins and delivered to the laboratory. The coal was unloaded by hand into wheelbarrows working back along the tray of the truck cleaning up the coal as the face advanced.

The first barrow went to Dump A, the second to Dump B, the third to Dump C, the fourth to Dump A and so on until the lorry was unloaded. The dumps were on a concrete slab.

Dump A was screened to yield a run-of-mine sizing analysis.

Dump B was screened on 63 mm the oversize being hand spalled so all passed this screen.

Dump C was similarly treated so all passed 63 mm. The material was then mixed and cut into two halves, one half being reserved for experimental work, the other half was added to Dump B.

The enlarged Dump B was mixed then spread evenly on the ground. Working around the periphery shovelfuls were placed in turn into five drums thus giving samples B-1, B-2, B-3, B-4 and B-5.

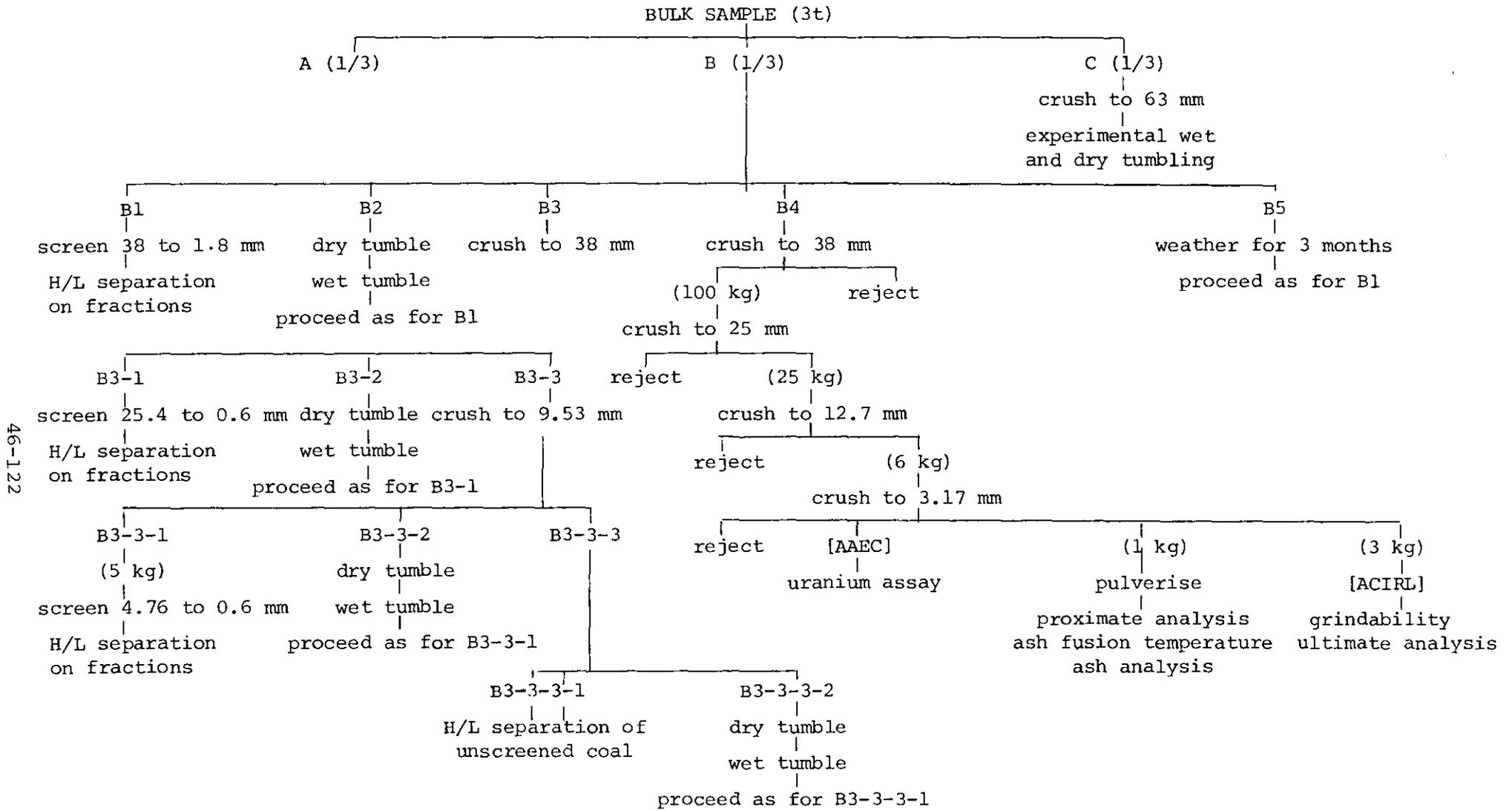
Sample B-1 was screened and the size fractions heavy liquid separated.

Sample B-2 was given a water treatment, air dried then screened and the fractions heavy liquid separated. It was necessary to do this water treatment in several separate runs.

Sample B-3 was screened to pass 38 mm, the oversize being crushed to pass this screen. From this three samples were cut and treated as follows:

Sample B-3-1 was screened and the size fractions heavy liquid separated.

* Ore Dressing Investigation R786.



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Note: Ash content will be determined in all products and proximate analysis with specific energy on all products with less than 30% ash.
 In addition, a maceral analysis by CSIRO will be carried out on the production of the -2.36 mm to -1.18 mm screen fraction from B1.

Figure 28. Flowchart for coal testing on bulk sample.

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Sample B-3-2 was water treated, air dried, screened and heavy liquid separated.

Sample B-3-3 screened on 9.5 mm and the oversize crushed to pass this screen. The sample was riffled down to get a kilogram for sizing and heavy liquid separation. The remainder was water treated, air dried, riffled to a kilogram for sizing and heavy liquid separation.

Sample B-4 was jaw crushed to pass 38 mm and then 100 kg was riffled out. This 100 kg was crushed to pass 25 mm then 25 kg was riffled out. This 25 kg was crushed to pass 12.7 mm and 6 kg was riffled out. This 6 kg was crushed to pass 3.17 mm then 3 kg was riffled out for ACIRL and 1 kg for analysis in this laboratory. A sample was also sent to AAEC, Lucas Heights for uranium assay.

Sample B-5 was left as a pile in the open from late October 1979 until April 1980 during which time the rainfall was only 150 mm. The sample was then rescreened and ash determined on the fractions.

HEAVY LIQUID SEPARATIONS

All samples for heavy liquid separation had the minus 0.6 mm material screened from them and excluded from testing except one. Samples were sized on 19.1, 9.53, 4.76, 2.36, 1.18 and 0.6 mm screens.

Samples B-1 and B-2 were screened on 38.1 mm in addition to those shown and likewise, B-3-1 and B-3-2 on 25.4 mm.

Heavy liquid separations were made at densities of 1.4, 1.6, 1.8 and 2.0 t/m³. After separation fractions were washed with Shellite and air dried.

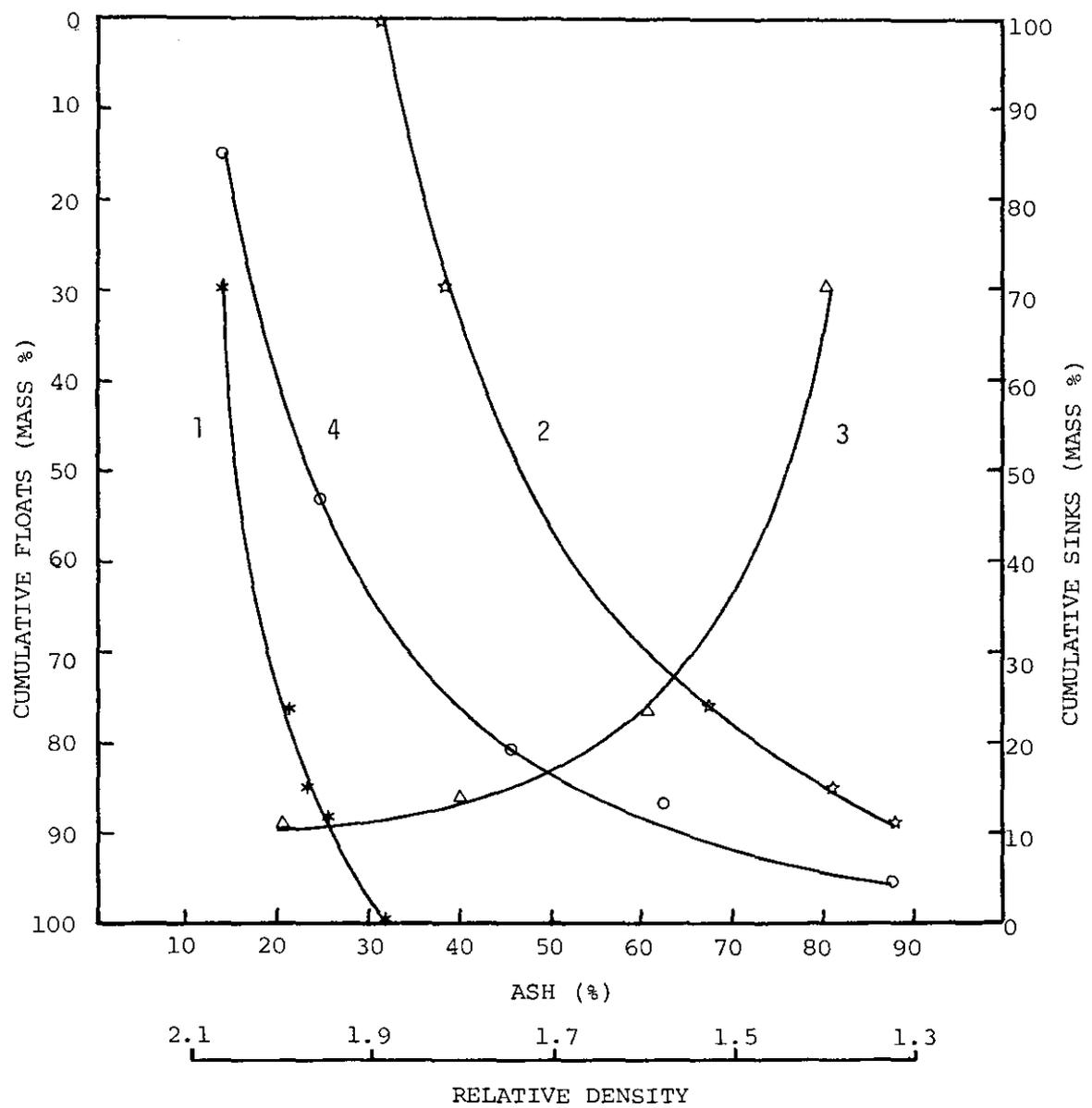
WATER TREATMENT

After some preliminary tumbling work the following procedures were adopted for the test work. In the case of sample B-2, water treatment was carried out batchwise. Each batch consisted of 20 kg of coal which was tumbled end for end in a 50 litre drum for 15 minutes. The drum rotated endwise 24 times per minute. At the end of the dry tumbling 30 litres of water was introduced and the coal was tumbled for a further 15 minutes. Fourteen batches of coal were tumbled.

The slime generated was decanted, and the residual coal was air dried. The slime from one decantation was saved and dried. The total slime produced was taken as 14 times the saved amount.

Sample B-3-2 was treated the same as sample B-2 except that it involved only five batches and the slime and fines generated were dried by lamp evaporation to remove the bulk of the water and finally air dried.

Sample B-3-3 which was -9.53 mm was given the water treatment by taking 2 kg of coal and dry tumbling for 15 minutes and then adding three litres of water and tumbling for a further 15 minutes. Three such batches were treated.



WASHABILITY CURVES
Curve 1: Cumulative floats
Curve 2: Cumulative sinks
Curve 3: Relative density
Curve 4: Instantaneous ash

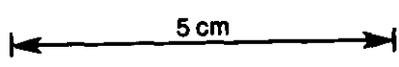
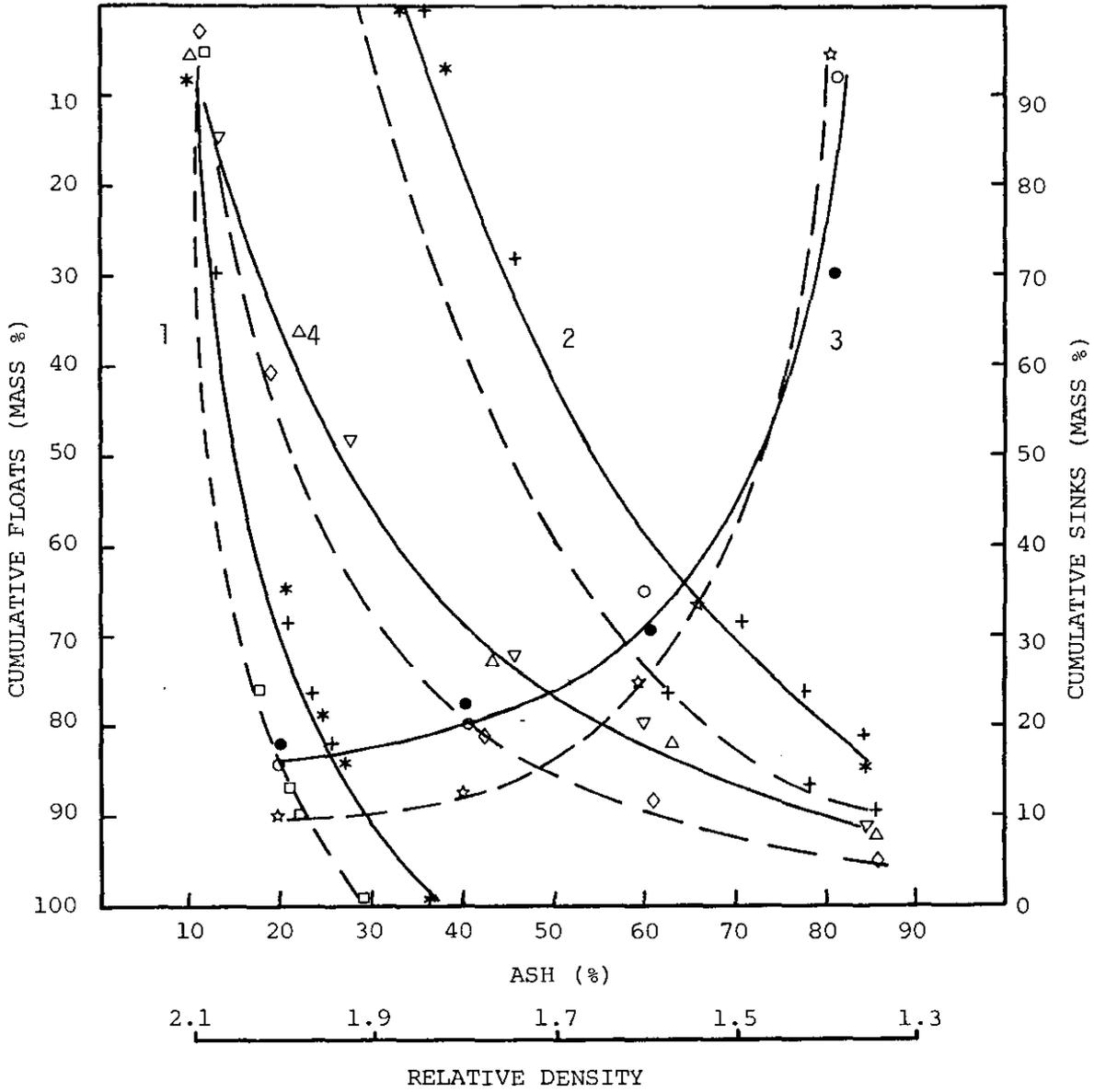
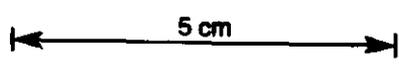


Figure 29. R786. Duncan run-of-mine coal. Sample B-1, -63, +0.6 mm.



Curves 1: Cumulative floats	B-2	* *	* +
	B-3-2	+ +	+ *
	B-3-3	□ □	□
Curves 2: Cumulative sinks	B-2	* *	* +
	B-3-2	+ +	+ *
	B-3-3	+ +	+
Curves 3: Relative density	B-2	○ ○	○ ●
	B-3-2	● ●	● ○
	B-3-3	☆ ☆	☆
Curves 4: Instantaneous ash	B-2	△ △	△ ☆
	B-3-2	▽ ▽	▽ △
	B-3-3	◇ ◇	◇

Figure 30.R786. Duncan run-of-mine coal. Comparison of washability curves, after water treatment. Samples B-2 (-63,+4.75 mm); B-3-2 (-38,+4.75 mm) and B-3-3 (-9.53,+4.75 mm).



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Table 15. PRODUCTS FROM DENSITY SEPARATIONS

Fraction		F/T ash (%)	Density (t/m ³)	% Mass			Remarks
Number	Size (mm)			F/T product	S/K reject	-0.6 mm untreated	
B-1	-63, +0.6	20	1.43	41	57	2	} No water treatment
		25	1.47	54	44	2	
		30	1.52	64	34	2	
B-2	-63, +0.6	20	1.43	43	51	6	} Water treated
		25	1.47	55	39	6	
		30	1.52	64	30	6	
B-3-1	-38, +0.6	20	(1.41)	43	53	4	} () by ex- trapolation No water treatment
		25	1.42	56	40	4	
		30	1.47	65	31	4	
B-3-2	-38, +0.6	20	1.40	45	49	6	} Water treated
		25	1.43	56	38	6	
		30	1.50	64	30	6	
B-3-3	-9.5, +0.6	20	1.46	41	47	12	} No water treatment
		25	1.50	51	37	12	
		30	1.55	59	29	12	
B-3-3	-9.5, +0.6	20	1.47	40	46	14	} Water treatment
		25	1.52	50	36	14	
		30	1.56	56	30	14	

Table 16. DENSITY SEPARATIONS TO GET A GIVEN ASH PRODUCT (all material +0.6 mm)

F/T ash (%)	Fraction		Density (t/m ³)	% Mass			Remarks
	Number	Size (mm)		F/T product	S/K reject	-0.6 mm untreated	
20	B-1	-63, +0.6	1.43	41	57	2	No water treatment. () by extrapolation
	B-3-1	-38, +0.6	(1.41)	43	53	4	
	B-3-3	-9.5, +0.6	1.46	41	47	12	
	B-2	-63, +0.6	1.43	43	51	6	Water treated
	B-3-2	-38, +0.6	1.40	45	49	6	
	B-3-3	-9.5, +0.6	1.47	40	46	14	
25	B-1	-63, +0.6	1.47	54	44	2	No water treatment
	B-3-1	-38, +0.6	1.42	56	40	4	
	B-3-3	-9.5, +0.6	1.50	51	37	12	
	B-2	-63, +0.6	1.47	55	39	6	Water treatment
	B-3-2	-38, +0.6	1.43	56	38	6	
	B-3-3	-9.5, +0.6	1.52	50	36	14	
30	B-1	-63, +0.6	1.52	64	34	2	No water treatment
	B-3-1	-38, +0.6	1.47	65	31	4	
	B-3-3	-9.5, +0.6	1.55	59	29	12	
	B-2	-63, +0.6	1.52	64	30	6	Water treatment
	B-3-2	-38, +0.6	1.50	64	30	6	
	B-3-3	-9.5, +0.6	1.56	56	30	14	

Table 17. DENSITY SEPARATIONS TO GET A GIVEN ASH PRODUCT (all material +4.75 mm)

F/T ash (%)	Fraction		Density (t/m ³)	F/T * product (% mass)	Percentage of total mass+	Remarks
	Number	Size (mm)				
20	B-1	-63, +4.7	1.44	40	92.3	No water treatment () by extrapolation
	B-3-1	-38, +4.7	(1.39)	40	85.9	
	B-3-3	-9.5, +4.7	1.43	42	37.8	
	B-2	-63, +4.7	1.42	35	81.9	Water treatment
	B-3-2	-63, +4.7	1.42	35	81.1	
	B-3-3	-9.5, +4.7	1.46	46	34.2	
25	B-1	-63, +4.7	1.47	51	92.3	No water treatment
	B-3-1	-38, +4.7	1.41	51	85.9	
	B-3-3	-9.5, +4.7	1.47	53	37.8	
	B-2	-63, +4.7	1.46	46	81.9	Water treatment
	B-3-2	-38, +4.7	1.46	46	81.1	
	B-3-3	-9.5, +4.7	1.51	60	34.2	
30	B-1	-63, +4.7	1.51	60	92.3	No water treatment
	B-3-1	-38, +4.7	1.46	60	85.9	
	B-3-3	-9.5, +4.7	1.52	63	37.8	
	B-2	-63, +4.7	1.50	55	81.9	Water treatment
	B-3-2	-38, +4.7	1.50	55	81.1	
	B-3-3	-9.5, +4.7	1.55	68	34.2	

* This is the percentage of product coal with the ash content shown derived from the size fraction shown, all fractions being +4.75 mm.

+ This is the percentage of the total coal (after water treatment where applicable) in the size fraction being considered.

Table 18. SIZING ANALYSES OF COAL SAMPLES

Aperture (mm)	No Water Treatment						Water Treatment						Weathering	
	B-1		B-3-1		B-3-3		B-2		B-3-2		B-3-3(W)		B-5	
	Mass %	Cum. mass %	Mass %	Cum. mass %	Mass %	Cum. mass %	Mass %	Cum. mass %	Mass %	Cum. mass %	Mass %	Cum. mass %	Mass %	Cum. mass %
+38.1	36.5	36.5	-	-	-	-	25.0	25.0	-	-	-	-	22.5	22.5
+25.4	-	-	34.8	34.8	-	-	-	-	24.2	24.2	-	-	-	-
+19.05	31.5	68.0	16.9	51.7	-	-	26.4	51.4	14.3	38.5	-	-	23.4	45.9
+9.53	18.0	86.0	25.2	74.9	-	-	19.0	70.4	28.0	66.5	-	-	20.3	66.2
+4.75	6.3	92.3	11.0	85.9	37.8	37.8	11.5	81.9	14.6	81.1	34.2	34.2	14.2	80.4
+2.36	2.5	94.8	5.2	91.1	26.2	64.0	6.8	88.7	6.2	87.3	26.3	60.5	8.1	88.5
+1.18	1.8	96.6	3.4	94.5	15.4	79.4	3.3	92.0	4.5	91.8	16.1	76.6	5.4	93.9
+0.60	1.2	97.8	2.0	96.5	8.7	88.1	1.8	93.8	2.7	94.5	9.2	85.8	2.8	96.7
-0.60	2.2	100	3.5	100	11.9	100	5.4	99.2	5.5	100	14.2	100	3.3	100
Slime	-	-	-	-	-	-	0.8	100	-	-	-	-	-	-

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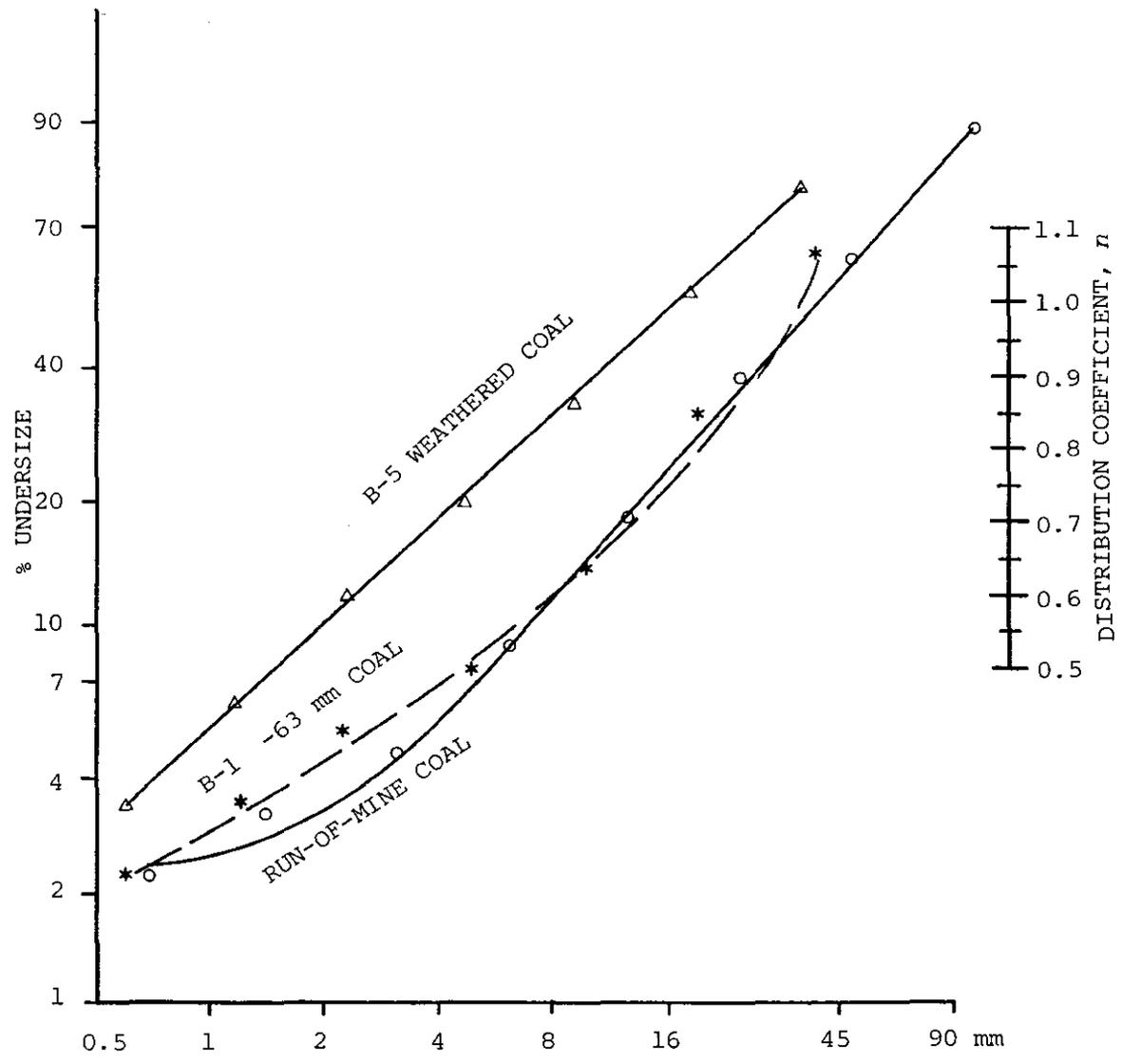
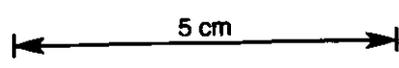


Figure 31. Rosin-Rammler plot of sizing analyses of coals A-1, B-1 and B-5.



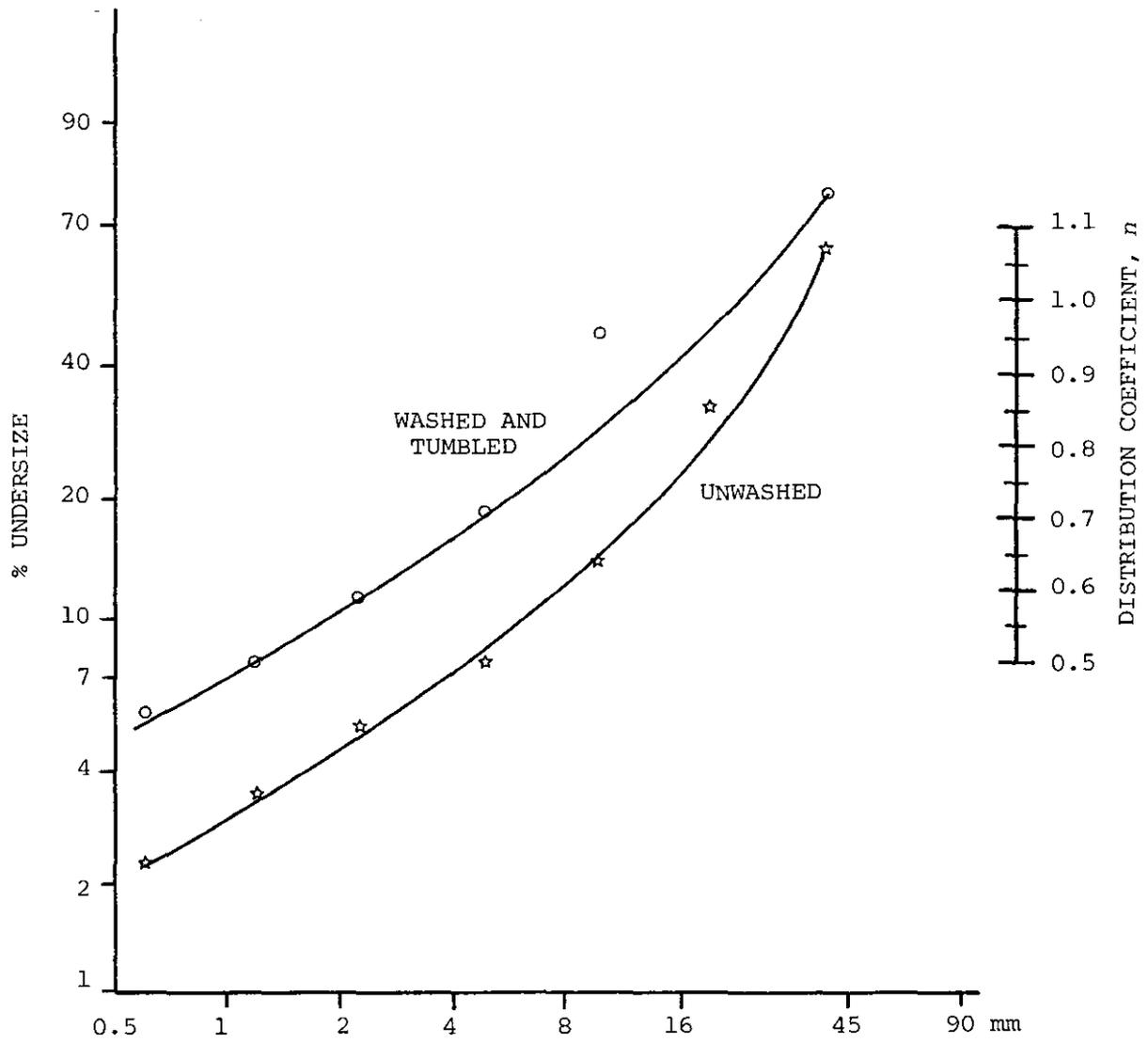
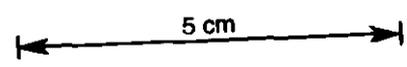


Figure 32. Rosin-Rammler plot of sizing analysis, -63 mm coal.



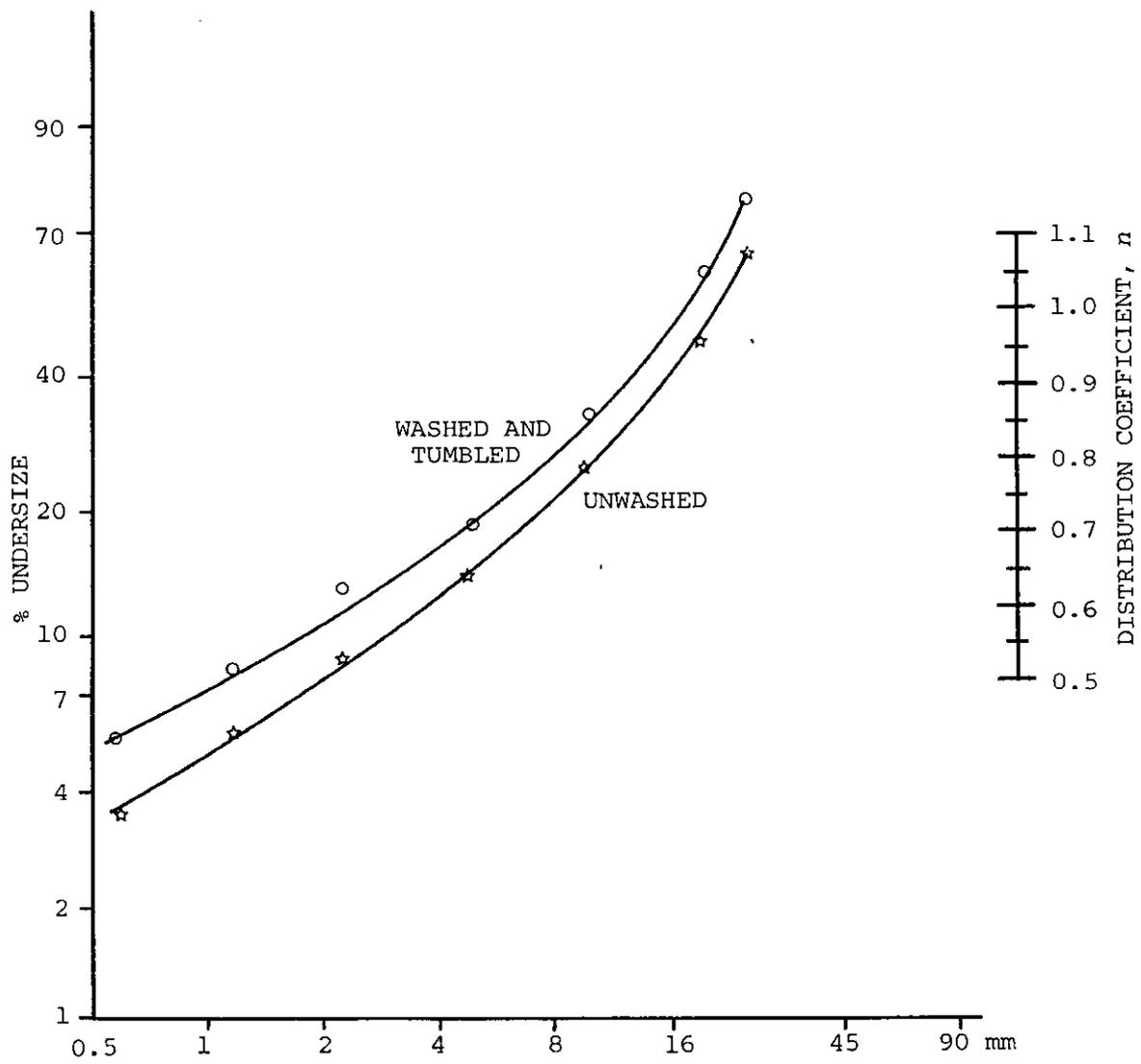
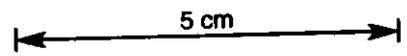


Figure 33. Rosin-Rammler plot of sizing analysis, -38 mm coal.



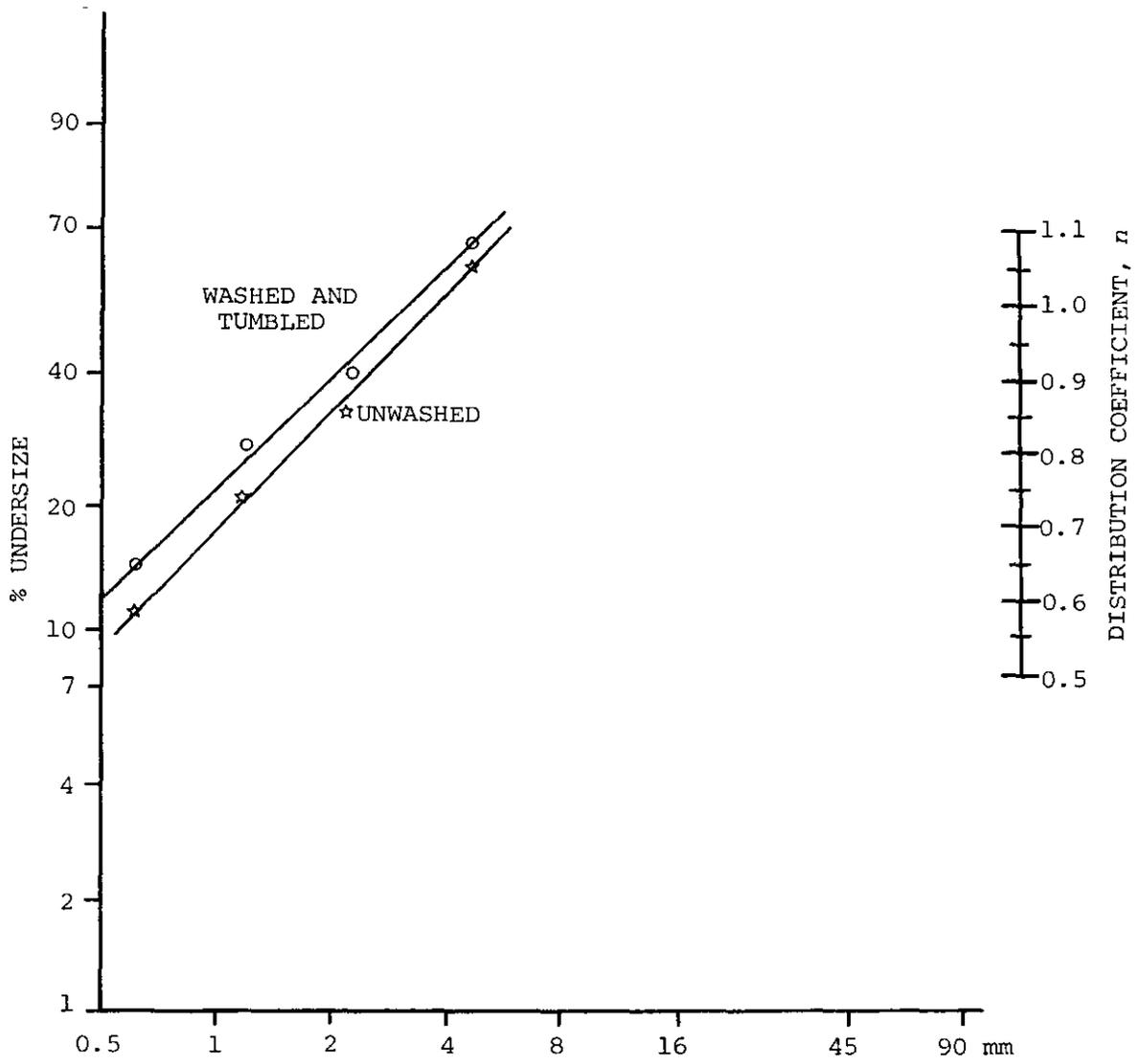


Figure 34. Rosin-Rammler plot of sizing analysis, -9.53 mm coal.

5 cm

Table 19. COMPARISON OF ASH IN UNWEATHERED AND WEATHERED COAL

Aperture (mm)	Mined Coal B-1				Weathered Coal B-5			
	Mass	(%)	Ash	Cum. ash	Mass	(%)	Ash	Cum. ash
	Cum.		(%)	(%)	Cum.		(%)	(%)
+38.1	36.5	36.5	30.9	30.9	22.5	22.5	26.6	26.6
+19.05	31.5	68.0	31.0	31.0	23.4	45.9	26.1	26.3
+9.53	18.0	86.0	31.1	31.0	20.3	66.2	28.3	26.9
+4.75	6.3	92.3	32.4	31.1	14.2	80.4	33.4	28.1
+2.36	2.5	94.8	33.3	31.1	8.1	88.5	43.6	29.5
+1.18	1.8	96.6	33.0	31.1	5.4	93.9	52.3	30.8
+0.60	1.2	97.8	34.0	31.2	2.8	96.7	53.2	31.5
-0.60	2.2	100	37.2	31.3	3.3	100	34.9	31.9
H	100		31.3		100		31.9	

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Screen weathered coal on 9.53 mm to yield +9.53 66.2% of mass assaying 26.9% ash reject 41.6% ash
 Screen weathered coal on 4.75 mm to yield +4.75 80.4% of mass assaying 28.1% ash reject 47.5% ash

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PRESENTATION OF RESULTS

The results of heavy liquid separation tests on each size fraction of each sample are given in Tables 20-25 and Figures 29 and 30.

In Tables 28 and 29 these results have been presented to show the total floats etc. in each density range. Table 28 shows those for unwashed coals and Table 29 those for the same coals after being given a water treatment.

Washability curves have been done for each size of coal namely -63, +0.6 mm; -38, +0.6 mm and -9.5, +0.6 mm both for unwashed and water treated material. As all curves are of similar shape only that for Sample B-1 (-63, +0.6 mm) unwashed has been included. All the curves show the coal is difficult to wash. As there is insufficient data no curves for ± 0.1 relative density have been plotted.

Washability curves have also been drawn for the coarser material in each sample namely the +4.75 mm to see if any differences were apparent. The unwashed samples gave very similar curves but after water treatment the -9.5, +4.7 mm differed markedly from the other two. These curves have been included to show the differences.

From the washability curves the yields of coal with ash contents of 20, 25 and 30% have been obtained together with the density of separation indicated to achieve this result. These are presented in Table 15 where the yields have been corrected for the untreated -0.6 mm material.

The data in Table 15 have been rearranged in Table 16. If heavy liquid separation results were independent of the size of the coal separated each group of three should give the same results. Curiously the (-38, +0.6 mm) results all show a lower separation density than those of the other two in each group. It may be worth noting that one operator did B-3-1 and B-3-2 (-38, +0.6 mm) and another did the rest.

Table 17 is similar to Table 16 but it deals only with coal coarser than 4.75 mm. Because of the greater size reduction to produce the -9.5 mm product only a little over a third of the total mass is being considered here in the finest sample whereas almost the whole mass is being included for the coarsest (-63 mm) sample.

SIZING RESULTS

The run-of-mine coal sized as follows:

Sample A

Aperture (mm)	Mass (%)	Cum. Mass (%)
+102	10.5	10.5
+51	25.4	35.9
+25.4	25.6	61.5
+12.7	20.4	81.9
+6.35	9.4	91.3
+3.17	4.0	95.3
+1.4	1.5	96.8
+0.7	1.0	97.8
-0.7	2.2	100

The sizings of samples used in heavy liquid tests are given in Table 18 together with the sizings of samples subjected to water treatment and weathering.

Rosin-Rammmer plots (fig. 31-34) have been made to show the effect of water treatment on the sizing. It should be observed that none of the curves for 63 and 38 mm coals are straight lines. The plot for run-of-mine coal A, is a straight line except for the finest sizes. The weathered coal B-5, plots as a straight line, even though it was derived from B-1.

The results of weathering are given in Table 19. While it is not possible to get a low (20% ash) product quite a high yield (80%) of coarse (+4.7 mm) coal is possible at 28% ash. While the weathering time was longer than one would contemplate for a commercial operation this selective weathering and simple screening should be further investigated as it may be possible to accelerate the shale breakdown e.g. by spraying the dumps with water.

RESULTS OF ANALYSES ON HEAD SAMPLE 791905 (B-4)

The following results were obtained by ACIRL as furnished in their Report No. 01 - 1916 dated 11 January 1980,

On a dry ash free basis: C	-	82.04%
H	-	4.59%
N	-	1.28%
S	-	0.48%
O	-	11.61%

On an as analysed basis: Moisture	-	4.6%
Ash	-	30.7%
Sulphur	-	0.31%
Carbonates (CO ₂)	-	0.26%
Forms of sulphur - Pyritic	-	0.13%
Sulphate	-	0.02%
Organic	-	0.16%

All of the foregoing determinations were done in accordance with BS 1016.

Hardgrove Grindability Index - 54

The above determination was done in accordance with AS K164 - 1977.

The following results were obtained in this laboratory using our normal laboratory procedures.

On an as received basis: Moisture - 3.7%

Proximate analysis on a moisture free basis -

V.C.M.	-	24.5%
Ash	-	31.3%
F.C. (by difference)		44.2%

Ash analysis	-	SiO ₂	-	62.0%
		Al ₂ O ₃	-	27.5%
		Fe ₂ O ₃	-	4.2%
		MnO	-	0.09%
		P ₂ O ₅	-	0.01%
		TiO ₂	-	1.1%
		CaO	-	1.6%
		MgO	-	1.1%
		K ₂ O	-	1.4%
		Na ₂ O	-	0.41%
		SO ₃	-	0.41%
		U	-	<4 g/t

Ash Fusion Temperature - 1620°C (oxidizing atmosphere)

URANIUM CONTENT

Neutron activation in duplicate by the AAEC on B-4 gave:

2.6 ± 0.2 g/t U
2.5 ± 0.2 g/t U

If all the uranium in the coal was in the ash then the ash uranium content would have been 8 g/t which should have been detected in the Department's ash analysis. As it wasn't, perhaps it was lost in the ashing process.

DISCUSSION

The Rosin-Rammler Plots (fig. 31-34) show firstly the run-of-mine coal received contains more fines than it should otherwise the plot would have been a straight line as the product of a single breaking operation namely the continuous miner. This probably means more fines were gathered from the bottom of a bin or something of that nature.

The Rosin-Rammler plots for the -63 mm and -38 mm coals are curved, indication of the secondary breaking to pass these screens. The -9.5 mm plot is again a straight line indication of the dominating influence of the jaw crusher in reducing this sample from the larger size.

Probably most noteworthy is the straight line plot of B-5, the weathered coal derived from B-1. Not only could this indicate the weathering as a breaking operation obeying the observed rules of man made breakers but it also could support a theory that all the stockpile is weathering homogeneously and not just at the surface of the stockpile. Conversely it may be coincidence that the straight line resulted from the interaction of these two factors in this case.

The washability curves for all products examined are all very similar. They indicate the coal will be difficult to wash but beyond that because of the currently held view that washery design cannot be based on cores less than 200 mm diameter one should not go any further.

The water washing treatment given can be related neither to washery practice nor to ACIRL water washing practice. The curves given for +4.75 mm materials show a marked displacement of the -9.53 mm material but elsewhere no similar displacement of the curves was found.

In Table 17 the summary of coal yields for 20, 25 and 30% ash gives a uniform picture for each coal size with results for -63 mm, +0.6 mm and

-38 mm, +0.6 mm agreeing reasonably well for product yield if not for density of separation. The finer coal (-9.53 mm, +0.6 mm) shows a lower yield.

If each size of coal behaved in the same way, then each set of results in Table 16 should be identical within the limits of experimental error.

Bearing in mind the non-standard methods of analysis and the different operators employed it is probably best not to draw more than indications from this table, namely that:

- (1) Water washing does not appear to affect the coal yield very much as indicated by subsequent heavy liquid separation tests.
- (2) The yield of coal containing 20% ash would appear to be between 40 and 45%, of 25% ash between 50 and 56% and of 30% ash 56 and 65%. It is probably worth noting that the head assay is only just over 30% ash hence this low recovery is indicative of the poor washing characteristics of this coal.

Table 17, which summarises results on coarser material, does show greater differences between procedures and initial crushing size. In general the more finely crushed gave a better yield of coal but the amount of coal in this fraction is less than half that in the other fractions. Thus from a study of the coarser material the conclusions are:

- (1) That water washing does have an effect in reducing the yield of coal from the coarser sizes and increasing the yield from more finely crushed coal.
- (2) The -9.5 mm material behaves differently from the more coarsely crushed material and markedly so after water treatment.

Thus one has rather conflicting results hence the conclusion that much more work needs to be done on this coal.

Heavy liquid separation on -9.53 mm material from which the -0.6 mm material was not removed did not show any significant difference from the results obtained when this fine material was removed.

An examination of the ash analyses of the 1.4 F/T fractions will reveal that the ash values decrease as the sizing decreases. It is felt that this is because the coal absorbs the heavy liquid into the surface.

The overall specific gravity of a large piece of coal is not affected but the overall specific gravity of a small piece is largely affected, and thus a piece of coal containing 14% ash floats when large and sinks when small. The smaller the piece of coal the greater is the effect.

This is confirmed by the fact that the sum of the masses of the air dried density fractions of any size fraction in the lower range of sizes was greater than the original mass of the size fraction.

The weathering test is interesting. While expert opinion confirmed that shale breakdown in a stockpile was to be expected it dismissed this effect as being minimal over the whole body of such a stockpile as it was thought such shale breakdown would be confined to the outer surface of such a stockpile. However the Rosin-Rammler plot (straight line) and the results

in Table 19 show that something much more significant has occurred witness the decreased ash assays of the coarser material and the greatly increased ash assays of the finer material.

Compare these heavy liquid test results with those from the weathering test:

Ash in product coal (%)	Coal yields (%)	
	-63, +0.6 mm (ex Table 16)	-63, +4.7 mm (ex Table 17)
20	41	40 (37)
25	54	51 (47)
30	64	60 (55)

() Overall yields

Weathered -63 mm coal screened on 9.53 mm yielded a +9.5 mm product assaying 27% ash and containing 66% of the mass and a -9.5 mm product assaying 42% ash. If screened on 4.75 mm the corresponding results are +4.7 mm assaying 28% ash and containing 80% of the mass with the -4.7 mm fraction assaying 48% ash.

CONCLUSION

While a lot of work has been done in this project on heavy liquid separation of this coal no clear evidence has been produced of a relationship between results obtained from initially finely crushed coal and initially coarsely crushed coal. In fact the finding that such differences as may exist may be masked by the presence of fine coal is the main conclusion to be drawn regarding heavy liquid separations.

Due to absorption of the heavy liquid at the coal surface fine coal particles are made denser and hence respond in that way. Larger coal lumps having relatively much less surface area are not so affected.

The coal or more importantly the shale with it is affected by water but as it is unlikely any of our small bore core will be used for washery design tests this aspect is unlikely to be pursued further.

Weathering of the run-of-mine coal in surface stockpiles shows a preferential size reduction of the ash components. By following this line it may be possible to devise a simple beneficiation process.

During the progress of this project it was realised that our analytical methods and equipment fall short of present practice and hence results may not be acceptable universally.

As an overall conclusion while the application of currently accepted procedures to this coal do not offer much encouragement for beneficiation a radically different approach through screening and weathering may be worth investigation.

Table 20. HEAVY LIQUID TEST DATA. SAMPLE B1 (-63 mm).

	1	2	3	4	5	6	7	8	9	10	11	12
	SIZE			FRACTION			BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
1.4 F/T	34.8	14.8	515.23	34.8	515.23	14.8	100.0	3090.10	(30.9)	17.4	-	
1.4-1.6	41.7	24.1	1005.53	76.5	1520.76	(19.9)	65.2	2574.87	(39.5)	55.7	51.5	
1.6-1.8	9.8	44.5	437.07	86.3	1957.83	(22.7)	23.5	1569.34	(66.9)	81.4	12.8	
1.8-2.0	3.0	62.1	184.08	89.3	2141.91	(24.0)	13.7	1132.27	(83.0)	87.8	-	
2.0 S/K	10.7	88.8	948.19	100.0	3090.10	(30.9)	10.7	948.19	88.8	94.7	-	
+38.10mm	100.0	(30.9)										
1.4 F/T	36.9	14.8	546.60	36.9	546.60	14.8	100.0	3098.95	(31.0)	18.5	-	
1.4-1.6	41.7	26.8	1119.12	78.6	1665.72	(21.2)	63.1	2552.35	(40.5)	57.8	50.6	
1.6-1.8	8.9	46.2	409.82	87.5	2075.54	(23.7)	21.4	1433.23	(67.3)	83.1	11.9	
1.8-2.0	3.0	62.8	186.86	90.5	2262.40	(25.0)	12.5	1023.41	(82.3)	89.0	-	
2.0 S/K	9.5	88.4	836.55	100.0	3098.95	(31.0)	9.5	836.55	88.4	95.3	-	
+19.05mm	100.0	(31.0)										
1.4 F/T	18.7	12.3	229.61	18.7	229.61	12.3	100.0	3112.21	(31.1)	9.4	-	
1.4-1.6	57.3	23.2	1328.42	76.0	1558.03	(20.5)	81.3	2882.60	(35.4)	47.4	68.9	
1.6-1.8	9.8	45.7	448.83	85.8	2006.86	(23.4)	24.0	1554.18	(64.6)	80.9	14.0	
1.8-2.0	4.2	61.7	262.29	90.0	2269.15	(25.2)	14.2	1105.35	(77.6)	87.9	-	
2.0 S/K	10.0	84.3	843.06	100.0	3112.21	(31.1)	10.0	843.06	84.3	95.0	-	
+9.53mm	100.0	(31.1)										
1.4 F/T	15.9	10.6	169.08	15.9	169.08	10.6	100.0	3240.14	(32.4)	8.0	-	
1.4-1.6	58.3	23.2	1351.60	74.2	1520.68	(20.5)	84.1	3071.06	(36.5)	45.1	66.9	
1.6-1.8	8.6	42.8	370.18	82.8	1890.86	(22.8)	25.8	1719.46	(66.7)	78.5	12.9	
1.8-2.0	4.3	61.6	263.38	87.1	2154.24	(24.7)	17.2	1349.28	(78.7)	85.0	-	
2.0 S/K	12.9	84.4	1085.90	100.0	3240.14	(32.4)	12.9	1085.90	84.4	93.6	-	
+4.75mm	100.0	(32.4)										

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Table 20. (continued)

1	2	3	4	5	6	7	8	9	10	11	12
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) - $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1
1.4 F/T	11.1	8.0	88.93	11.1	88.93	8.0	100.0	3329.19	(33.3)	5.6	-
1.4-1.6	57.1	20.7	1182.72	68.2	1271.65	(18.6)	88.9	3240.24	(36.5)	39.7	68.9
1.6-1.8	11.8	41.3	485.55	80.0	1757.20	(22.0)	31.8	2057.54	(64.8)	74.1	16.5
1.8-2.0	4.7	62.0	289.30	84.7	2046.50	(24.2)	20.0	1571.99	(78.6)	82.4	-
2.0 S/K	15.3	83.7	1282.69	100.0	3329.19	(33.3)	15.3	1282.69	83.7	92.4	-
+2.36mm	100.0	(33.3)									
1.4 F/T	12.6	7.5	94.71	12.6	94.71	7.5	100.0	3298.65	(33.0)	6.3	-
1.4-1.6	55.4	20.0	1107.69	68.0	1202.40	(17.7)	87.4	3203.94	(36.7)	40.3	65.0
1.6-1.8	9.6	40.3	384.92	77.6	1587.32	(20.5)	32.0	2096.25	(65.5)	72.8	14.8
1.8-2.0	5.2	57.6	299.08	82.8	1886.40	(22.8)	22.4	1711.33	(76.3)	80.2	-
2.0 S/K	17.2	81.9	1412.25	100.0	3298.65	(33.0)	17.2	1412.25	81.9	91.4	-
+1.18mm	100.0	(33.0)									
1.4 F/T	10.1	8.6	86.80	10.1	86.80	8.6	100.0	3397.74	(34.0)	5.1	-
1.4-1.6	52.5	18.3	960.75	62.6	1047.55	(16.7)	89.9	3310.94	(36.8)	36.4	64.4
1.6-1.8	11.9	38.9	464.64	74.5	1512.19	(20.3)	37.4	2350.19	(62.8)	68.6	17.9
1.8-2.0	6.0	55.8	335.83	80.5	1848.02	(22.9)	25.5	1885.55	(74.1)	77.5	-
2.0 S/K	19.5	79.7	1549.72	100.0	3397.74	(34.0)	19.5	1549.72	79.7	90.3	-
+600 μ m	100.0	(34.0)									
-600 μ m											

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Table 20. HEAVY LIQUID TEST DATA. SAMPLE B1 (-63 mm).

	1	13	14	15	16	17	18	19	20	21
			BULK		SAMPLE		BASIS			
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	
1.4 F/T	12.7	14.8	188.42	12.7	188.42	14.8	36.5	1130.05	(30.9)	
1.4-1.6	15.2	24.1	367.72	27.9	556.14	(17.9)	23.8	941.63	(39.5)	
1.6-1.8	3.6	44.5	159.84	31.5	715.98	(22.7)	8.6	573.91	(66.9)	
1.8-2.0	1.1	62.1	67.32	32.6	783.30	(24.0)	5.0	414.07	(83.0)	
2.0 S/K	3.9	88.8	346.75	36.5	1130.05	(30.9)	3.9	346.75	(88.8)	
+38.10mm	36.5	(30.9)	1130.05							
1.4 F/T	11.6	14.8	172.08	11.6	172.08	14.8	31.5	975.62	(31.0)	
1.4-1.6	13.2	26.8	352.33	24.8	524.41	(21.2)	19.9	803.54	(40.5)	
1.6-1.8	2.8	46.2	129.02	27.6	653.43	(23.7)	6.7	451.21	(67.3)	
1.8-2.0	0.9	62.8	58.83	28.5	712.26	(25.0)	3.9	322.19	(82.3)	
2.0 S/K	3.0	88.4	263.36	31.5	975.62	(31.0)	3.0	263.36	88.4	
+19.05mm	31.5	(31.0)	975.62							
1.4 F/T	3.4	12.3	41.45	3.4	41.45	12.3	18.0	561.81	(31.1)	
1.4-1.6	10.3	23.2	239.80	13.7	281.25	(20.5)	14.6	520.36	(35.4)	
1.6-1.8	1.8	45.7	81.02	15.5	362.27	(23.4)	4.3	280.56	(64.6)	
1.8-2.0	0.7	61.7	47.35	16.2	409.62	(25.2)	2.5	199.54	(77.6)	
2.0 S/K	1.8	84.3	152.19	18.0	561.81	(31.1)	1.8	152.19	84.3	
+9.53mm	18.0	(31.1)	561.81							
1.4 F/T	1.0	10.6	10.60	1.0	10.60	10.6	6.3	203.20	(32.4)	
1.4-1.6	3.7	23.2	84.77	4.7	95.37	(20.5)	5.3	192.60	(36.5)	
1.6-1.8	0.5	42.8	23.21	5.2	118.58	(22.8)	1.6	107.83	(66.7)	
1.8-2.0	0.3	61.6	16.52	5.5	135.10	(24.7)	1.1	84.62	(78.7)	
2.0 S/K	0.8	84.4	68.10	6.3	203.20	(32.4)	0.8	68.10	84.4	
+4.75mm	6.3	(32.4)	203.20							

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Table 20. (continued)

1	13	14	15	16	17	18	19	20	21
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks		
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%
1.4 F/T	0.3	8.0	2.21	0.3	2.21	8.0	2.5	82.57	(33.3)
1.4-1.6	1.4	20.7	29.34	1.7	31.55	(18.6)	2.2	80.36	(36.5)
1.6-1.8	0.3	41.3	12.04	2.0	43.59	(22.0)	0.8	51.02	(64.8)
1.8-2.0	0.1	62.0	7.17	2.1	50.76	(24.2)	0.5	38.98	(78.6)
2.0 S/K	0.4	83.7	31.81	2.5	82.57	(33.3)	0.4	31.81	83.7
+2.36mm	2.5	(33.3)	82.57						
1.4 F/T	0.2	7.5	1.68	0.2	1.68	7.5	1.8	58.63	(33.0)
1.4-1.6	1.0	20.0	19.69	1.2	21.37	(17.7)	1.6	56.95	(36.7)
1.6-1.8	0.2	40.3	6.84	1.4	28.21	(20.5)	0.6	37.26	(65.5)
1.8-2.0	0.1	57.6	5.32	1.5	33.53	(22.8)	0.4	30.42	(76.3)
2.0 S/K	0.3	81.9	25.10	1.8	58.63	(33.0)	0.3	25.10	81.9
+1.18mm	1.8	(33.0)	58.63						
1.4 F/T	0.1	8.6	1.03	0.1	1.03	8.6	1.2	40.42	(34.0)
1.4-1.6	0.6	18.3	11.43	0.7	12.46	(16.7)	1.1	39.39	(36.8)
1.6-1.8	0.2	38.9	5.53	0.9	17.99	(20.3)	0.5	27.96	(62.8)
1.8-2.0	0.1	55.8	4.00	1.0	21.99	(22.9)	0.3	22.43	(74.1)
2.0 S/K	0.2	79.7	18.43	1.2	40.42	(34.0)	0.2	18.43	79.7
+600 μm	1.2	(34.0)	40.42						
-600 μm	2.2	37.2	81.00						
H	100.0	(31.3)	3133.30						

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Table 21. HEAVY LIQUID TEST DATA. SAMPLE B2 (-63 mm). WATER TREATED.

	1	2	3	4	5	6	7	8	9	10	11	12
	SIZE			FRACTION			BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
1.4 F/T	50.0	15.3	765.54	50.0	765.54	15.3	100.0	2678.99	(26.8)	25.0	-	
1.4-1.6	36.2	25.7	929.80	86.2	1695.34	(19.7)	50.0	1913.45	(38.3)	68.1	41.3	
1.6-1.8	5.1	45.8	232.80	91.3	1928.14	(21.1)	13.8	983.65	(71.4)	88.8	6.6	
1.8-2.0	1.5	56.1	84.54	92.8	2012.68	(21.7)	8.7	750.85	(86.3)	92.1	-	
2.0 S/K	7.2	92.6	666.31	100.0	2678.99	(26.8)	7.2	666.31	92.6	96.4	-	
+38.10 mm	100.0	(26.8)										
1.4 F/T	47.8	15.1	721.31	47.8	721.31	15.1	100.0	2579.02	(25.8)	23.9	-	
1.4-1.6	39.3	26.3	1033.80	87.1	1755.11	(20.2)	52.2	1857.71	(35.6)	67.5	45.7	
1.6-1.8	6.4	46.8	299.92	93.5	2055.03	(22.0)	12.9	823.91	(63.8)	90.3	8.8	
1.8-2.0	2.4	62.9	148.48	95.9	2203.51	(23.0)	6.5	523.99	(80.4)	94.7	-	
2.0 S/K	4.1	90.4	375.51	100.0	2579.02	(25.8)	4.1	375.51	90.4	98.0	-	
+19.05 mm	100.0	(25.8)										
1.4 F/T	23.2	13.3	308.39	23.2	308.39	13.3	100.0	2897.33	(29.0)	11.6	-	
1.4-1.6	57.1	23.1	1317.99	80.3	1626.38	(20.3)	76.8	2588.94	(33.7)	51.8	65.8	
1.6-1.8	8.7	46.2	402.23	89.0	2028.61	(22.8)	19.7	1270.95	(64.3)	84.7	12.1	
1.8-2.0	3.4	62.7	215.53	92.4	2244.14	(24.3)	11.0	868.72	(78.6)	90.7	-	
2.0 S/K	7.6	85.8	653.19	100.0	2897.33	(29.0)	7.6	653.19	85.8	96.2	-	
+9.53 mm	100.0	(29.0)										
1.4 F/T	8.0	10.2	81.81	8.0	81.81	10.2	100.0	3614.36	(36.1)	4.0	-	
1.4-1.6	57.4	22.3	1279.80	65.4	1361.61	(20.8)	92.0	3532.55	(38.4)	36.7	71.9	
1.6-1.8	14.5	43.4	630.52	79.9	1992.13	(24.9)	34.6	2252.75	(65.1)	72.7	18.8	
1.8-2.0	4.3	62.5	269.96	84.2	2262.09	(26.8)	20.1	1622.23	(80.9)	82.1	-	
2.0 S/K	15.8	85.9	1352.27	100.0	3614.36	(36.1)	15.8	1352.27	85.9	92.1	-	
+4.75 mm	100.0	(36.1)										

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Table 21. (continued)

	1	2	3	4	5	6	7	8	9	10	11	12
	SIZE			FRACTION			BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
1.4 F/T	7.5	8.2	61.42	7.5	61.42	8.2	100.0	4308.37	(43.1)	3.8	-	
1.4-1.6	47.2	22.2	1048.24	54.7	1109.66	(20.3)	92.5	4246.95	(45.9)	31.1	60.1	
1.6-1.8	12.9	42.7	553.27	67.6	1662.93	(24.6)	45.3	3198.71	(70.6)	61.2	17.7	
1.8-2.0	4.8	60.5	288.37	72.4	1951.30	(26.9)	32.4	2645.44	(81.8)	70.0	-	
2.0 S/K	27.6	85.5	2357.07	100.0	4308.37	(43.1)	27.6	2357.07	85.5	86.2	-	
+2.36 mm	100.0	(43.1)										
1.4 F/T	10.1	7.2	72.84	10.1	72.84	7.2	100.0	4305.54	(43.1)	5.1	-	
1.4-1.6	39.6	19.9	788.52	49.7	861.36	(17.3)	89.9	4232.70	(47.1)	29.9	55.4	
1.6-1.8	15.8	41.2	649.05	65.5	1510.41	(23.1)	50.3	3444.18	(68.5)	57.6	21.0	
1.8-2.0	5.2	59.6	309.79	70.7	1820.20	(25.7)	34.5	2795.13	(81.0)	68.1	-	
2.0 S/K	29.3	84.8	2485.34	100.0	4305.54	(43.1)	29.3	2485.34	84.8	85.4	-	
+1.18 mm	100.0	(43.1)										
1.4 F/T	12.0	7.0	84.24	12.0	84.24	7.0	100.0	3879.80	(38.8)	6.0	-	
1.4-1.6	40.8	19.0	774.43	52.8	858.67	(16.3)	88.0	3795.56	(43.1)	32.4	58.5	
1.6-1.8	17.7	39.4	697.12	70.5	1555.79	(22.1)	47.2	3021.13	(64.0)	61.7	24.0	
1.8-2.0	6.3	59.4	374.44	76.8	1930.23	(25.1)	29.5	2324.01	(78.7)	73.7	-	
2.0 S/K	23.2	84.0	1949.57	100.0	3879.80	(38.8)	23.2	1949.57	84.0	88.4	-	
+600 μm	100.0	(38.8)										
-600 μm												
Slimes												
H												

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Table 21. HEAVY LIQUID TEST DATA. SAMPLE B2 (-63 mm). WATER TREATED.

	1	13	14	15	16	17	18	19	20	21
	BULK			SAMPLE			BASIS			
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	
1.4 F/T	12.5	15.3	191.26	12.5	191.26	15.3	25.0	669.30	(26.8)	
1.4-1.6	9.0	25.7	232.29	21.5	423.55	(19.7)	12.5	478.04	(38.3)	
1.6-1.8	1.3	45.8	58.16	22.8	481.71	(21.1)	3.5	245.75	(71.4)	
1.8-2.0	0.4	56.1	21.12	23.2	502.83	(21.7)	2.2	187.59	(86.3)	
2.0 S/K	1.8	92.6	166.47	25.0	669.30	(26.8)	1.8	166.47	92.6	
+38.10 mm	25.0	(26.8)	669.30							
1.4 F/T	12.6	15.1	190.69	12.6	190.69	15.1	26.4	681.81	(25.8)	
1.4-1.6	10.4	26.3	273.30	23.0	463.99	(20.2)	13.8	491.12	(35.6)	
1.6-1.8	1.7	46.8	79.29	24.7	543.28	(22.0)	3.4	217.82	(63.8)	
1.8-2.0	0.6	62.9	39.26	25.3	582.54	(23.0)	1.7	138.53	(80.4)	
2.0 S/K	1.1	90.4	99.27	26.4	681.81	(25.8)	1.1	99.27	90.4	
+19.05 mm	26.4	(25.8)	681.81							
1.4 F/T	4.4	13.3	58.65	4.4	58.65	13.3	19.0	551.04	(29.0)	
1.4-1.6	10.8	23.1	250.67	15.2	309.32	(20.3)	14.6	492.39	(33.7)	
1.6-1.8	1.7	46.2	76.50	16.9	385.82	(22.8)	3.8	241.72	(64.3)	
1.8-2.0	0.7	62.7	40.99	17.6	426.81	(24.3)	2.1	165.22	(78.6)	
2.0 S/K	1.4	85.8	124.23	19.0	551.04	(29.0)	1.4	124.23	85.8	
+9.53 mm	19.0	(29.0)	551.04							
1.4 F/T	0.9	10.2	9.42	0.9	9.42	10.2	11.5	416.01	(36.1)	
1.4-1.6	6.6	22.3	147.30	7.5	156.72	(20.8)	10.6	406.59	(38.4)	
1.6-1.8	1.7	43.4	72.57	9.2	229.29	(24.9)	4.0	259.29	(65.1)	
1.8-2.0	0.5	62.5	31.08	9.7	260.37	(26.8)	2.3	186.72	(80.9)	
2.0 S/K	1.8	85.9	155.64	11.5	416.01	(36.1)	1.8	155.64	85.9	
+4.75 mm	11.5	(36.1)	416.01							

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Table 21. (continued)

	1	13	14	15	16	17	18	19	20	21
				BULK	SAMPLE	BASIS				
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	
1.4 F/T	0.5	8.2	4.16	0.5	4.16	8.2	6.8	292.03	(43.1)	
1.4-1.6	3.2	22.2	71.05	3.7	75.21	(20.3)	6.3	287.87	(45.9)	
1.6-1.8	0.9	42.7	37.50	4.6	112.71	(24.6)	3.1	216.82	(70.6)	
1.8-2.0	0.3	60.5	19.55	4.9	132.26	(26.9)	2.2	179.32	(81.8)	
2.0 S/K	1.9	85.5	159.77	6.8	292.03	(43.1)	1.9	159.77	85.5	
+2.36 mm	6.8	(43.1)	292.03							
1.4 F/T	0.3	7.2	2.40	0.3	2.40	7.2	3.3	142.01	(43.1)	
1.4-1.6	1.3	19.9	26.01	1.6	28.41	(17.3)	3.0	139.61	(47.1)	
1.6-1.8	0.5	41.2	21.41	2.1	49.82	(23.1)	1.7	113.60	(68.5)	
1.8-2.0	0.2	59.6	10.22	2.3	60.04	(25.7)	1.2	92.19	(81.0)	
2.0 S/K	1.0	84.8	81.97	3.3	142.01	(43.1)	1.0	81.97	84.8	
+1.18 mm	3.3	(43.1)	142.01							
1.4 F/T	0.2	7.0	1.55	0.2	1.55	7.0	1.8	71.42	(38.8)	
1.4-1.6	0.8	19.0	14.26	1.0	15.81	(16.3)	1.6	69.87	(43.1)	
1.6-1.8	0.3	39.4	12.83	1.3	28.64	(22.1)	0.8	55.61	(64.0)	
1.8-2.0	0.1	59.4	6.89	1.4	35.53	(25.1)	0.5	42.78	(78.7)	
2.0 S/K	0.4	84.0	35.89	1.8	71.42	(38.8)	0.4	35.89	84.0	
+600 μm	1.8	(38.8)	71.42							
-600 μm	5.4	38.5	206.69							
Slimes	0.8	57.0	43.67							
H	100.0	(30.7)	3073.98							

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Table 22. HEAVY LIQUID TEST DATA. SAMPLE B-3-1 (-38 mm).

	1	2	3	4	5	6	7	8	9	10	11	12
	SIZE			FRACTION			BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
1.4 F/T	54.1	16.8	909.06	54.1	909.06	16.8	100.0	3055.88	(30.6)	27.1	-	
1.4-1.6	26.2	28.2	738.78	80.3	1647.84	(20.5)	45.9	2146.82	(46.8)	67.2	33.0	
1.6-1.8	6.8	47.2	320.21	87.1	1968.05	(22.6)	19.7	1408.04	(71.5)	83.7	9.6	
1.8-2.0	2.8	67.8	188.38	89.9	2156.43	(24.0)	12.9	1087.83	(84.3)	88.5	-	
2.0 S/K	10.1	88.8	899.45	100.0	3055.88	(30.6)	10.1	899.45	88.8	95.0	-	
+25.4 mm	100.0	(30.6)										
1.4 F/T	63.3	17.4	1101.15	63.3	1101.15	17.4	100.0	3010.86	(30.1)	31.7	-	
1.4-1.6	18.2	32.1	584.14	81.5	1685.29	(20.7)	36.7	1909.71	(52.0)	72.4	24.0	
1.6-1.8	5.8	48.1	277.31	87.3	1962.60	(22.5)	18.5	1325.57	(71.6)	84.4	8.7	
1.8-2.0	2.9	64.1	187.97	90.2	2150.57	(23.8)	12.7	1048.26	(82.2)	88.8	-	
2.0 S/K	9.8	87.6	860.29	100.0	3010.86	(30.1)	9.8	860.29	87.6	95.1	-	
+19.05 mm	100.0	(30.1)										
1.4 F/T	41.8	14.8	618.68	41.8	618.68	14.8	100.0	3119.38	(31.2)	20.9	-	
1.4-1.6	37.0	27.5	1017.69	78.8	1636.37	(20.8)	58.2	2500.70	(43.0)	60.3	44.0	
1.6-1.8	7.0	48.1	336.38	85.8	1972.75	(23.0)	21.2	1483.01	(70.0)	82.3	10.9	
1.8-2.0	3.9	64.7	250.85	89.7	2223.60	(24.8)	14.2	1146.63	(80.8)	87.8	-	
2.0 S/K	10.3	86.8	895.78	100.0	3119.38	(31.2)	10.3	895.78	86.8	94.9	-	
+9.53 mm	100.0	(31.2)										
1.4 F/T	45.1	13.9	626.50	45.1	626.50	13.9	100.0	3236.32	(32.4)	22.6	-	
1.4-1.6	29.0	28.4	823.81	74.1	1450.31	(19.6)	54.9	2609.82	(47.5)	59.6	37.9	
1.6-1.8	8.9	46.5	413.14	83.0	1863.45	(22.5)	25.9	1786.01	(68.9)	78.6	13.9	
1.8-2.0	5.0	64.8	325.99	88.0	2189.44	(24.9)	17.0	1372.87	(80.6)	85.5	-	
2.0 S/K	12.0	87.2	1046.88	100.0	3236.32	(32.4)	12.0	1046.88	87.2	94.0	-	
+4.75 mm	100.0	(32.4)										

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Table 22. (continued)

1	2	3	4	5	6	7	8	9	10	11	12
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) - $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1
1.4 F/T	47.1	13.8	650.26	47.1	650.26	13.8	100.0	3253.48	(32.5)	23.6	-
1.4-1.6	24.5	27.2	665.39	71.6	1315.65	(18.4)	52.9	2603.22	(49.2)	59.4	34.1
1.6-1.8	9.6	45.6	436.32	81.2	1751.97	(21.6)	28.4	1937.83	(68.2)	76.4	14.5
1.8-2.0	4.9	63.3	309.70	86.1	2061.67	(24.0)	18.8	1501.51	(79.7)	83.7	-
2.0 S/K	13.9	85.4	1191.81	100.0	3253.48	(32.5)	13.9	1191.81	85.4	93.1	-
+2.36 mm	100.0	(32.5)									
1.4 F/T	24.7	8.8	217.58	24.7	217.58	8.8	100.0	3257.03	(32.6)	12.4	-
1.4-1.6	48.2	23.2	1117.89	72.9	1335.47	(18.3)	75.3	3039.45	(40.4)	48.8	55.1
1.6-1.8	6.9	47.1	326.44	79.8	1661.91	(20.8)	27.1	1921.56	(70.9)	76.4	10.1
1.8-2.0	3.2	58.3	184.39	83.0	1846.30	(22.2)	20.2	1595.12	(79.1)	81.4	-
2.0 S/K	17.0	83.0	1410.73	100.0	3257.03	(32.6)	17.0	1410.73	83.0	91.5	-
+1.18 mm	100.0	(32.6)									
1.4 F/T	34.4	11.1	381.85	34.4	381.85	11.1	100.0	3231.98	(32.3)	17.2	-
1.4-1.6	34.9	23.6	824.81	69.3	1206.66	(17.4)	65.6	2850.13	(43.4)	51.9	46.5
1.6-1.8	11.6	43.7	505.77	80.9	1712.43	(21.2)	30.7	2025.32	(66.1)	75.1	14.8
1.8-2.0	3.2	62.1	198.86	84.1	1911.29	(22.7)	19.1	1519.55	(79.7)	82.5	-
2.0 S/K	15.9	83.2	1320.69	100.0	3231.98	(32.3)	15.9	1320.69	83.2	92.1	-
+600 μ m	100.0	(32.3)									
-600 μ m											
H											

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Table 22. HEAVY LIQUID TEST DATA. SAMPLE B-3-1 (-38 mm).

	1	13	14	15	16	17	18	19	20	21
	BULK SAMPLE BASIS									
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	
1.4 F/T	18.8	16.8	316.01	18.8	316.01	16.8	34.8	1062.65	(30.6)	
1.4-1.6	9.1	28.2	256.90	27.9	572.91	(20.5)	16.0	746.64	(46.8)	
1.6-1.8	2.4	47.2	111.39	30.3	684.30	(22.6)	6.9	489.74	(71.5)	
1.8-2.0	1.0	67.8	65.77	31.3	750.07	(24.0)	4.5	378.35	(84.3)	
2.0 S/K	3.5	88.8	312.58	34.8	1062.65	(30.6)	3.5	312.58	88.8	
+25.4 mm	34.8	(30.6)	1062.65							
1.4 F/T	10.7	17.4	186.70	10.7	186.70	17.4	16.9	510.18	(30.1)	
1.4-1.6	3.1	32.1	98.87	13.8	285.57	(20.7)	6.2	323.48	(52.0)	
1.6-1.8	1.0	48.1	47.14	14.8	332.71	(22.5)	3.1	224.61	(71.5)	
1.8-2.0	0.5	64.1	32.05	15.3	364.76	(23.8)	2.1	177.47	(82.2)	
2.0 S/K	1.6	87.6	145.42	16.9	510.18	(30.1)	1.6	145.42	87.6	
+19.05 mm	16.9	(30.1)	510.18							
1.4 F/T	9.7	14.8	143.41	9.7	143.41	14.8	23.2	722.69	(31.2)	
1.4-1.6	8.6	27.5	235.68	18.3	379.09	(20.8)	13.5	579.28	(43.0)	
1.6-1.8	1.6	48.1	77.92	19.9	457.01	(23.0)	4.9	343.60	(70.0)	
1.8-2.0	0.9	64.7	58.23	20.8	515.24	(24.8)	3.3	265.68	(80.8)	
2.0 S/K	2.4	86.8	207.45	23.2	722.69	(31.2)	2.4	207.45	86.5	
+9.53 mm	23.2	(31.2)	722.69							
1.4 F/T	5.0	13.9	68.94	5.0	68.94	13.9	11.0	355.85	(32.4)	
1.4-1.6	3.2	28.4	90.60	8.2	159.54	(19.6)	6.0	286.91	(47.5)	
1.6-1.8	1.0	46.5	45.57	9.2	205.11	(22.5)	2.8	196.31	(68.9)	
1.8-2.0	0.5	64.8	35.64	9.7	240.75	(24.9)	1.8	150.74	(80.6)	
2.0 S/K	1.3	87.2	115.10	11.0	355.85	(32.4)	1.3	115.10	87.2	
+4.75 mm	11.0	(32.4)	355.85							

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Table 22. (continued)

1	13	14	15	16	17	18	19	20	21
Fraction	BULK		SAMPLE BASIS						
	Per Cent		Ash	Cumulative Floats			Cumulative Sinks		
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%
1.4 F/T	2.4	13.8	33.81	2.4	33.81	13.8	5.2	168.47	(32.5)
1.4-1.6	1.3	27.2	34.54	3.7	68.35	(18.4)	2.8	134.66	(49.1)
1.6-1.8	0.5	45.6	22.80	4.2	91.15	(21.6)	1.5	100.12	(68.2)
1.8-2.0	0.3	63.3	15.83	4.5	106.98	(24.0)	1.0	77.32	(79.7)
2.0 S/K	0.7	85.4	61.49	5.2	168.47	(32.5)	0.7	61.49	85.4
+2.36 mm	5.2	(32.5)	168.47						
1.4 F/T	0.9	8.8	7.42	0.9	7.42	8.8	3.4	111.06	(32.6)
1.4-1.6	1.6	23.2	38.12	2.5	45.54	(18.3)	2.5	103.64	(40.4)
1.6-1.8	0.2	47.1	11.13	2.7	56.67	(20.8)	0.9	65.52	(70.9)
1.8-2.0	0.1	58.3	6.28	2.8	62.95	(22.2)	0.7	54.39	(79.1)
2.0 S/K	0.6	83.0	48.11	3.4	111.06	(32.6)	0.6	48.11	83.0
+1.18 mm	3.4	(32.6)	111.06						
1.4 F/T	0.7	11.1	7.83	0.7	7.83	11.1	2.0	66.25	(32.3)
1.4-1.6	0.7	23.6	16.91	1.4	24.74	(17.4)	1.3	58.42	(43.4)
1.6-1.8	0.2	43.7	10.37	1.6	35.11	(21.2)	0.6	41.51	(66.1)
1.8-2.0	0.1	62.1	4.07	1.7	39.18	(22.7)	0.4	31.14	(79.7)
2.0 S/K	0.3	83.2	27.07	2.0	66.25	(32.3)	0.3	27.07	83.2
+600 μm	2.0	(32.3)	66.25						
-600 μm	3.5	36.3	125.58						
H	100.0	(31.2)	3122.73						

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Table 23. HEAVY LIQUID TEST DATA. SAMPLE B3-2 (-38 mm). WATER TREATED

1	2	3	4	5	6	7	8	9	10	11	12
			SIZE	FRACTION		BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1
1.4 F/T	59.5	14.7	874.16	59.5	874.16	14.7	100.0	2531.77	(25.3)	29.8	-
1.4-1.6	25.1	26.8	671.84	84.6	1546.00	(18.3)	40.5	1657.61	(40.9)	72.1	33.9
1.6-1.8	8.8	44.7	394.87	93.4	1940.87	(20.8)	15.4	985.77	(63.7)	89.0	9.2
1.8-2.0	0.4	66.2	25.12	93.8	1965.99	(21.0)	6.6	590.90	(89.1)	93.6	-
2.0 S/K	6.2	90.5	565.78	100.0	2531.77	(25.3)	6.2	565.78	90.5	96.9	-
+25.4 mm	100.0	(25.3)									
1.4 F/T	51.4	14.4	740.35	51.4	740.35	14.4	100.0	2601.31	(26.0)	25.7	-
1.4-1.6	32.8	26.8	879.16	84.2	1619.51	(19.2)	48.6	1860.96	(38.3)	67.8	39.8
1.6-1.8	7.0	44.1	309.40	91.2	1928.91	(21.1)	15.8	981.80	(62.2)	87.7	10.7
1.8-2.0	3.7	59.6	219.63	94.9	2148.54	(22.6)	8.8	672.40	(76.7)	93.1	-
2.0 S/K	5.1	89.1	452.77	100.0	2601.31	(26.0)	5.1	452.77	89.1	97.5	-
+19.05 mm	100.0	(26.0)									
1.4 F/T	53.6	15.9	852.66	53.6	852.66	15.9	100.0	2925.02	(29.3)	26.8	-
1.4-1.6	26.8	29.3	783.22	80.4	1635.88	(20.4)	46.4	2072.36	(44.7)	67.0	33.1
1.6-1.8	6.3	45.6	287.15	86.7	1923.03	(22.2)	19.6	1289.14	(65.6)	83.6	11.4
1.8-2.0	5.1	59.2	303.71	91.8	2226.74	(24.3)	13.3	1001.99	(75.1)	89.3	-
2.0 S/K	8.2	85.0	698.28	100.0	2925.02	(29.3)	8.2	698.28	85.0	95.9	-
+9.53 mm	100.0	(29.3)									
1.4 F/T	29.3	12.8	374.50	29.3	374.50	12.8	100.0	3618.27	(36.2)	14.7	-
1.4-1.6	40.0	27.0	1080.48	69.3	1454.98	(21.0)	70.7	3243.77	(45.9)	49.3	47.9
1.6-1.8	7.9	45.4	357.72	77.2	1812.70	(23.5)	30.7	2163.29	(70.4)	73.3	13.2
1.8-2.0	5.3	59.6	315.49	82.5	2128.19	(25.8)	22.8	1805.57	(79.0)	79.9	-
2.0 S/K	17.5	84.9	1490.08	100.0	3618.27	(36.2)	17.5	1490.08	84.9	91.3	-
+4.75 mm	100.0	(36.2)									

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Table 23. (continued)

1	2	3	4	5	6	7	8	9	10	11	12	
			SIZE	FRACTION		BASIS						
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
1.4 F/T	34.5	13.1	452.25	34.5	452.25	13.1	100.0	3953.21	(39.5)	17.3	-	
1.4-1.6	21.7	26.5	573.95	56.2	1026.20	(18.3)	65.5	3500.96	(53.5)	45.4	37.0	
1.6-1.8	15.3	41.0	627.08	71.5	1653.28	(23.1)	43.8	2927.01	(66.8)	63.9	19.7	
1.8-2.0	4.4	60.0	264.28	75.9	1917.56	(25.3)	28.5	2299.93	(80.6)	73.7	-	
2.0 S/K	24.1	84.4	2035.65	100.0	3953.21	(39.5)	24.1	2035.65	84.4	88.0	-	
+2.36 mm	100.0	(39.5)										
1.4 F/T	36.9	13.7	506.07	36.9	506.07	13.7	100.0	3739.14	(37.4)	18.5	-	
1.4-1.6	14.3	28.7	411.79	51.2	917.86	(17.9)	63.1	3233.07	(51.3)	44.1	35.8	
1.6-1.8	21.5	41.5	890.15	72.7	1808.01	(24.9)	48.8	2821.28	(57.9)	62.0	32.7	
1.8-2.0	11.2	52.7	590.90	83.9	2398.91	(28.6)	27.3	1931.13	(70.8)	78.3	-	
2.0 S/K	16.1	83.5	1340.23	100.0	3739.14	(37.4)	16.1	1340.23	83.5	92.0	-	
+1.18 mm	100.0	(37.4)										
1.4 F/T	20.0	8.0	159.72	20.0	159.72	8.0	100.0	3456.03	(34.6)	10.0	-	
1.4-1.6	25.1	19.5	489.39	45.1	649.11	(14.4)	80.0	3296.31	(41.2)	32.6	59.7	
1.6-1.8	34.6	38.4	1329.49	79.7	1978.60	(24.8)	54.9	2806.92	(51.1)	62.4	40.9	
1.8-2.0	6.3	55.3	349.88	86.0	2328.48	(27.1)	20.3	1477.43	(72.7)	82.9	-	
2.0 S/K	14.0	80.6	1127.55	100.0	3456.03	(34.6)	14.0	1127.55	80.6	93.0	-	
+600 μ m	100.0	(34.6)										
-600 μ m												

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H

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Table 23. HEAVY LIQUID TEST DATA. SAMPLE B3-2 (-38 mm). WATER TREATED.

	1	13	14	15	16	17	18	19	20	21
			BULK		SAMPLE		BASIS			
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	
1.4 F/T	14.4	14.7	211.74	14.4	211.74	14.7	24.2	613.24	(25.3)	
1.4-1.6	6.1	26.8	162.74	20.5	374.48	(18.3)	9.8	401.50	(40.9)	
1.6-1.8	2.1	44.7	95.64	22.6	470.12	(20.8)	3.7	238.76	(63.7)	
1.8-2.0	0.1	66.2	6.08	22.7	476.20	(21.0)	1.6	143.12	(89.1)	
2.0 S/K	1.5	90.5	137.04	24.2	613.24	(25.3)	1.5	137.04	90.5	
+25.4 mm	24.2	(25.3)	613.24							
1.4 F/T	7.4	14.4	105.87	7.4	105.87	14.4	14.3	372.00	(26.0)	
1.4-1.6	4.7	26.8	125.72	12.1	231.59	(19.2)	6.9	266.13	(38.3)	
1.6-1.8	1.0	44.1	44.25	13.1	275.84	(21.1)	2.2	140.41	(62.2)	
1.8-2.0	0.5	59.6	31.41	13.6	307.25	(22.6)	1.2	96.16	(76.7)	
2.0 S/K	0.7	89.1	64.75	14.3	372.00	(26.0)	0.7	64.75	89.1	
+19.05 mm	14.3	(26.0)	372.00							
1.4 F/T	15.0	15.9	238.43	15.0	238.43	15.9	28.0	817.93	(29.3)	
1.4-1.6	7.5	29.3	219.01	22.5	457.44	(20.4)	13.0	579.50	(44.7)	
1.6-1.8	1.8	45.6	80.30	24.3	537.74	(22.2)	5.5	360.49	(65.6)	
1.8-2.0	1.4	59.2	84.93	25.7	622.67	(24.3)	3.7	280.19	(75.1)	
2.0 S/K	2.3	85.0	195.26	28.0	817.93	(29.3)	2.3	195.26	85.0	
+9.53 mm	28.0	(29.3)	817.93							
1.4 F/T	4.3	12.8	54.86	4.3	54.86	12.8	14.6	530.28	(36.2)	
1.4-1.6	5.9	27.0	158.53	10.2	213.39	(21.0)	10.3	475.42	(45.8)	
1.6-1.8	1.1	45.4	52.40	11.3	265.79	(23.5)	4.4	316.89	(70.4)	
1.8-2.0	0.8	59.6	46.21	12.1	312.00	(25.8)	3.3	264.49	(79.0)	
2.0 S/K	2.5	84.9	218.28	14.6	530.28	(36.2)	2.5	218.28	84.9	
+4.75 mm	14.6	(36.2)	530.28							

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Table 23. (continued)

1	13	14	15	16	17	18	19	20	21
Fraction	BULK		SAMPLE	BASIS					
	Per Cent		Ash	Cumulative Floats			Cumulative Sinks		
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%
1.4 F/T	2.1	13.1	27.92	2.1	27.92	13.1	6.2	244.04	(39.5)
1.4-1.6	1.3	26.5	35.43	3.4	63.35	(18.3)	4.1	216.12	(53.5)
1.6-1.8	1.0	41.0	38.71	4.4	102.06	(23.1)	2.8	180.69	(66.8)
1.8-2.0	0.3	60.0	16.31	4.7	118.37	(25.3)	1.8	141.98	(80.6)
2.0 S/K	1.5	84.4	125.67	6.2	244.04	(39.5)	1.5	125.67	84.4
+2.36 mm	6.2	(39.5)	244.04						
1.4 F/T	1.7	13.7	22.85	1.7	22.85	13.7	4.5	168.84	(37.4)
1.4-1.6	0.6	28.7	18.59	2.3	41.44	(17.9)	2.8	145.99	(51.3)
1.6-1.8	1.0	41.5	40.20	3.3	81.64	(24.9)	2.2	127.40	(57.9)
1.8-2.0	0.5	52.7	26.68	3.8	108.32	(28.6)	1.2	87.20	(70.8)
2.0 S/K	0.7	83.5	60.52	4.5	168.84	(37.4)	0.7	60.52	83.5
+1.18 mm	4.5	(37.4)	168.84						
1.4 F/T	0.5	8.0	4.26	0.5	4.26	8.0	2.7	92.20	(34.6)
1.4-1.6	0.7	19.5	13.06	1.2	17.32	(14.4)	2.2	87.94	(41.2)
1.6-1.8	0.9	38.4	35.47	2.1	52.79	(24.8)	1.5	74.88	(51.1)
1.8-2.0	0.2	55.3	9.33	2.3	62.12	(27.1)	0.6	39.41	(72.7)
2.0 S/K	0.4	80.6	30.08	2.7	92.20	(34.6)	0.4	30.08	80.6
+600 μm	2.7	(34.6)	92.20						
-600 μm	5.5	37.3	205.47						
H	100.0	(30.4)	3044.00						

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Table 24. HEAVY LIQUID TEST DATA. SAMPLE B3-3 (-9.5 mm)

1	2	3	4	5	6	7	8	9	10	11	12	
Fraction		Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass
		Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) - $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1
	1.4 F/T	13.8	10.6	146.91	13.8	146.91	10.6	100.0	3074.16	(30.7)	6.9	-
	1.4-1.6	60.9	20.3	1235.70	74.7	1382.61	(18.5)	86.2	2927.25	(34.0)	44.3	69.8
	1.6-1.8	8.9	42.4	375.83	83.6	1758.44	(21.0)	25.3	1691.55	(66.9)	79.2	12.4
	1.8-2.0	3.5	62.3	219.67	87.1	1978.11	(22.7)	16.4	1315.72	(80.2)	85.4	-
	2.0 S/K	12.9	85.1	1096.05	100.0	3074.16	(30.7)	12.9	1096.05	85.1	93.6	-
	+4.75 mm	100.0	(30.7)									
	1.4 F/T	9.3	10.3	96.22	9.3	96.22	10.3	100.0	2911.93	(29.1)	4.7	-
	1.4-1.6	65.7	18.6	1222.89	75.0	1319.11	(17.6)	90.7	2815.71	(31.1)	42.2	75.8
	1.6-1.8	10.1	41.4	416.05	85.1	1735.16	(20.4)	25.0	1592.82	(63.9)	80.1	13.5
	1.8-2.0	3.4	59.2	201.10	88.5	1936.26	(21.9)	14.9	1176.77	(79.2)	86.8	-
	2.0 S/K	11.5	85.1	975.67	100.0	2911.93	(29.1)	11.5	975.67	85.1	94.3	-
	+2.36 mm	100.0	(29.1)									
	1.4 F/T	8.5	9.4	79.83	8.5	79.83	9.4	100.0	2829.97	(28.3)	4.3	-
	1.4-1.6	62.0	17.2	1065.74	70.5	1145.57	(16.3)	91.5	2750.14	(30.1)	39.5	75.1
	1.6-1.8	13.1	38.2	502.63	83.6	1648.20	(19.7)	29.5	1684.40	(57.0)	77.1	17.2
	1.8-2.0	4.1	56.1	228.16	87.7	1876.36	(21.4)	16.4	1181.77	(72.1)	85.7	-
	2.0 S/K	12.3	77.4	953.61	100.0	2829.97	(28.3)	12.3	953.61	77.4	93.9	-
	+1.18 mm	100.0	(28.3)									
	1.4 F/T	11.0	9.4	103.56	11.0	103.56	9.4	100.0	2896.39	(29.0)	5.5	-
	1.4-1.6	55.9	16.3	911.69	66.9	1015.25	(15.2)	89.0	2792.83	(31.4)	39.0	71.4
	1.6-1.8	15.5	37.2	575.34	82.4	1590.59	(19.3)	33.1	1881.14	(56.9)	74.7	20.0
	1.8-2.0	4.5	57.6	256.27	86.9	1846.86	(21.3)	17.6	1305.80	(74.3)	84.7	-
	2.0 S/K	13.1	79.9	1049.53	100.0	2896.39	(29.0)	13.1	1049.53	79.9	93.5	-
	+600 μm	100.0	(29.0)									
	-600 μm											

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Table 24. HEAVY LIQUID TEST DATA. SAMPLE B3-3 (-9.5 mm)

1	13	14	15	16	17	18	19	20	21
Fraction	BULK		SAMPLE		BASIS				
	Per Cent		Ash	Cumulative Floats			Cumulative Sinks		
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%
1.4 F/T	5.2	10.6	55.50	5.2	55.50	10.6	37.8	1161.38	(30.7)
1.4-1.6	23.0	20.3	466.83	28.2	522.33	(18.5)	32.6	1105.88	(34.0)
1.6-1.8	3.4	42.4	141.98	31.6	664.31	(21.0)	9.6	639.05	(66.9)
1.8-2.0	1.3	62.3	82.99	32.9	747.30	(22.7)	6.2	497.07	(80.2)
2.0 S/K	4.9	85.1	414.08	37.8	1161.38	(30.7)	4.9	414.08	(85.1)
+4.75 mm	37.8	(30.7)	1161.38						
1.4 F/T	2.5	10.3	25.19	2.5	25.19	10.3	26.2	762.30	(29.1)
1.4-1.6	17.2	18.6	320.13	19.7	345.32	(17.6)	23.7	737.11	(31.1)
1.6-1.8	2.6	41.4	108.92	22.3	454.24	(20.4)	6.5	416.98	(63.9)
1.8-2.0	0.9	59.2	52.65	23.2	506.89	(21.9)	3.9	308.06	(79.2)
2.0 S/K	3.0	85.1	255.41	26.2	762.30	(29.1)	3.0	255.41	85.1
+2.36 mm	26.2	(29.1)	762.30						
1.4 F/T	1.3	9.4	12.31	1.3	12.31	9.4	15.4	436.29	(28.3)
1.4-1.6	9.6	17.2	164.30	10.9	176.61	(16.3)	14.1	423.98	(30.1)
1.6-1.8	2.0	38.2	77.49	12.9	254.10	(19.7)	4.5	259.68	(57.0)
1.8-2.0	0.6	56.1	35.17	13.5	289.27	(21.4)	2.5	182.19	(72.1)
2.0 S/K	1.9	77.4	147.02	15.4	436.29	(28.3)	1.9	147.02	77.4
+1.18 mm	15.4	(28.3)	436.29						
1.4 F/T	1.0	9.4	8.99	1.0	8.99	9.4	8.7	251.46	(29.0)
1.4-1.6	4.9	16.3	79.15	5.9	88.14	(15.2)	7.7	242.47	(31.4)
1.6-1.8	1.3	37.2	49.95	7.2	138.09	(19.3)	2.8	163.32	(56.9)
1.8-2.0	0.4	57.6	22.25	7.6	160.34	(21.3)	1.5	113.37	(74.3)
2.0 S/K	1.1	79.9	91.12	8.7	251.46	(29.0)	1.1	91.12	79.9
+600 µm	8.7	(29.0)	251.46						
-600 µm	11.9	32.6	389.33						
H	100.0	(30.0)	3000.81						

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Table 25. HEAVY LIQUID TEST DATA. SAMPLE B-3-3 (-9.5 mm). WATER TREATED

1	2	3	4	5	6	7	8	9	10	11	12		
Fraction			SIZE FRACTION BASIS			Cumulative Floats			Cumulative Sinks			Mass	Mass
Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass			
Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1	R.D.-0.1		
1.4 F/T	6.0	11.0	66.23	6.0	66.23	11.0	100.0	2863.89	(28.6)	3.0	-		
1.4-1.6	70.3	18.6	1307.77	76.3	1374.00	(18.0)	94.0	2797.66	(29.8)	41.2	80.8		
1.6-1.8	10.5	42.3	442.79	86.8	1816.79	(20.9)	23.7	1489.89	(62.9)	81.6	13.8		
1.8-2.0	3.3	60.4	198.63	90.1	2015.42	(22.4)	13.2	1047.10	(79.3)	88.5	-		
2.0 S/K	9.9	85.6	848.47	100.0	2863.89	(28.6)	9.9	848.47	85.6	95.1	-		
+4.75 mm	100.0	(28.6)											
1.4 F/T	8.6	8.3	71.26	8.6	71.26	8.3	100.0	3015.01	(30.2)	4.3	-		
1.4-1.6	62.6	18.7	1171.38	71.2	1242.64	(17.4)	91.4	2943.75	(32.2)	39.9	74.8		
1.6-1.8	12.2	39.1	476.89	83.4	1719.53	(20.6)	28.8	1772.37	(61.6)	77.3	16.4		
1.8-2.0	4.2	56.2	236.25	87.6	1955.78	(22.3)	16.6	1295.48	(78.1)	85.5	-		
2.0 S/K	12.4	85.6	1059.23	100.0	3015.01	(30.2)	12.4	1059.23	85.6	93.8	-		
+2.36 mm	100.0	(30.2)											
1.4 F/T	10.1	7.6	76.45	10.1	76.45	7.6	100.0	2885.85	(28.9)	5.1	-		
1.4-1.6	57.1	17.2	982.13	67.2	1058.58	(15.8)	89.9	2809.40	(31.2)	38.7	71.4		
1.6-1.8	14.3	37.9	541.96	81.5	1600.54	(19.6)	32.8	1827.27	(55.6)	74.4	19.7		
1.8-2.0	5.4	55.6	301.58	86.9	1902.12	(21.9)	18.5	1285.31	(69.3)	84.2	-		
2.0 S/K	13.1	75.0	983.73	100.0	2885.85	(28.9)	13.1	983.73	75.0	93.5	-		
+1.18 mm	100.0	(28.9)											
1.4 F/T	10.4	8.1	84.17	10.4	84.17	8.1	100.0	3174.62	(31.7)	5.2	-		
1.4-1.6	49.6	16.8	832.84	60.0	917.01	(15.3)	89.6	3090.45	(34.5)	35.2	65.4		
1.6-1.8	15.8	37.0	586.20	75.8	1503.21	(19.8)	40.0	2257.61	(56.4)	67.9	25.9		
1.8-2.0	10.1	56.0	562.86	85.9	2066.07	(24.1)	24.2	1671.41	(69.1)	80.9	-		
2.0 S/K	14.1	78.4	1108.55	100.0	3174.62	(31.7)	14.1	1108.55	78.4	92.0	-		
+600 μm	100.0	(31.7)											
+600 μm													

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Table 25. HEAVY LIQUID TEST DATA. SAMPLE B-3-3 (-9.5 mm). WATER TREATED

	1	13	14	15	16	17	18	19	20	21
	BULK		SAMPLE		BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	
1.4 F/T	2.0	11.0	22.62	2.0	22.62	11.0	34.1	978.06	(28.6)	
1.4-1.6	24.0	18.6	446.62	26.0	469.24	(18.0)	32.1	955.44	(29.8)	
1.6-1.8	3.6	42.3	151.22	29.6	620.46	(20.9)	8.1	508.82	(62.9)	
1.8-2.0	1.1	60.4	67.84	30.7	688.30	(22.4)	4.5	357.60	(79.3)	
2.0 S/K	3.4	85.6	289.76	34.1	978.06	(28.6)	3.4	289.76	85.6	
+4.75 mm	34.2	(28.6)	978.06							
1.4 F/T	2.3	8.3	18.73	2.3	18.73	8.3	26.3	792.41	(30.2)	
1.4-1.6	16.5	18.7	307.86	18.8	326.59	(17.4)	24.0	773.68	(32.2)	
1.6-1.8	3.2	39.1	125.34	22.0	451.93	(20.6)	7.5	465.82	(61.6)	
1.8-2.0	1.1	56.2	62.09	23.1	514.02	(22.3)	4.3	340.48	(78.1)	
2.0 S/K	3.2	85.6	278.39	26.3	792.41	(30.2)	3.2	278.39	85.6	
+2.36 mm	26.3	(30.2)	792.41							
1.4 F/T	1.6	7.6	12.28	1.6	12.28	7.6	16.1	463.47	(28.9)	
1.4-1.6	9.2	17.2	157.73	10.8	170.01	(15.8)	14.5	451.19	(31.2)	
1.6-1.8	2.3	37.9	87.04	13.1	257.05	(19.6)	5.3	293.46	(55.6)	
1.8-2.0	0.9	55.6	48.43	14.0	305.48	(21.9)	3.0	206.42	(69.3)	
2.0 S/K	2.1	75.0	157.99	16.1	463.47	(28.9)	2.1	157.99	75.0	
+1.18 mm	16.1	(28.9)	463.4							
1.4 F/T	1.0	8.1	7.71	1.0	7.71	8.1	9.2	290.66	(31.7)	
1.4-1.6	4.5	16.8	76.25	5.5	83.96	(15.3)	8.2	282.95	(34.5)	
1.6-1.8	1.5	37.0	53.67	7.0	137.63	(19.8)	3.7	206.70	(56.4)	
1.8-2.0	0.9	56.0	51.53	7.9	189.16	(24.1)	2.2	153.03	(69.1)	
2.0 S/K	1.3	78.4	101.50	9.2	290.66	(31.7)	1.3	101.50	78.4	
+600 μm	9.2	(31.7)	290.6							
-600 μm	14.3	34.5	495.91							
H	100.0	(30.2)	3019.7							

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Table 26. HEAVY LIQUID TEST DATA. SAMPLE B3-3 (unsized)

1	2	3	4	5	6	7	8	9	10	11	12
			SIZE	FRACTION	BASIS						
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1
1.4 F/T	12.1	9.0	108.36	12.1	108.36	9.0	100.0	3001.42	(30.0)	6.1	-
1.6 F/T	57.5	18.6	1069.67	69.6	1178.03	(16.9)	87.9	2893.06	(32.9)	40.9	-
1.8 F/T	12.0	38.2	459.92	81.6	1637.95	(20.1)	30.4	1823.39	(59.9)	75.6	69.5
2.0 F/T	4.3	52.6	226.33	85.9	1864.28	(21.7)	18.4	1363.47	(74.1)	83.8	16.3
2.0 S/E	14.1	80.6	1137.14	100.0	3001.42	(30.01)	14.1	1137.14	80.6	93.0	-
	100.0	(30.01)	3001.42								

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Table 27. PROXIMATE ANALYSES OF FLOAT PRODUCTS

Table	Product	% Ash	% V.S.M.	% F.C.	S.E. MJ/kg
22	+38.10 mm 1.4 F/T	14.8	28.5	56.7	
	+38.10 mm 1.4-1.6	24.1	24.5	51.4	
	+19.05 mm 1.4 F/T	14.8	29.2	56.0	27.9
	+19.05 mm 1.4-1.6	27.2	24.6	48.2	23.5
	+9.53 mm 1.4 F/T	12.3	30.7	57.0	28.6
	+9.53 mm 1.4-1.6	23.2	25.6	51.2	24.3
	+4.75 mm 1.4 F/T	10.6	32.3	57.1	29.3
	+4.75 mm 1.4-1.6	23.5	25.7	50.8	24.5
	+2.36 mm 1.4 F/T	8.0	33.9	58.1	30.7
	+2.36 mm 1.4-1.6	20.7	24.7	54.6	24.7
	+1.18 mm 1.4 F/T	7.5	35.4	57.1	30.3
	+1.18 mm 1.4-1.6	20.0	27.3	52.7	24.4
	+600 μ m 1.4 F/T	8.6	37.8	53.6	29.8
	+600 μ m 1.4-1.6	18.3	27.8	53.9	25.9
23	+38.10 mm 1.4 F/T	15.3	27.0	57.7	
	+38.10 mm 1.4-1.6	25.7	25.0	49.3	
	+19.05 mm 1.4 F/T	15.1	26.5	58.4	
	+19.05 mm 1.4-1.6	26.3	22.7	51.0	
	+9.53 mm 1.4 F/T	13.3	28.3	58.4	
	+9.53 mm 1.4-1.6	23.1	24.0	52.9	
	+4.75 mm 1.4 F/T	10.2	31.0	58.8	
	+4.75 mm 1.4-1.6	22.3	23.9	53.8	
	+2.36 mm 1.4 F/T	8.2	31.2	60.6	
	+2.36 mm 1.4-1.6	22.2	22.6	55.2	
	+1.18 mm 1.4 F/T	7.2	33.3	59.5	
	+1.18 mm 1.4-1.6	19.9	24.2	55.9	
	+600 μ m 1.4 F/T	7.0	34.4	58.6	
	+600 μ m 1.4-1.6	19.0	25.1	55.9	
26	+4.75 mm 1.4 F/T	10.6	32.6	56.8	25.2
	+4.75 mm 1.4-1.6	20.3	26.1	53.6	
	+2.36 mm 1.4 F/T	10.3	34.5	55.2	
	+2.36 mm 1.4-1.6	18.6	26.5	54.9	
	+1.18 mm 1.4 F/T	9.4	36.3	54.3	
	+1.18 mm 1.4-1.6	17.2	27.5	55.3	
	+600 μ m 1.4 F/T	9.4	35.6	55.0	
	+600 μ m 1.4-1.6	16.3	27.9	55.8	
27	+4.75 mm 1.4 F/T	11.0	36.1	52.9	
	+4.75 mm 1.4-1.6	18.6	27.8	53.6	
	+2.36 mm 1.4 F/T	8.3	35.2	56.5	
	+2.36 mm 1.4-1.6	18.7	27.0	54.3	
	+1.18 mm 1.4 F/T	7.6	34.3	58.1	
	+1.18 mm 1.4-1.6	17.2	27.4	55.4	
	+600 μ m 1.4 F/T	8.1	33.2	58.7	
	+600 μ m 1.4-1.6	16.8	25.3	57.9	
28	Unsize 1.4 F/T	9.0	33.3	57.7	
	Unsize 1.4-1.6	18.6	27.2	54.2	

Note: Number in table column refers to another table.
There are no results from Tables 24 and 25.

Table 28. UNSCREENED COAL

	1	2	3	4	5	6	7	8	9	10	11	12
	SIZE			FRACTION			BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) - $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
Σ 1.4 F/T	30.0	(14.2)	426.76	30.0	426.76	(14.2)	100.0	3120.24	(31.2)	15.0	-	
Σ 1.4-1.6	46.4	(24.3)	1129.67	76.4	1556.43	(20.4)	70.0	2693.48	(38.5)	53.2	55.9	
Σ 1.6-1.8	9.5	(44.9)	426.81	85.9	1983.24	(23.1)	23.6	1563.81	(66.4)	81.2	12.9	
Σ 1.8-2.0	3.4	(61.9)	211.09	89.3	2194.33	(24.6)	14.1	1137.00	(80.9)	87.6	-	
Σ 2.0 S/K	10.7	(87.0)	925.91	100.0	3120.24	(31.2)	10.7	925.91	(87.0)	94.7	-	
B1	100.0	(31.2)	3120.24									
Σ 1.4 F/T	49.9	(15.9)	791.36	49.9	791.36	(15.9)	100.0	3105.22	(31.1)	25.0	-	
Σ 1.4-1.6	28.6	(28.0)	799.53	78.5	1590.89	(20.3)	50.1	2313.86	(46.2)	64.2	35.7	
Σ 1.6-1.8	7.1	(47.2)	337.55	85.6	1928.44	(22.5)	21.5	1514.33	(70.4)	82.1	10.6	
Σ 1.8-2.0	3.5	(65.2)	225.57	89.1	2154.01	(24.2)	14.4	1176.78	(81.9)	87.4	-	
Σ 2.0 S/K	10.9	(87.2)	951.21	100.0	3105.22	(31.1)	10.9	951.21	(87.2)	94.6	-	
B3-1	100.0	(31.1)	3105.22									
Σ 1.4 F/T	11.3	(10.3)	115.83	11.3	115.83	(10.3)	100.0	2965.67	(29.7)	5.7	-	
Σ 1.4-1.6	62.0	(18.9)	1170.19	73.3	1286.02	(17.5)	88.7	2849.84	(32.1)	42.3	72.6	
Σ 1.6-1.8	10.6	(40.5)	429.65	83.9	1715.67	(20.4)	26.7	1679.65	(63.0)	78.6	14.3	
Σ 1.8-2.0	3.7	(59.7)	219.25	87.6	1934.92	(22.1)	16.1	1250.00	(77.8)	85.8	-	
Σ 2.0 S/K	12.4	(83.2)	1030.75	100.0	2965.67	(29.7)	12.4	1030.75	(83.2)	93.8	-	
B3-3	100.0	(29.7)	2965.55									
Σ 1.4 F/T	12.0	9.0	108.36	12.0	108.36	9.0	100.0	3001.42	(30.0)	6.0	-	
Σ 1.4-1.6	57.5	18.6	1069.67	69.5	1178.03	(16.9)	88.0	2893.06	(32.9)	40.8	69.6	
Σ 1.6-1.8	12.1	38.2	459.92	81.6	1637.95	(20.1)	30.5	1823.39	(59.9)	75.6	16.4	
Σ 1.8-2.0	4.3	52.6	226.33	85.9	1864.28	(21.7)	18.4	1363.47	(74.1)	83.8	-	
Σ 2.0 S/K	14.1	80.6	1137.14	100.0	3001.42	(30.0)	14.1	1137.14	80.6	93.0	-	
B3-3	100.0	(30.0)	3001.42									

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Table 29. WATER TREATED COAL

	1	2	3	4	5	6	7	8	9	10	11	12
	SIZE			FRACTION			BASIS					
Fraction	Per Cent		Ash	Cumulative Floats			Cumulative Sinks			Mass	Mass	
	Mass	Ash	Units	Mass%	Ash Units	Ash%	Mass%	Ash Units	Ash%	(5) $\frac{(2)}{2}$	R.D.+0.1 Σ (2) R.D.-0.1	
Σ 1.4 F/T	33.6	(14.5)	488.07	33.6	488.07	(14.5)	100.0	3008.12	(30.1)	16.8	-	
Σ 1.4-1.6	44.9	(24.1)	1081.20	78.5	1569.27	(20.0)	66.4	2520.05	(37.9)	56.1	53.4	
Σ 1.6-1.8	8.5	(44.7)	381.67	87.0	1950.94	(22.4)	21.5	1438.85	(66.9)	82.8	11.5	
Σ 1.8-2.0	3.0	(61.2)	180.14	90.0	2131.08	(23.7)	13.0	1057.18	(81.5)	88.5	-	
Σ 2.0 S/K	10.0	(87.4)	877.04	100.0	3008.12	(30.1)	10.0	877.04	(87.4)	95.0	-	
B2	100.0	(30.1)	3008.12									
Σ 1.4 F/T	48.0	(14.7)	704.76	48.0	704.76	(14.7)	100.0	3003.79	(30.0)	24.0	-	
Σ 1.4-1.6	28.3	(27.4)	775.56	76.3	1480.32	(19.4)	52.0	2299.03	(44.2)	62.2	37.7	
Σ 1.6-1.8	9.4	(43.5)	409.53	85.7	1889.85	(22.0)	23.7	1523.47	(64.4)	81.0	13.4	
Σ 1.8-2.0	4.0	(58.5)	233.85	89.7	2123.70	(23.7)	14.3	1113.94	(78.1)	87.7	-	
Σ 2.0 S/K	10.3	(85.8)	880.09	100.0	3003.79	(30.0)	10.3	880.09	(85.8)	94.9	-	
B3-2	100.0	(30.0)	3003.79									
Σ 1.4 F/T	8.0	(8.9)	71.67	8.0	71.62	(8.9)	100.0	2947.61	(29.5)	4.0	-	
Σ 1.4-1.6	63.3	(18.2)	1154.08	71.3	1225.70	(17.2)	92.0	2875.99	(31.3)	39.7	75.6	
Σ 1.6-1.8	12.3	(39.6)	487.19	83.6	1712.89	(20.5)	28.7	1721.91	(60.0)	77.5	17.0	
Σ 1.8-2.0	4.7	(57.2)	268.41	88.3	1981.30	(22.4)	16.4	1234.72	(75.2)	86.0	-	
Σ 2.0 S/K	11.7	(82.4)	966.31	100.0	2947.61	(29.5)	11.7	966.31	(82.4)	94.2	-	
B3-3												

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APPENDIX 5

List of recent unpublished departmental reports.

<i>No.</i>	<i>Title</i>	<i>Author</i>
1976/14	Diamond drilling for coal in the Fingal area.	V.M. Threader
1978/16	An estimate of the coal resource of the Fingal area.	V.M. Threader
1978/39	East Coast coal project gravity survey. Preliminary report. Part 1. Survey details and qualitative interpretation.	D.E. Leaman
1979/15	East Coast Coal Project gravity survey. Preliminary report. Part 2. First progress report, December 1978 - June 1979.	D.E. Leaman
1979/54	East Coast Coal Project gravity survey. Preliminary report. Part 3. Second progress report, July 1979 - January 1980.	D.E. Leaman
1980/13	The geology of the Mt Nicholas, Fingal Valley and Mt St John areas.	P.W. Baillie C. Calver
1980/21	Sedimentology of the Freshwater Sequence, Upper Parmeener Super-Group on Fingal Tier.	C.A. Bacon
1980/27	Barium-bearing heulandite from DDH 55, Fingal.	D.C. Green
1980/45	A seismic reflection traverse on the Seymour coalfield.	R.G. Richardson D.E. Leaman
1980/46	Magnetic survey, Fingal Tier region.	D.E. Leaman R.G. Richardson
1980/49	Geophysical exploration of the East Coast coalfields, Tasmania: a summary.	D.E. Leaman
1980/51	Radiometric survey, Fingal Tier.	D.E. Leaman
1981/6	Fingal Tier seismic reflection traverses 1 and 2.	R.G. Richardson D.E. Leaman
1981/10	Borehole logs of diamond drilling, Fingal Tier. [Note - Logs are available on microfiche only]	V.M. Threader C.A. Bacon R.H. Castleden
1983/3	Introductory notes for a survey of the coal resources of Tasmania.	C.A. Bacon

1983/7	The Merrywood coalfield.	C.A. Bacon
1983/22	The Mount Christie-Stanhope coalfield.	C.A. Bacon
1983/34	The Fingal coalfield.	C.A. Bacon
1983/36	Analysis of coal from the Duncan seam, Duncan Colliery, Fingal.	C.A. Bacon
1983/41	The Mt Nicholas coalfield.	C.A. Bacon

Material contained in unpublished reports 1978/39, 1979/15, and 1979/54 (East Coast Coal Project gravity survey; Parts 1-3) has been published as Geological Survey Bulletin 60 (Gravity survey of the East Coast coalfields).

APPENDIX 6

Graphic logs of coal seam intersections

Microfiche of graphic logs of some boreholes are included with this report. These diagrams comprise two sections:

- (a) the left hand column shows the graphic log of the complete hole.
- (b) the columns on the right hand side are 1:20 enlargements of labelled sections of the complete hole column.

The symbols used on the graphic logs are shown in Figure 35 (complete hole) and Figure 36 (enlarged sections). The graphic logs cover the following holes:

<i>Figure</i>	<i>DDH</i>	<i>Fiche</i>	<i>Figure</i>	<i>DDH</i>	<i>Fiche</i>	<i>Figure</i>	<i>DDH</i>	<i>Fiche</i>
37	1	4	54	37	6	71	58	9
38	2	4	55	38	7	72	59	9
39	3	4	56	39	7	73	60	10
40	4	4	57	40	7	74	61	10
41	5	4	58	41	7	75	62	10
42	6	4	59	42	7	76	64	10
43	7B	5	60	43	7	77	65	10
44	17	5	61	44	8	78	66	10
45	19	5	62	45	8	79	68	11
46	20	5	63	46B	8	80	69	11
47	21	5	64	49	8	81	70	11
48	24	5	65	52	8	82	71	11
49	25	6	66	53	8	83	73	11
50	27	6	67	54	9	84	74	11
51	30	6	68	55	9	85	75	12
52	32	6	69	56	9	86	76	12
53	34A, B	6	70	57	9			

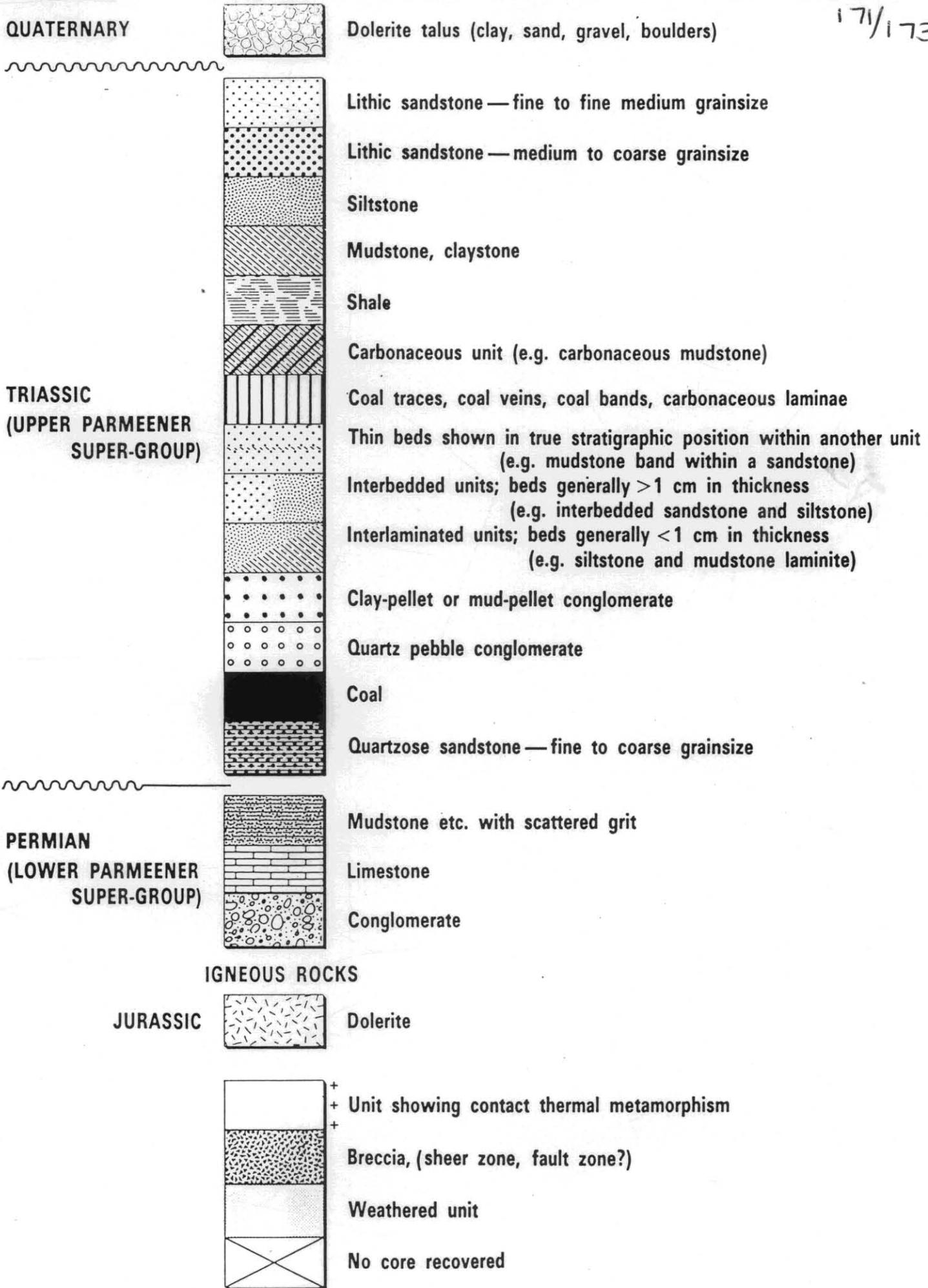
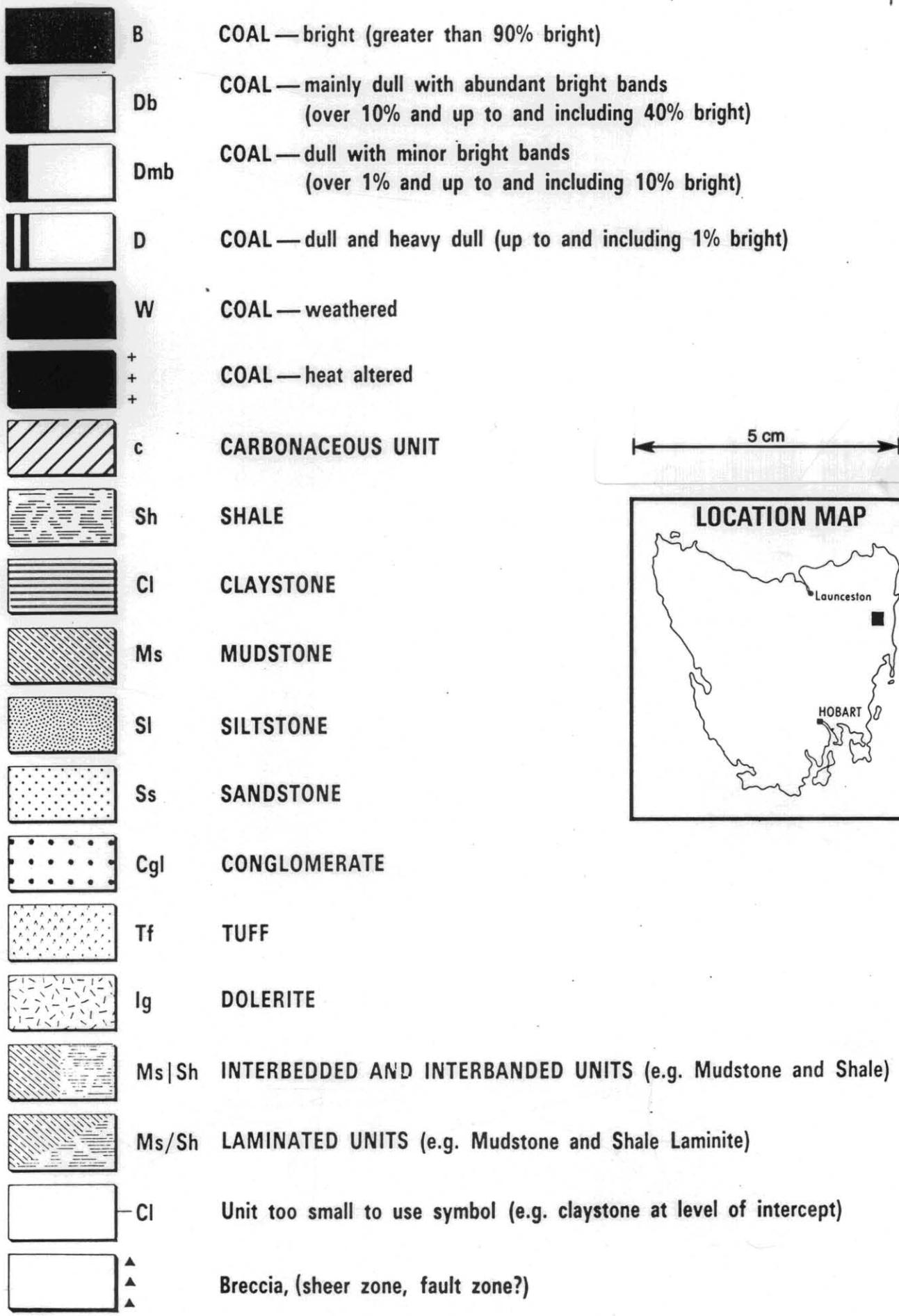
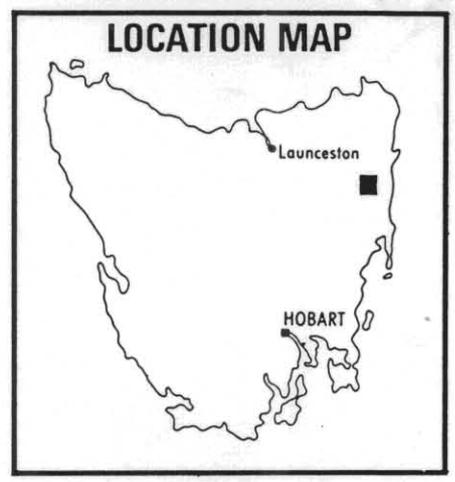


Figure 35. Symbols used on complete hole logs.
46-168



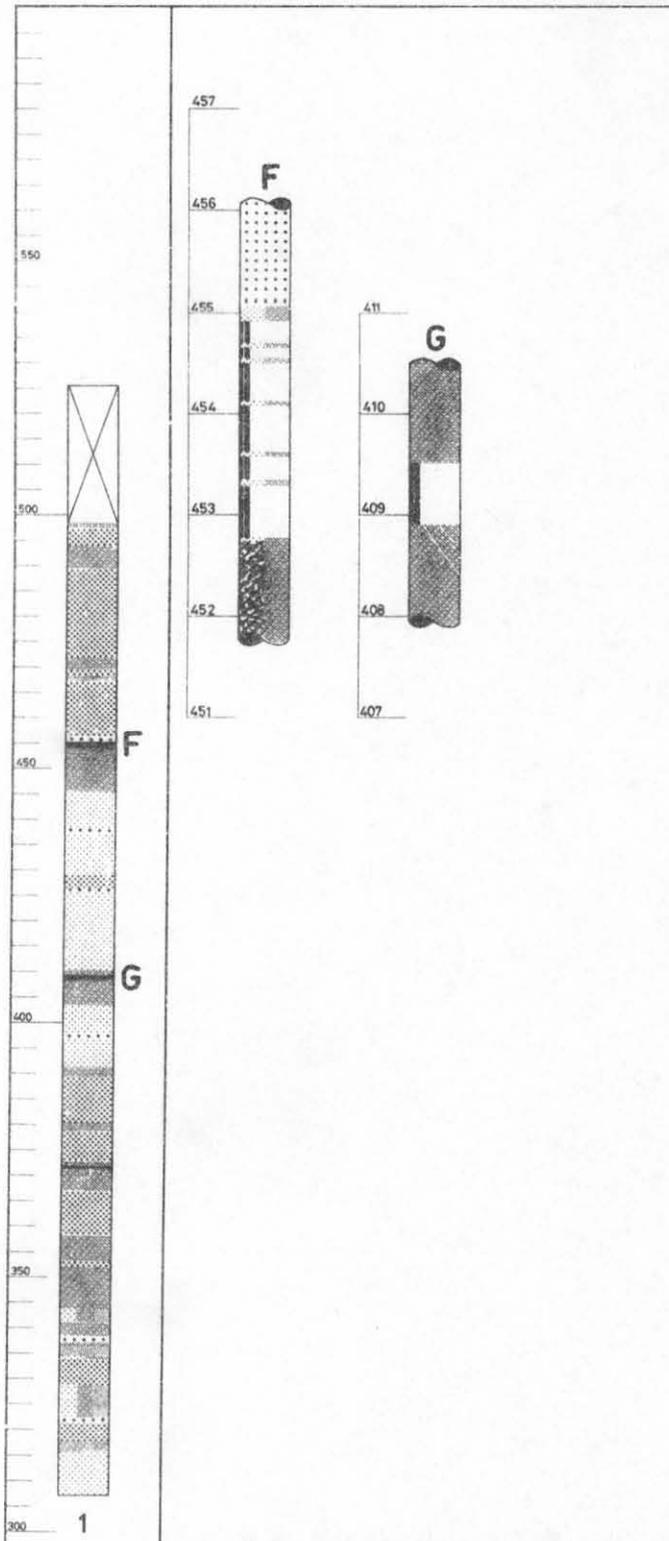
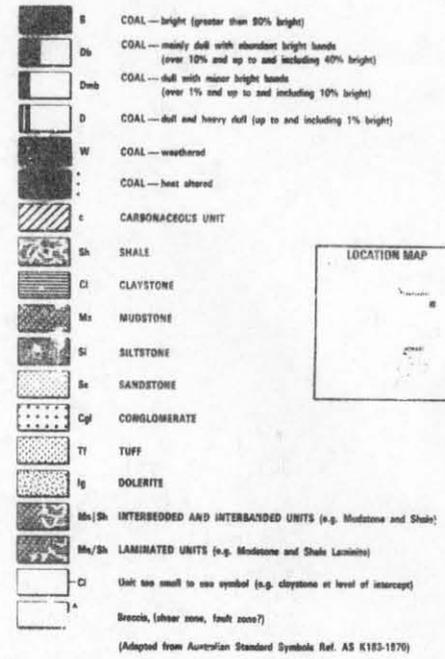
5 cm



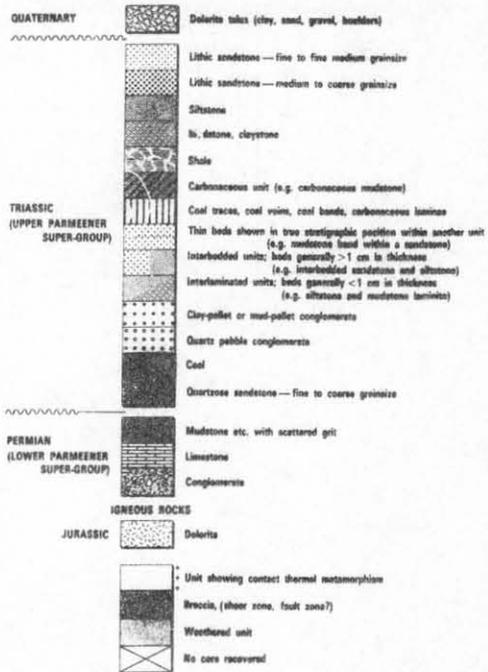
(Adapted from Australian Standard Symbols Ref. AS K183-1970)

Figure 36. Symbols used on enlarged logs of coal seam intersections.

GRAPHIC LOG FOR ENLARGEMENT



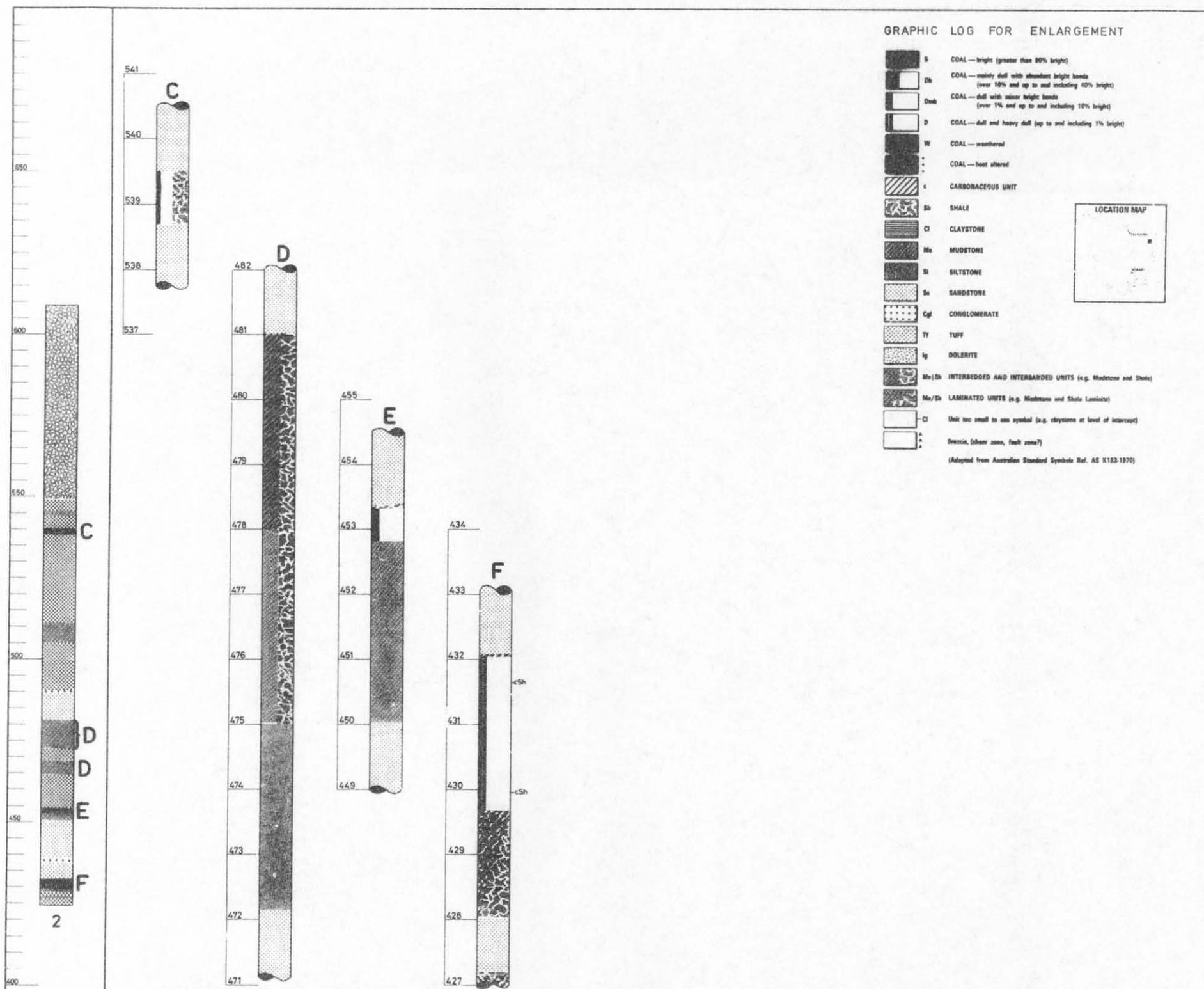
GRAPHIC LOG



TASMANIA DEPARTMENT OF MINES
AREA EXEMPT FROM THE MINING ACT 1923

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 1

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
R.H. CASTLEDEN & C.A. BACON DEC 1980



GRAPHIC LOG FOR ENLARGEMENT

- S COAL — bright (greater than 80% bright)
 - Dh COAL — mainly dull with abundant bright bands (over 10% and up to and including 40% bright)
 - Dmb COAL — dull with minor bright bands (over 1% and up to and including 10% bright)
 - D COAL — dull and heavy dull (up to and including 1% bright)
 - W COAL — weathered
 - COAL — heat altered
 - c CARBONACEOUS UNIT
 - Sh SHALE
 - Cl CLAYSTONE
 - Ms MUDSTONE
 - Sl SILTSTONE
 - Ss SANDSTONE
 - Cgl CONGLOMERATE
 - Tf TUFF
 - Dol DOLERITE
 - Ms/Sh INTERBEDDED AND INTERBARBED UNITS (e.g. Mudstone and Shale)
 - Ms/Sh LAMINATED UNITS (e.g. Mudstone and Shale Lenticles)
 - Cl Unit too small to see symbol (e.g. claystone at level of intercept)
 - Breccia (shear zone, fault zone?)
- (Adapted from Australian Standard Symbols Ref. AS 1183-1978)

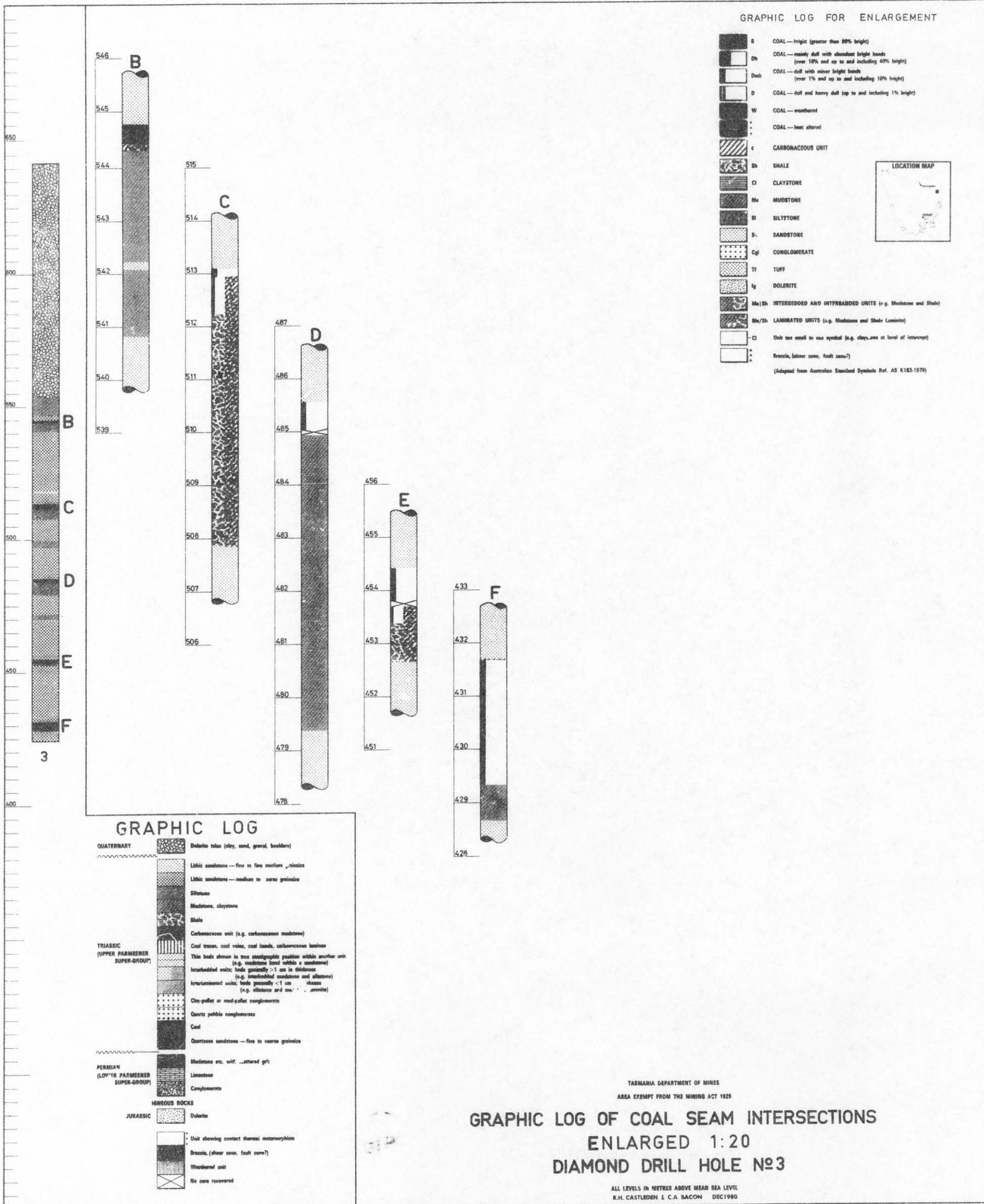


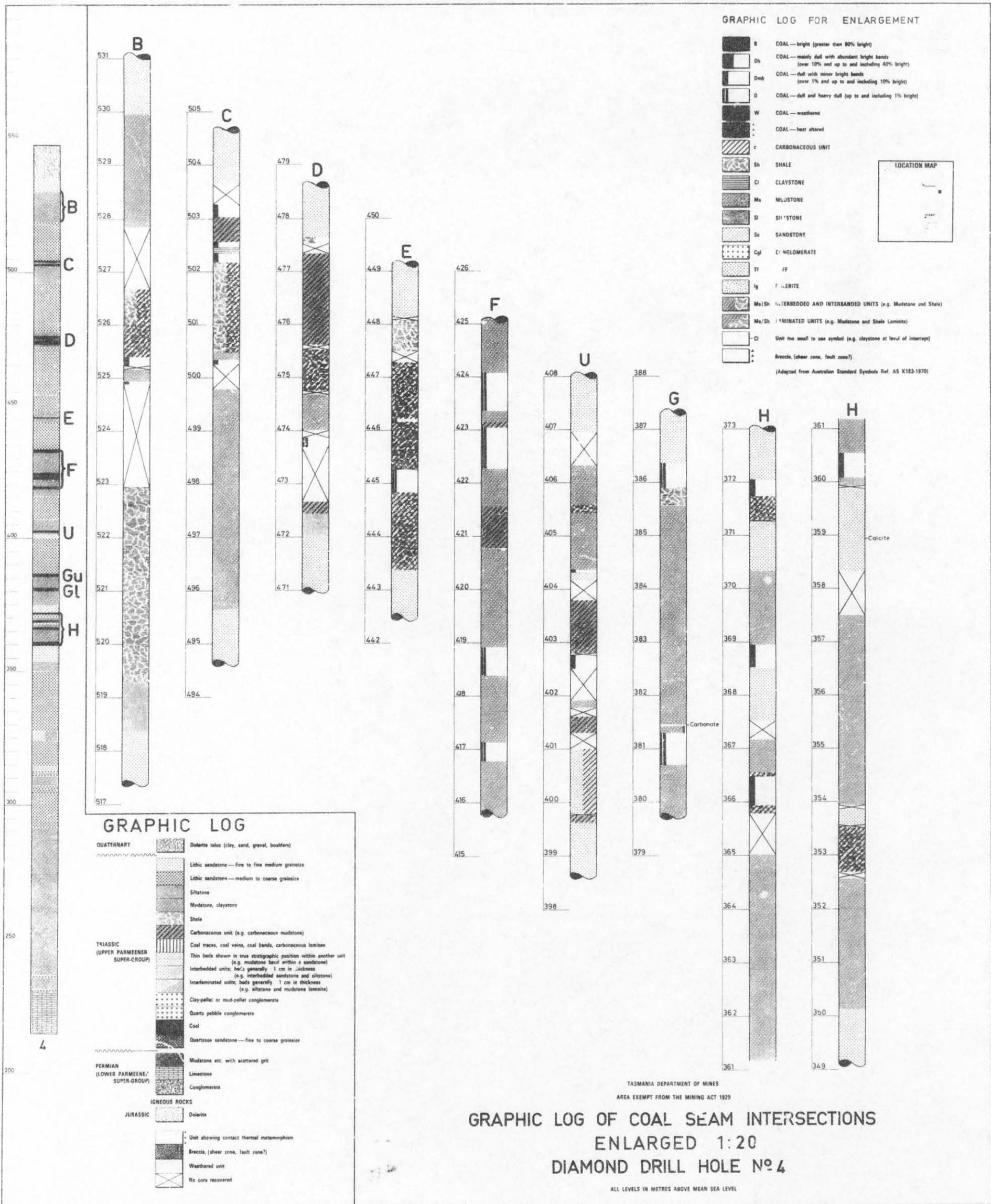
GRAPHIC LOG

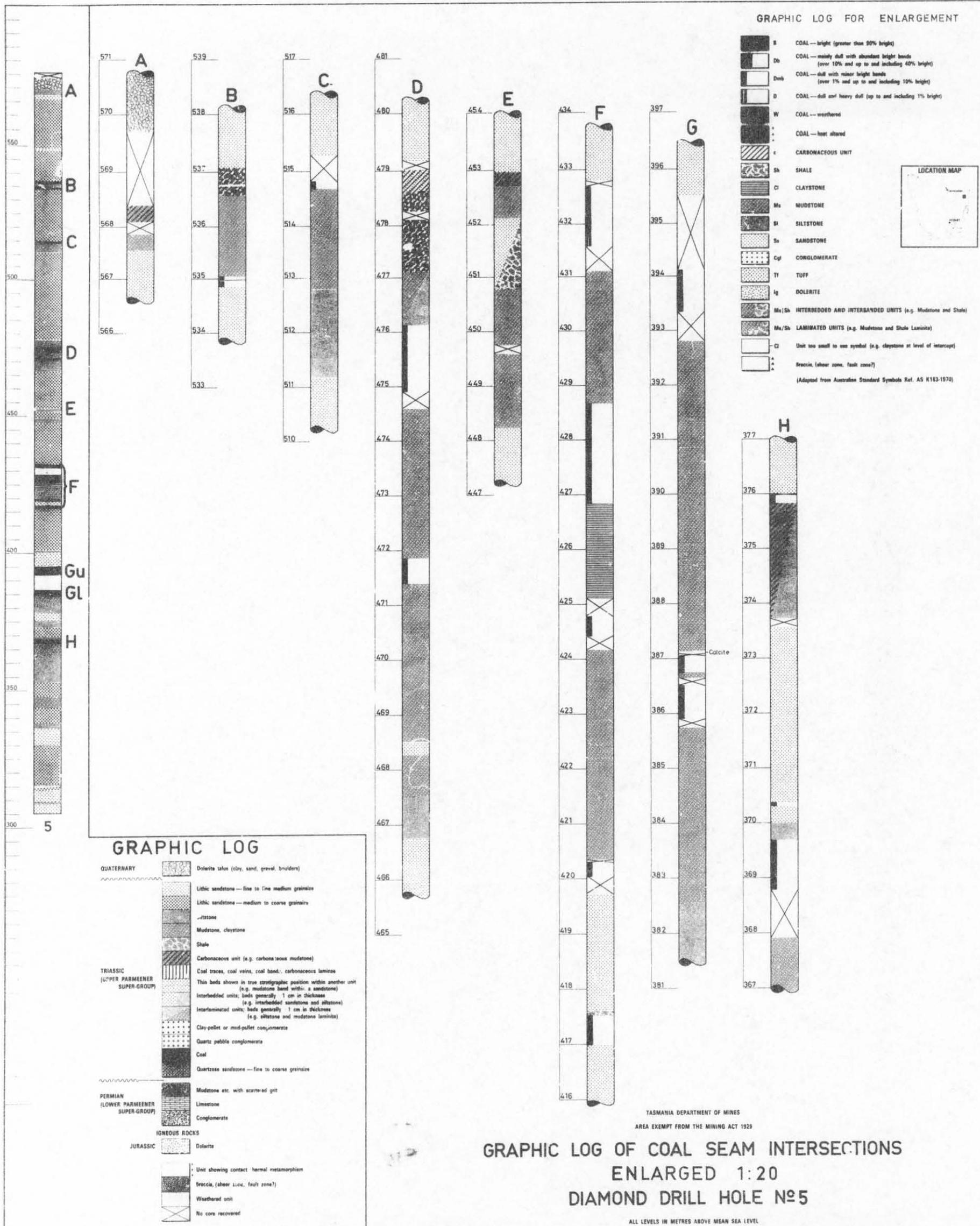
- QUATERNARY
 - Delritic talus (clay, sand, gravel, boulders)
 - Litic sandstone — fine to fine medium grained
 - Litic sandstone — medium to coarse grained
 - Siltstone
 - Mudstone, claystone
 - Shale
 - Carbonaceous unit (e.g. carbonaceous mudstone)
 - Coal traces, coal veins, coal bands, carbonaceous laminae
- TRIASSIC (UPPER PARMEERER SUPER-GROUP)
 - This beds shown in true stratigraphic position within another unit (e.g. mudstone lens within a sandstone)
 - Interbedded units: beds generally < 1 m in thickness (e.g. interbedded sandstone and siltstone)
 - Interlaminated units: beds generally < 1 cm in thickness (e.g. siltstone and mudstone laminae)
 - Clay-pellet or mud-pellet conglomerates
 - Quartz pebbles conglomerates
 - Coal
 - Quartzose sandstone — fine to coarse grained
- PERMIAN (LOWER PARMEERER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerates
- IGNEOUS ROCKS
 - JURASSIC
 - Dolerite
 - Unit showing contact thermal metamorphism
 - Breccia (shear zone, fault zone?)
 - Weathered unit
 - No core recovered

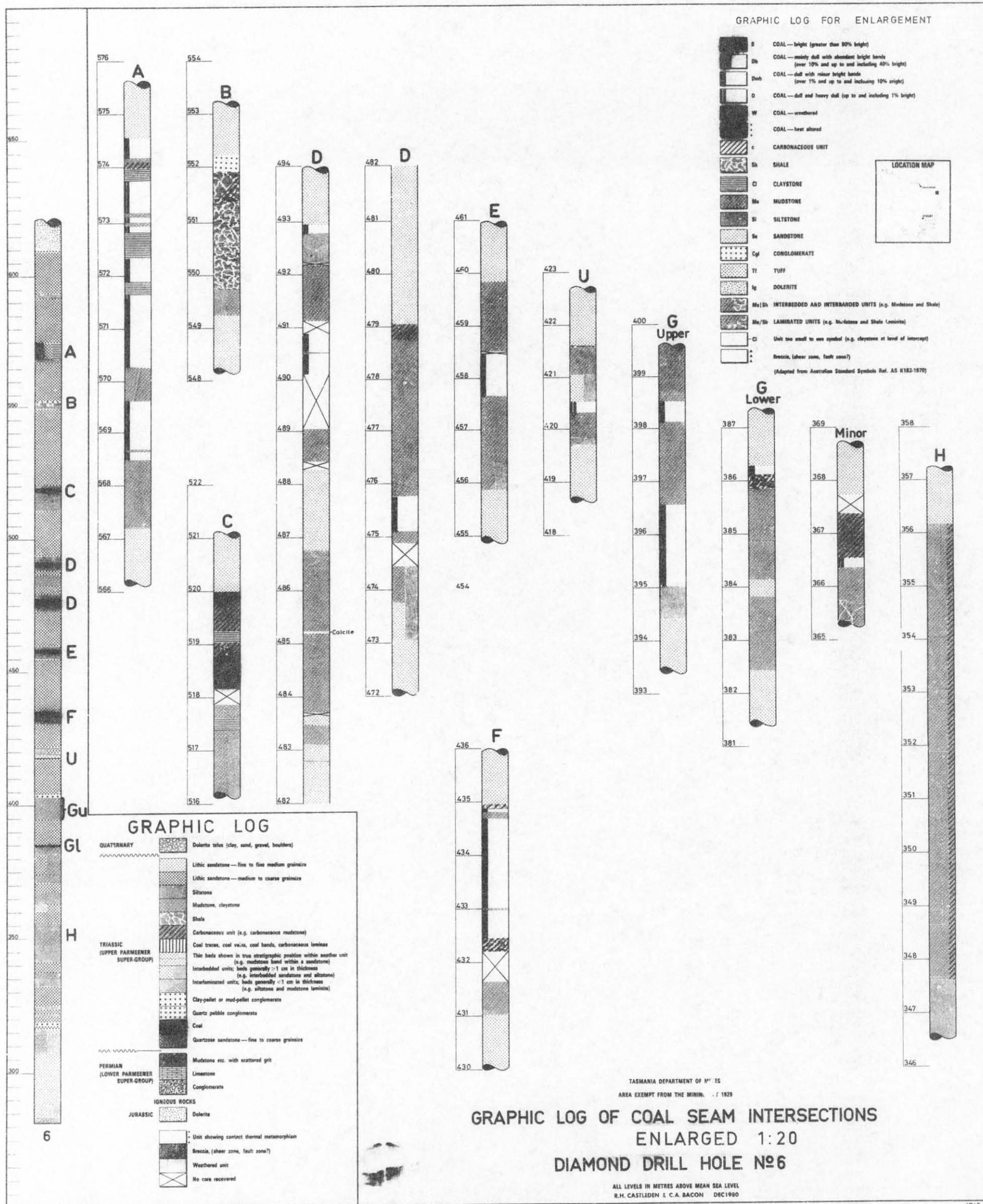
TASMANIA DEPARTMENT OF MINES
 AREA EXEMPT FROM THE MINING ACT 1929
GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 2

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
 R.H. CASTLEDEN & C.A. BACON DEC 1980



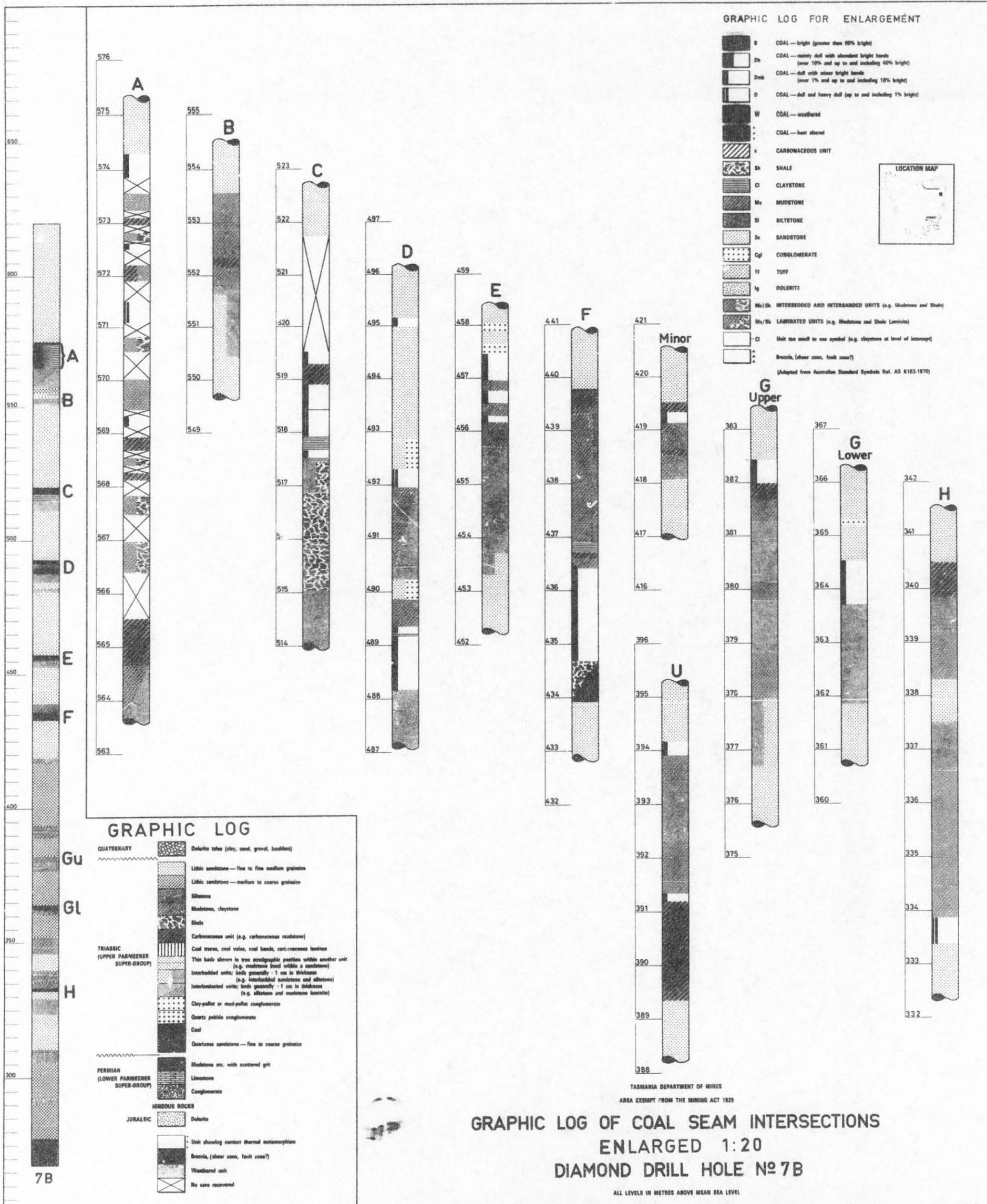


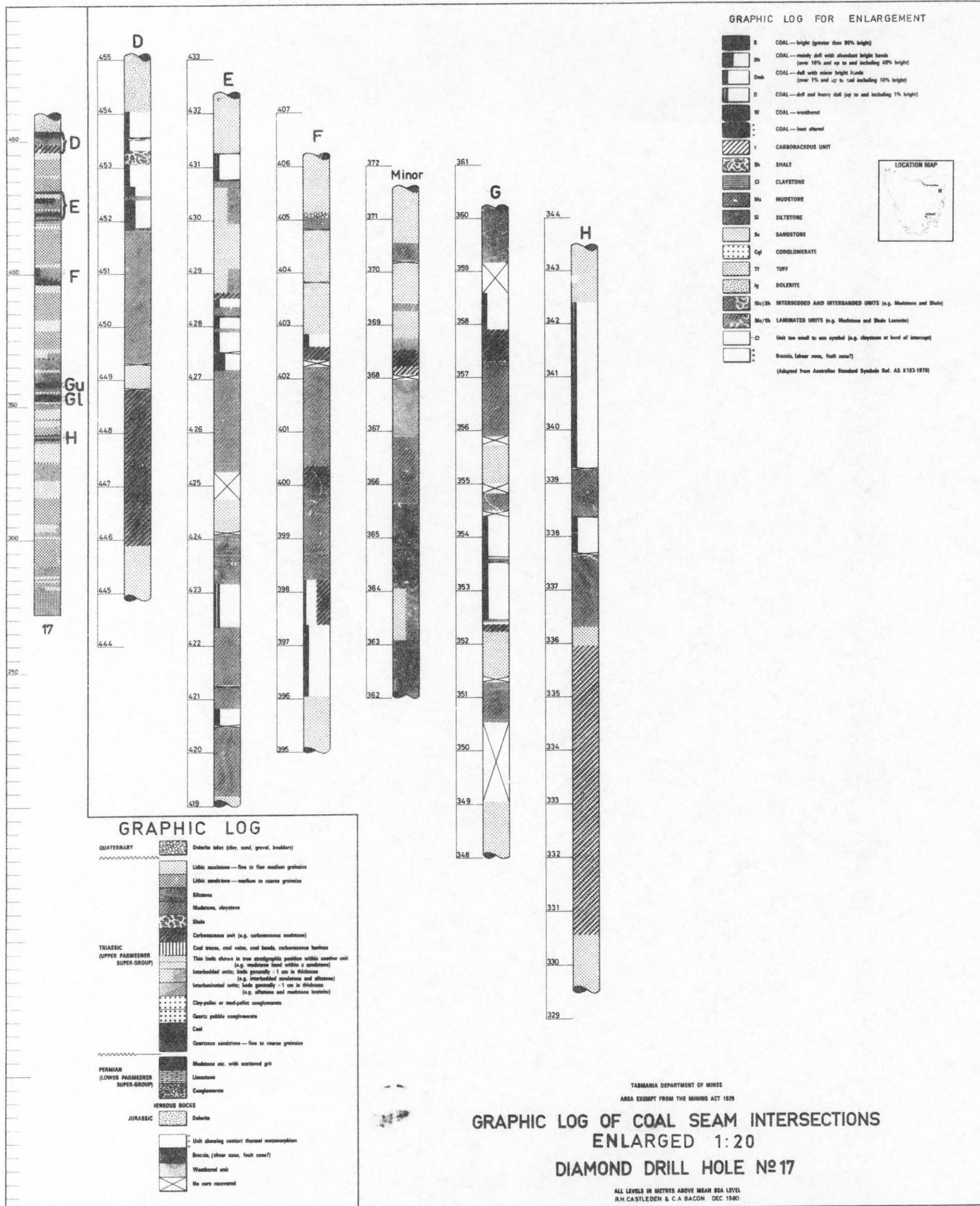




SHEET 41 FIGURE 12

4745-41





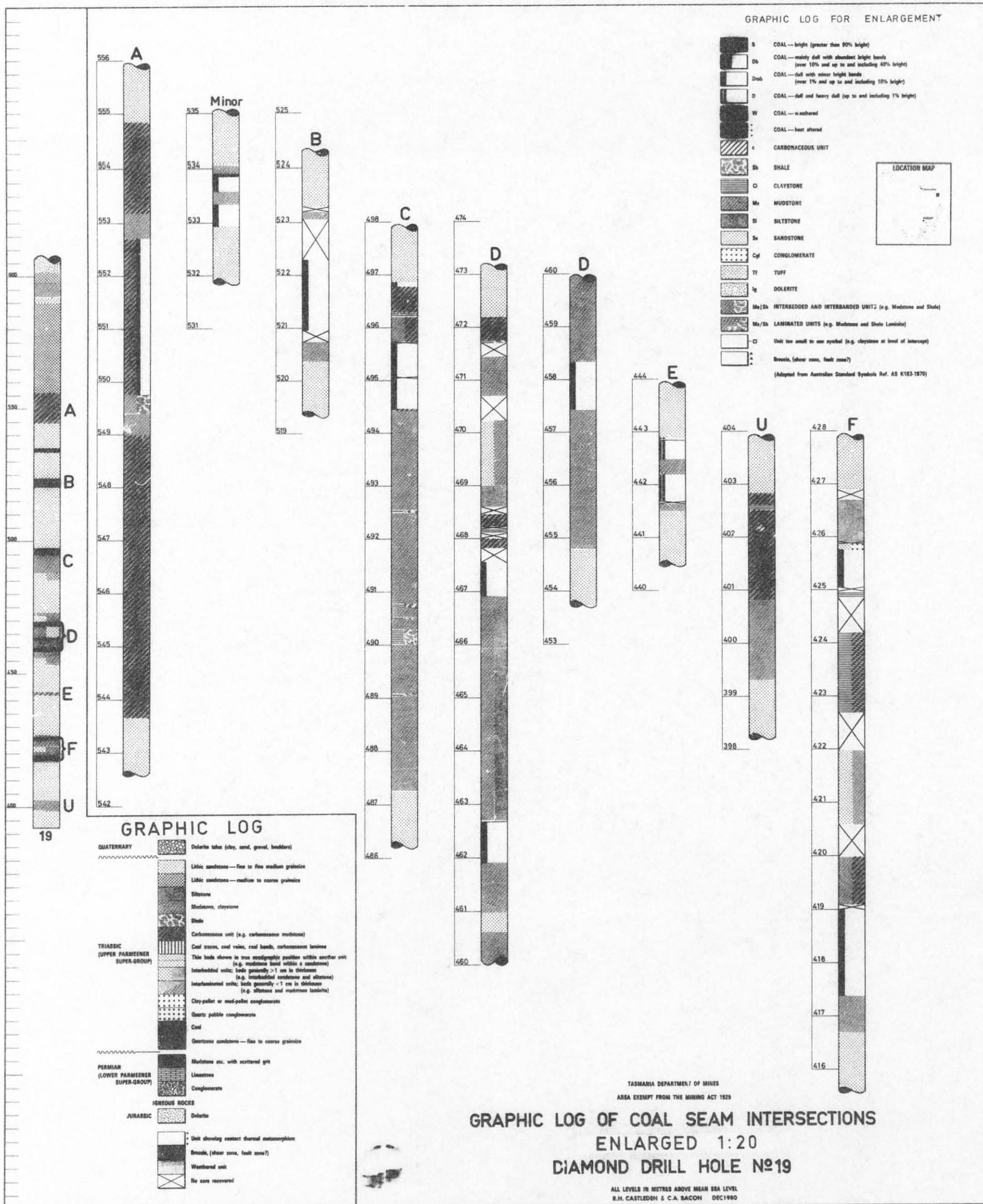


FIGURE 45

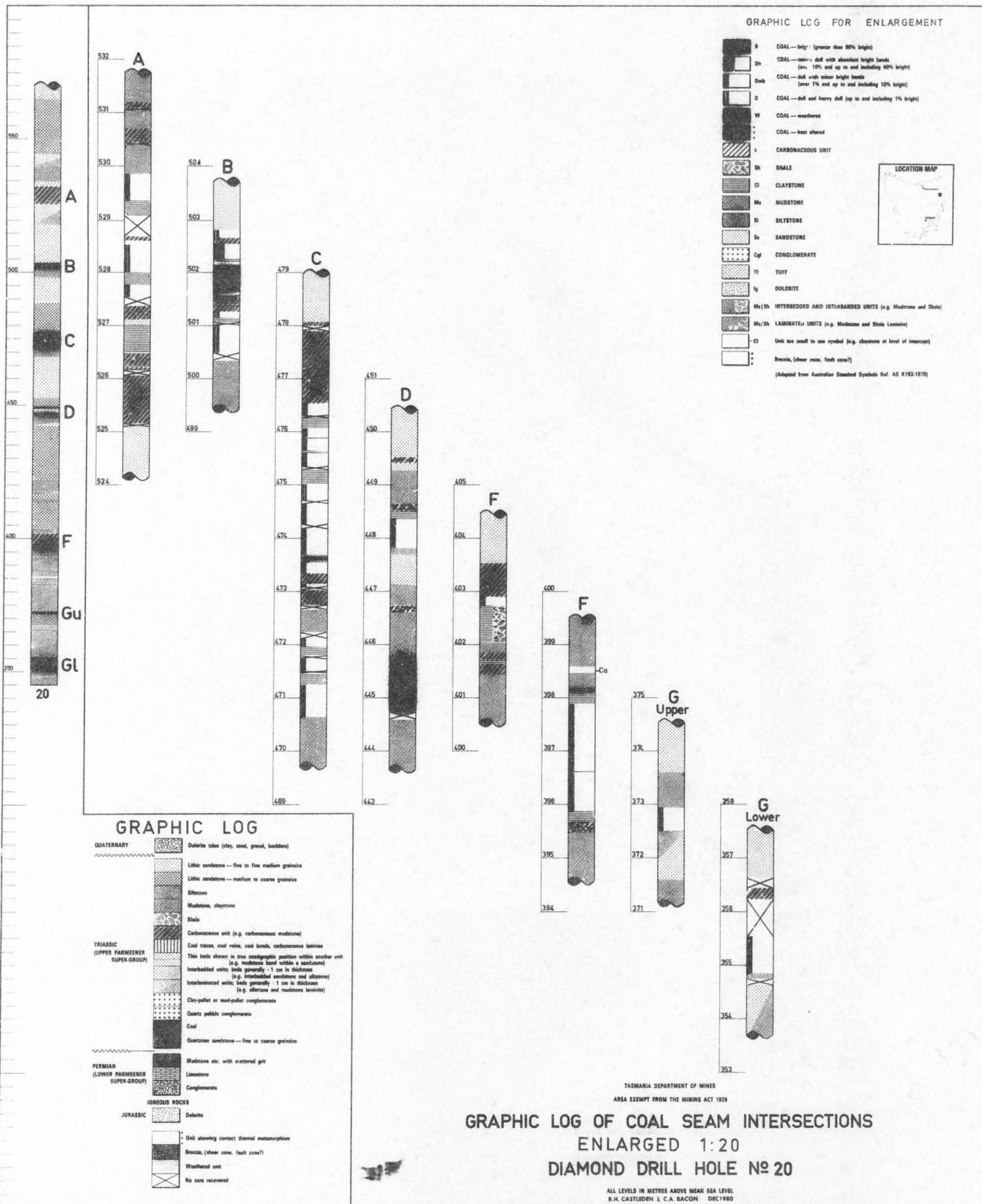


FIGURE 46

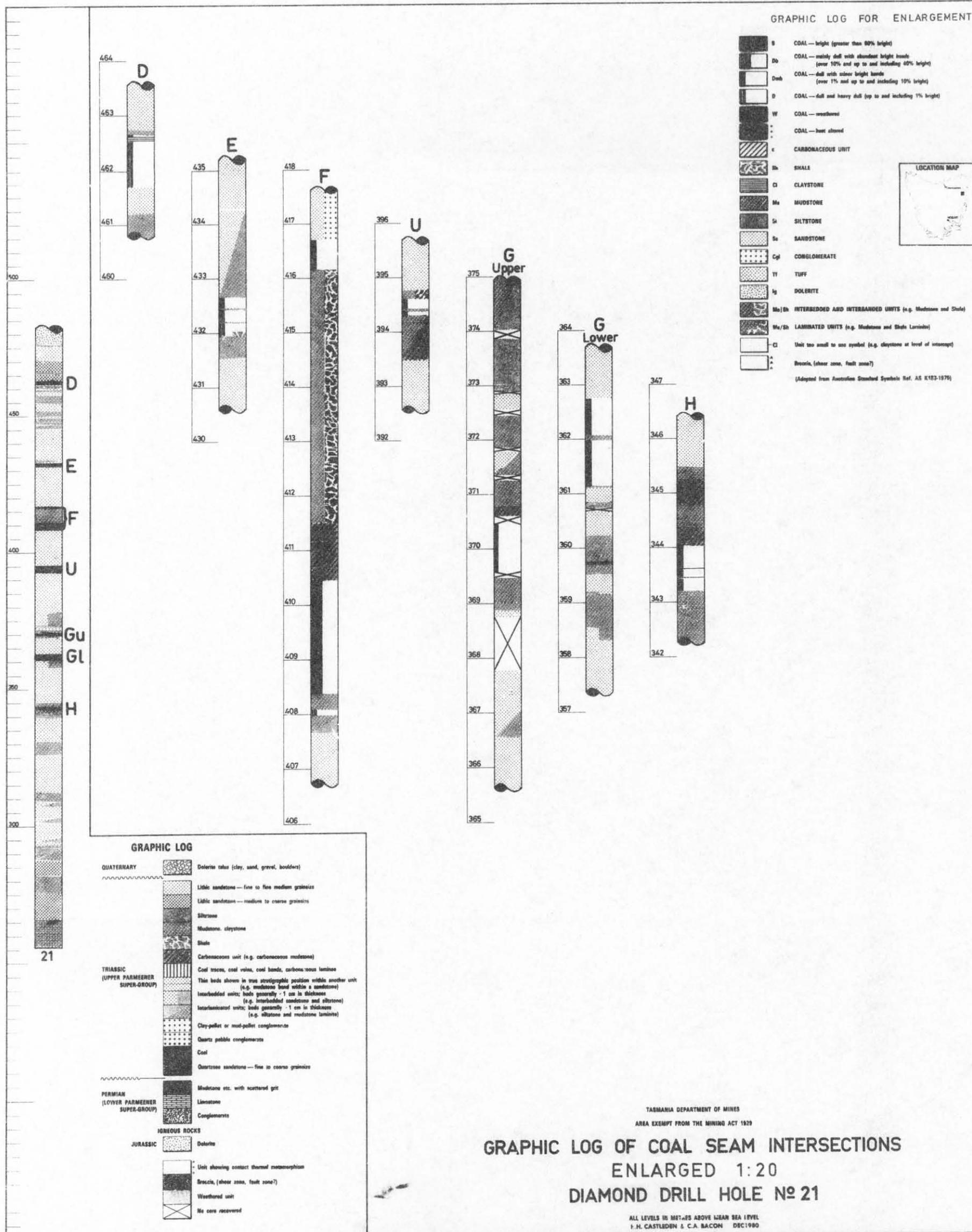


FIGURE 47

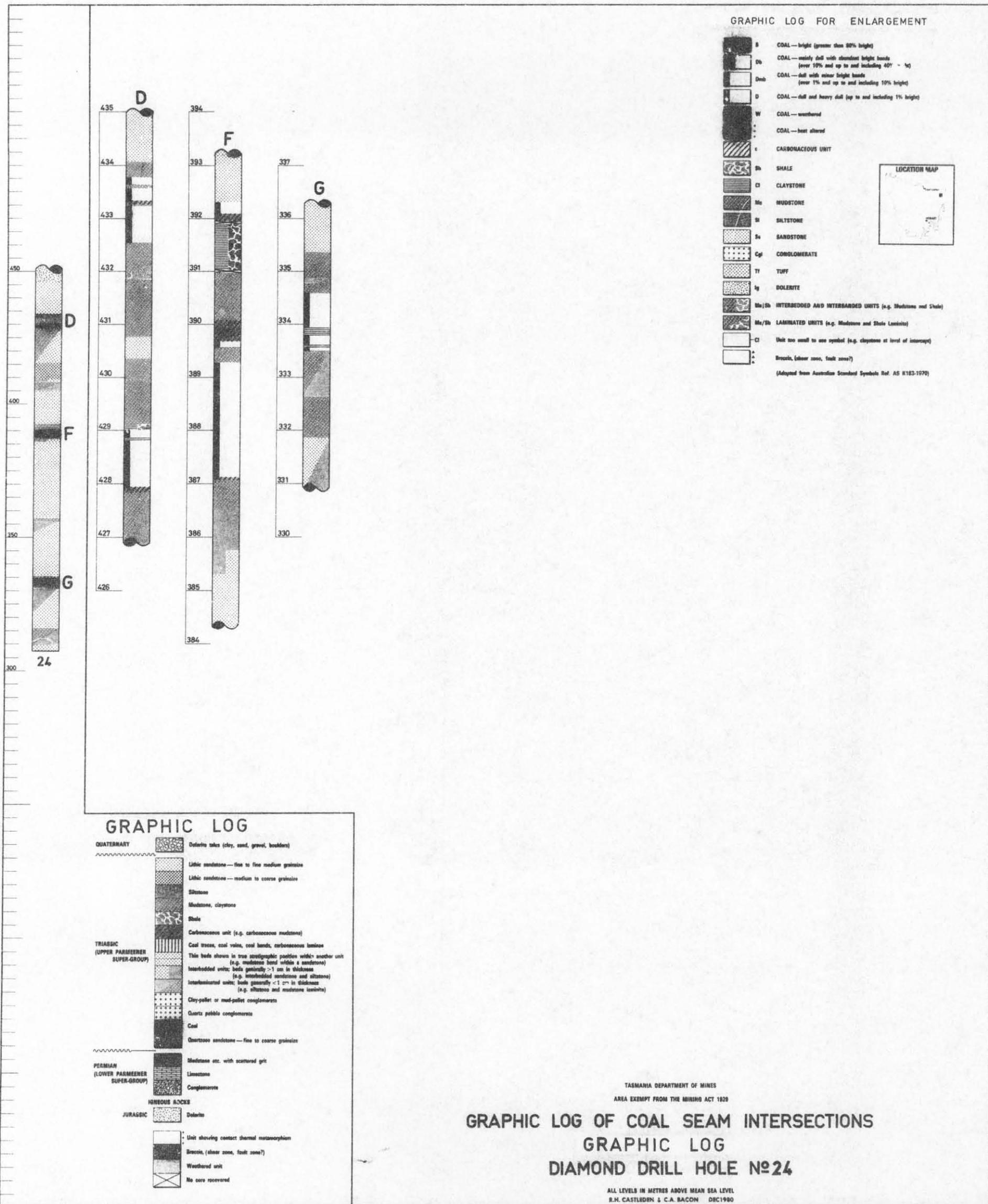


FIGURE 48

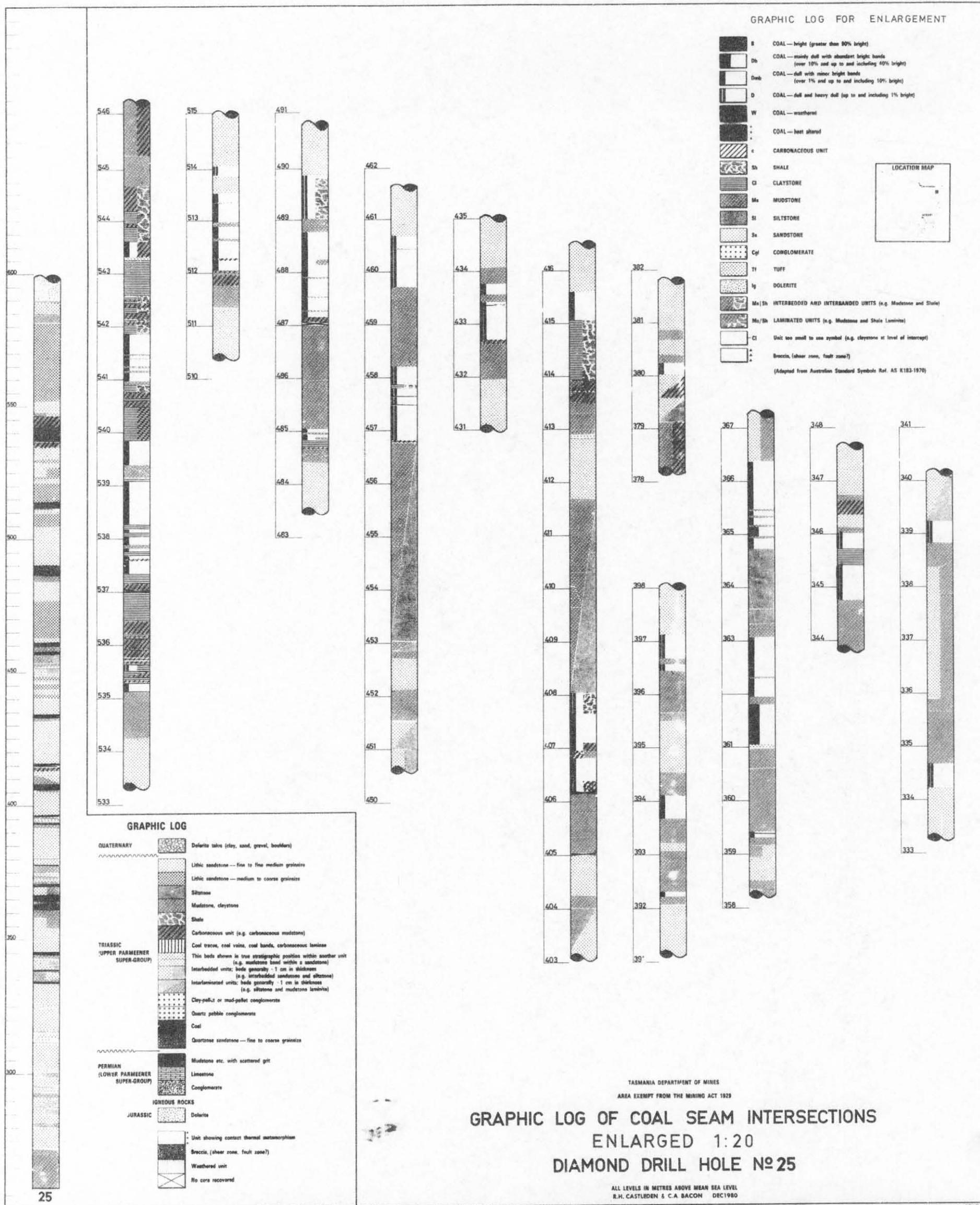
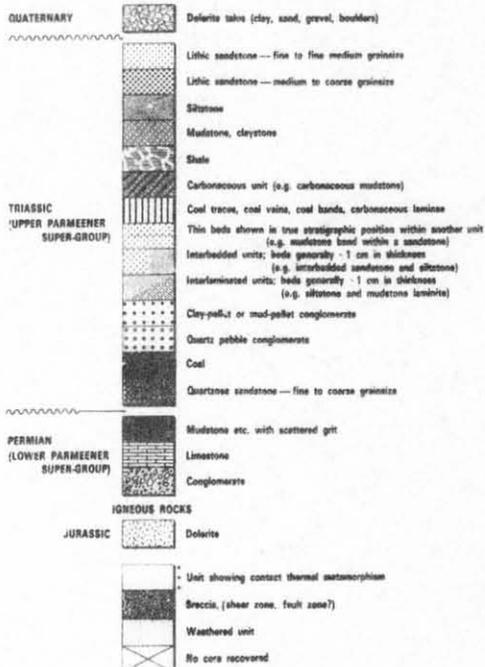
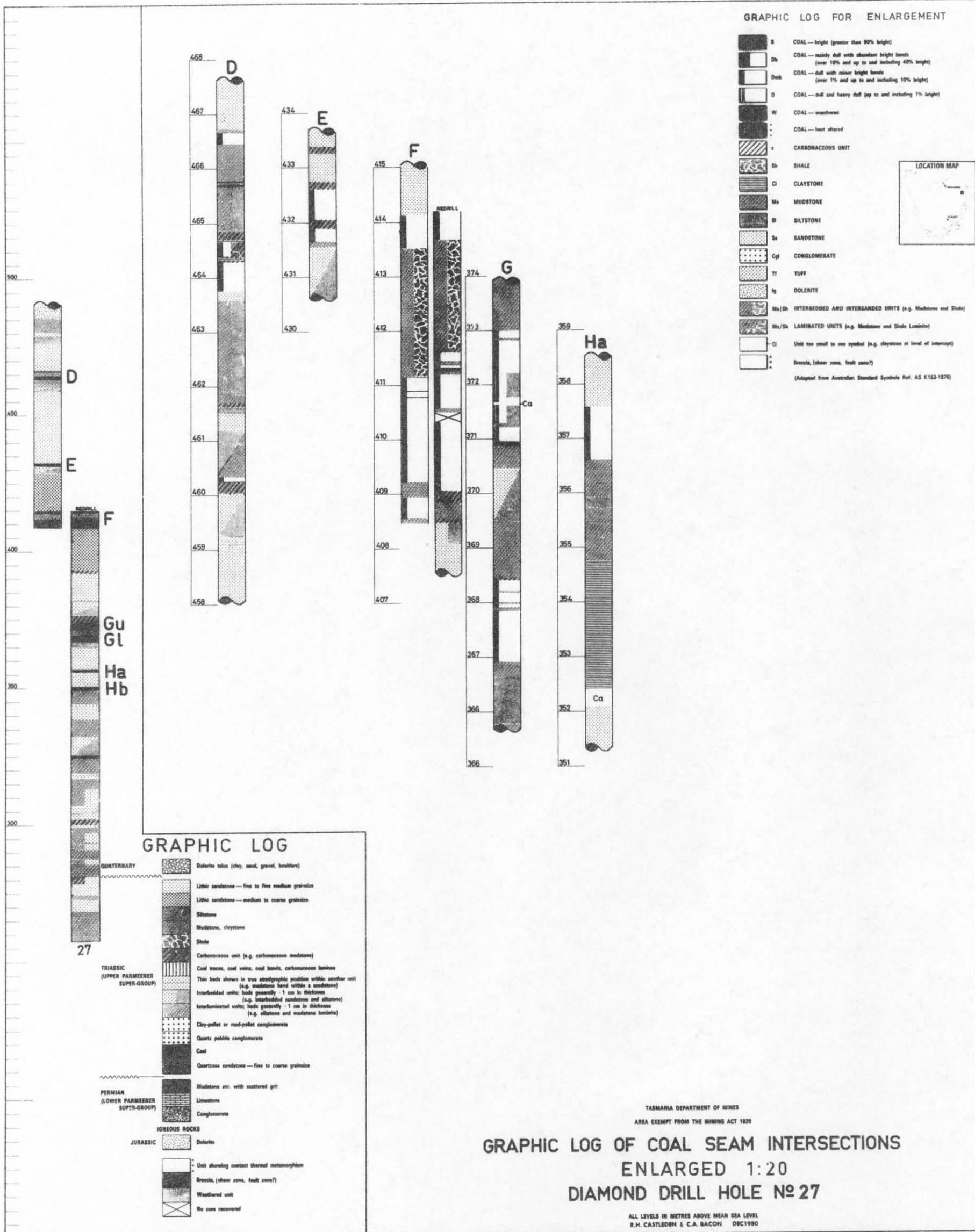


FIGURE 49

25

GRAPHIC LOG





GRAPHIC LOG FOR ENLARGEMENT

- B COAL — bright (greater than 90% bright)
- Dn COAL — mainly dull with abundant bright bands (over 10% and up to and including 40% bright)
- Dsh COAL — dull with minor bright bands (over 1% and up to and including 10% bright)
- D COAL — dull and heavy dull (up to and including 1% bright)
- W COAL — weathered
- COAL — heat altered
- c CARBONACEOUS UNIT
- Sh SHALE
- Cl CLAYSTONE
- Mu MUDSTONE
- Sf SILTSTONE
- Sa SANDSTONE
- Cgl CONGLOMERATE
- Tl TUFF
- Dol DOLERITE
- Mu/Sh INTERBEDDED AND INTERFINGERED UNITS (e.g. Mudstone and Shale)
- Mu/Ss LAMINATED UNITS (e.g. Mudstone and Sandstone)
- Cl Unit too small to see symbol (e.g. claystone at level of intercept)
- Br Bricks, (shear zone, fault zone?)
- Weathered unit
- No core recovered



GRAPHIC LOG

- QUATERNARY
 - Dolerite tuffs (clay, sand, gravel, boulders)
 - Litic sandstone — fine to fine medium grain size
 - Litic sandstone — medium to coarse grain size
 - Siltstone
 - Mudstone, claystone
 - Shale
 - Carbonaceous unit (e.g. carbonaceous mudstone)
 - Coal traces, coal veins, coal banks, carbonaceous laminae
 - This beds shown in true stratigraphic position within another unit (e.g. mudstone band within a sandstone)
 - Interspersed units: beds generally 1 cm in thickness (e.g. interbedded sandstone and siltstone)
 - Interfingered units: beds generally 1 cm in thickness (e.g. siltstone and mudstone laminae)
 - Clay-pellet or mud-pellet conglomerates
 - Quartz pebble conglomerates
 - Coal
 - Quartzite sandstone — fine to coarse grain size
- TRIASSIC (UPPER PARMEERER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerate
- PERMIAN (LOWER PARMEERER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerate
- IGNEOUS ROCKS
 - Dolerite
- JURASSIC
 - Dolerite
- Unit showing contact thermal metamorphism
- Bricks, (shear zone, fault zone?)
- Weathered unit
- No core recovered

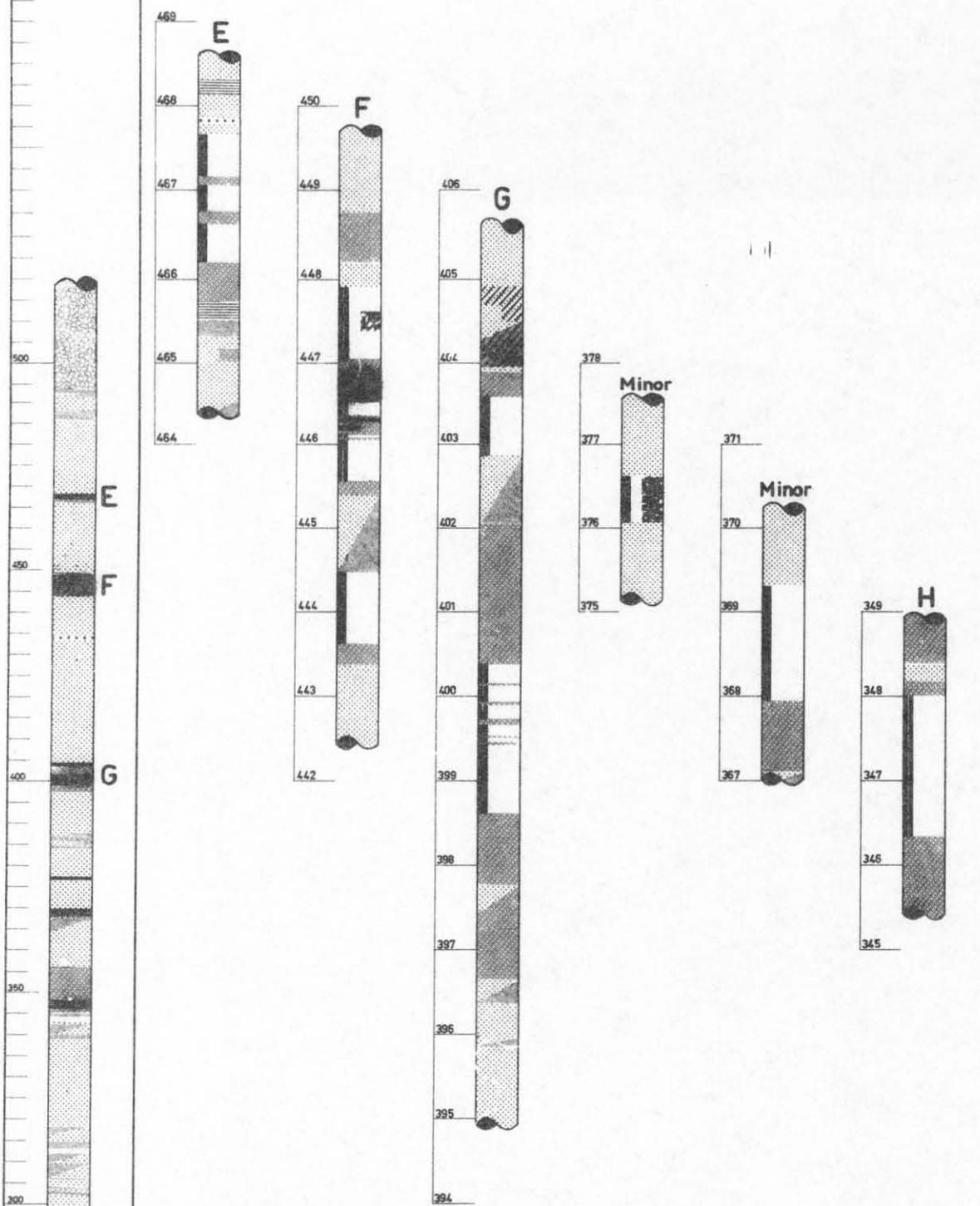
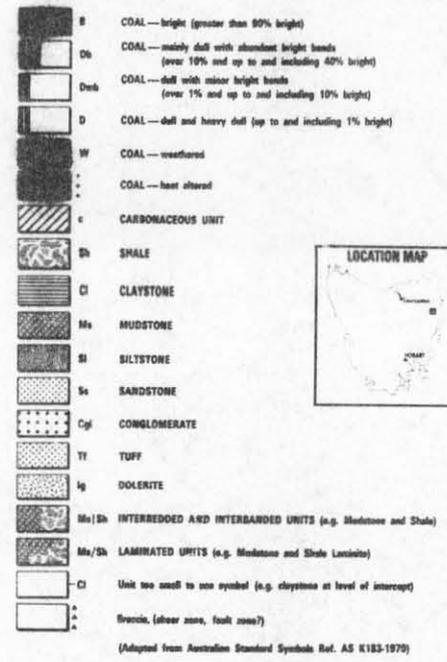
TASMANIA DEPARTMENT OF MINES
AREA EXEMPT FROM THE MINING ACT 1920

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 27

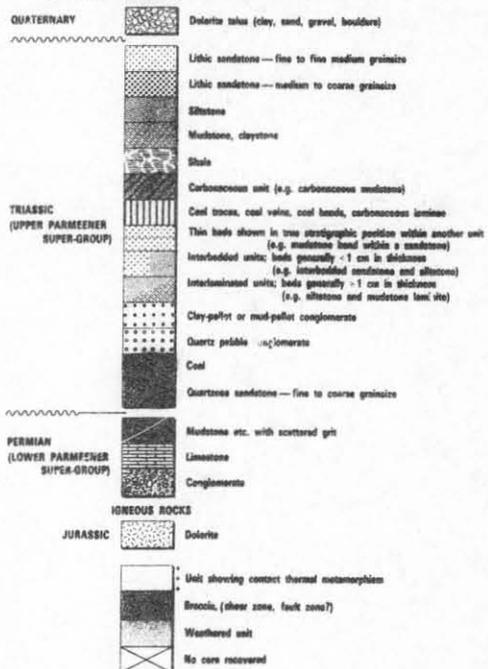
ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
R.H. CASTLEDON & C.A. BACON DEC1980

FIGURE 50

GRAPHIC LOG FOR ENLARGEMENT



GRAPHIC LOG



TASMANIA DEPARTMENT OF MINES
 AREA EXEMPT FROM THE MINING ACT 1929

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
 ENLARGED 1:20
 DIAMOND DRILL HOLE No 30

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
 R.H. CASTLEDEN & C.A. BACON DEC 1980

FIGURE 51

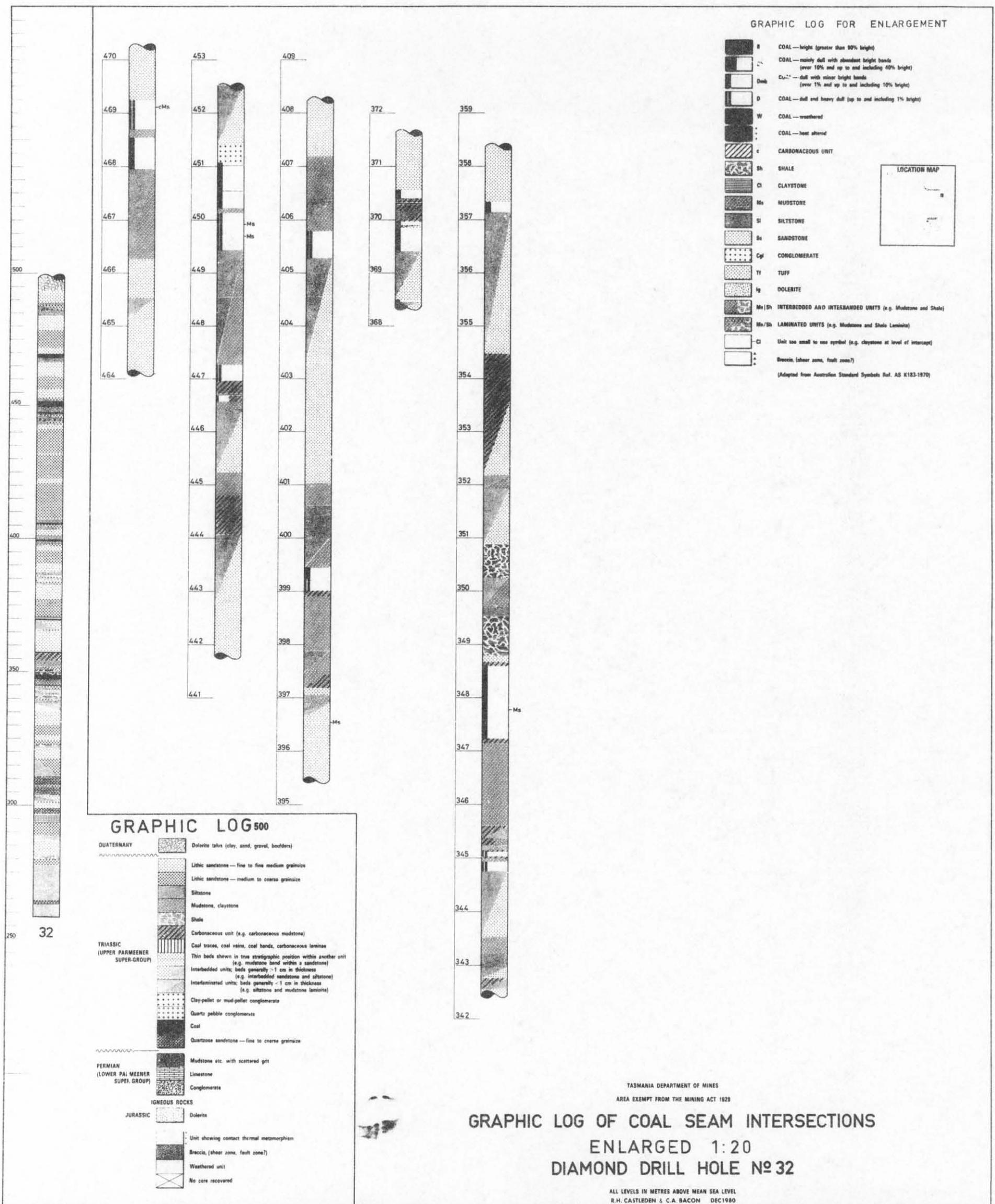
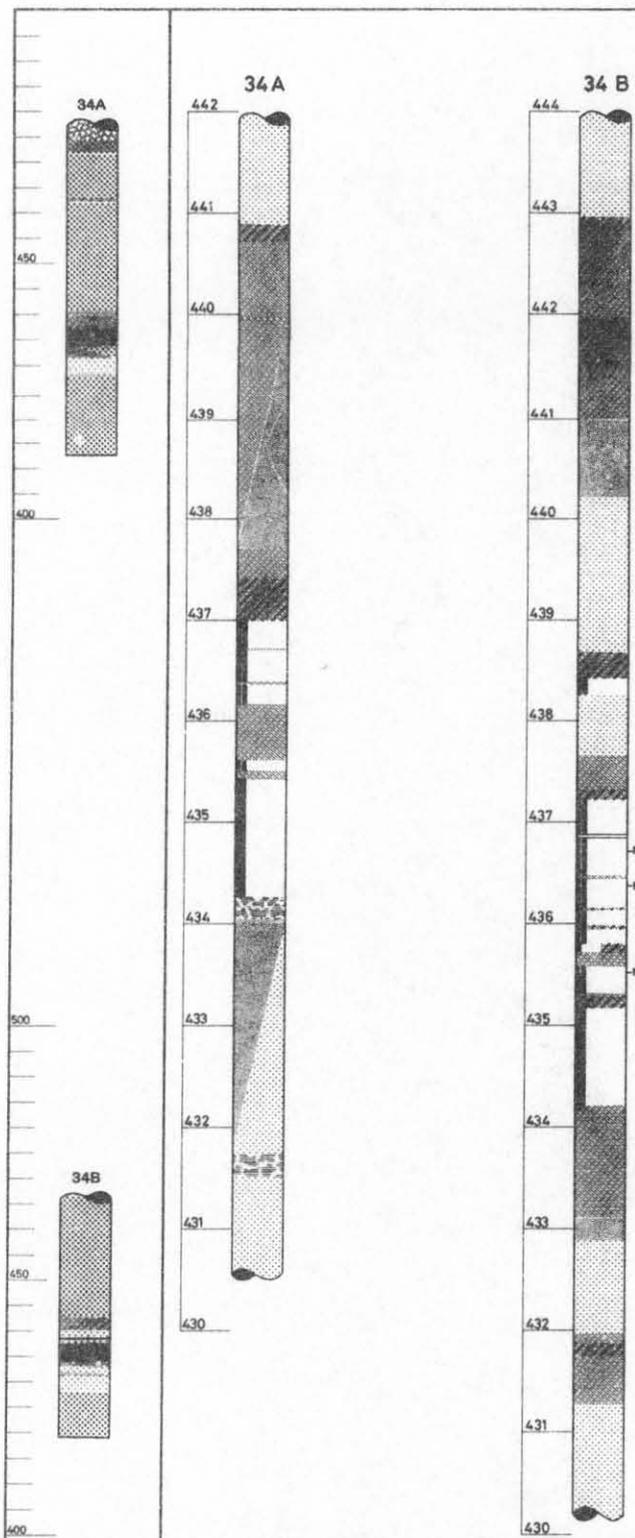
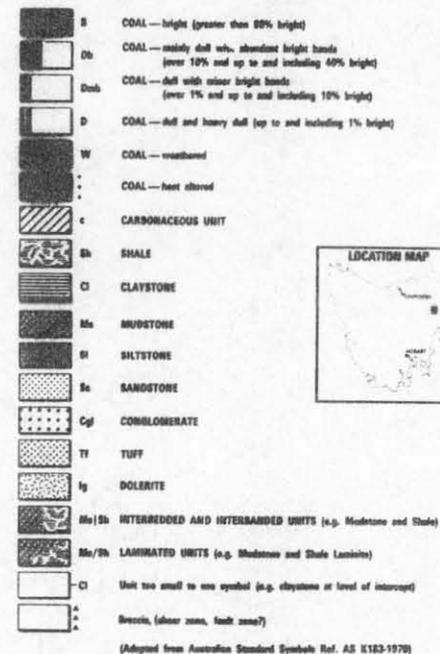


FIGURE 52

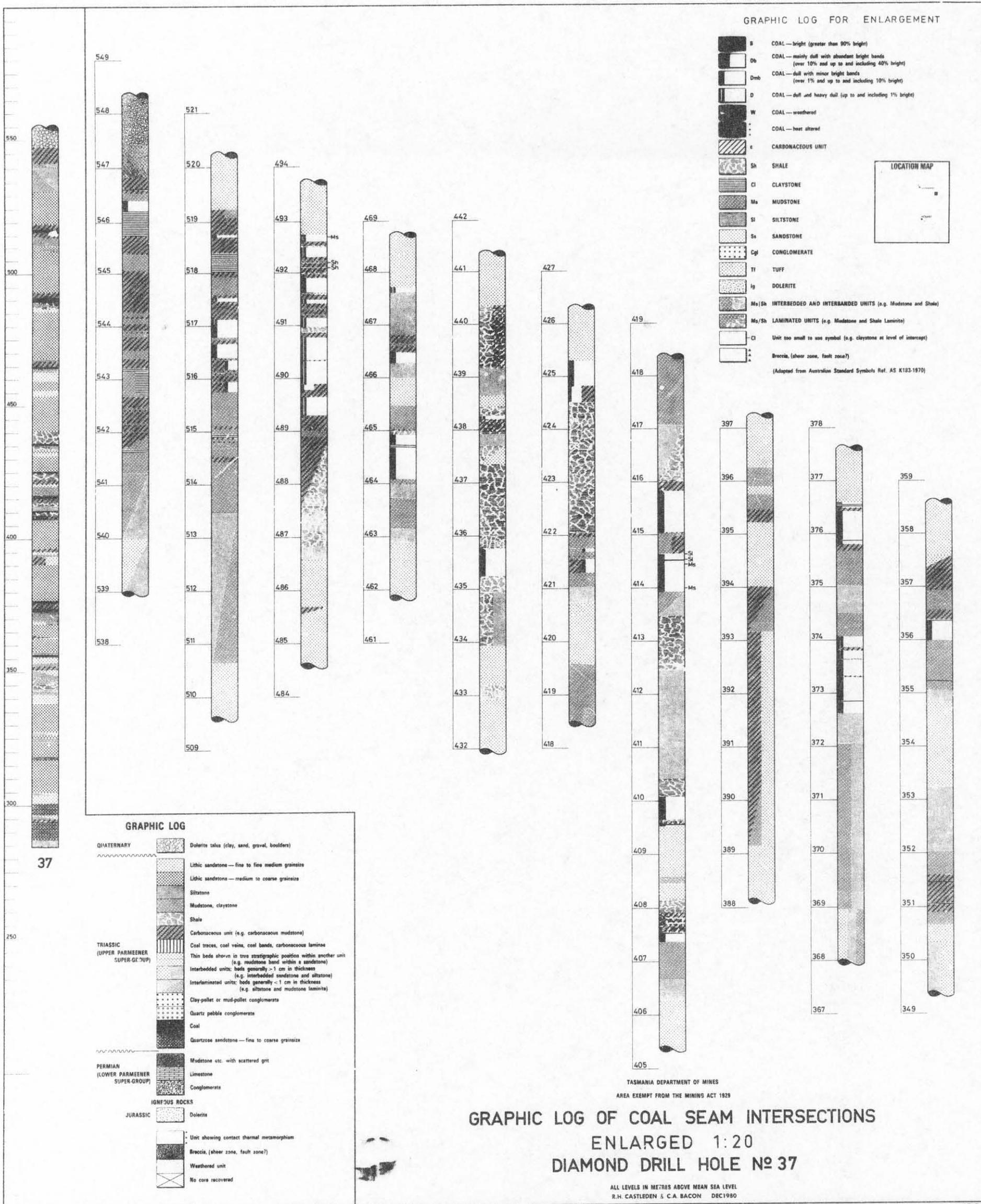
GRAPHIC LOG FOR ENLARGEMENT



TASMANIA DEPARTMENT OF MINES
 AREA EXEMPT FROM THE MINING ACT 1929

**GRAPHIC LOG OF COAL SEAM INTERSECTIONS
 ENLARGED 1:20
 DIAMOND DRILL HOLE No 34A, 34B**

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
 R.M. CASTLEDEN & C.A. BACON DEC 1980



GRAPHIC LOG FOR ENLARGEMENT

- B COAL—bright (greater than 90% bright)
 - Db COAL—mainly dull with abundant bright bands (over 10% and up to and including 40% bright)
 - Dmb COAL—dull with minor bright bands (over 1% and up to and including 10% bright)
 - D COAL—dull and heavy dull (up to and including 1% bright)
 - W COAL—weathered
 - COAL—heat altered
 - c CARBONACEOUS UNIT
 - Sh SHALE
 - Cl CLAYSTONE
 - Ma MUDSTONE
 - Sl SILTSTONE
 - Ss SANDSTONE
 - Cgl CONGLOMERATE
 - Tl TUFF
 - Dg DOLERITE
 - Ma/Sh INTERBEDDED AND INTERBANDED UNITS (e.g. Mudstone and Shale)
 - Ma/Sh LAMINATED UNITS (e.g. Mudstone and Shale Laminite)
 - Cl Unit too small to use symbol (e.g. claystone at level of intercept)
 - Breccia (shear zone, fault zone?)
- (Adapted from Australian Standard Symbols Ref. AS K183-1870)



GRAPHIC LOG

- QUATERNARY
 - Dolerite talus (clay, sand, gravel, boulders)
 - Lithic sandstone—fine to fine medium grainsize
 - Lithic sandstone—medium to coarse grainsize
 - Siltstone
 - Mudstone, claystone
 - Shale
 - Carbonaceous unit (e.g. carbonaceous mudstone)
- TRIASSIC (UPPER PARMEENER SUPER-GROUP)
 - Coal traces, coal veins, coal bands, carbonaceous laminae
 - Thin beds shown in true stratigraphic position within another unit (e.g. mudstone band within a sandstone)
 - Interbedded units: beds generally >1 cm in thickness (e.g. interbedded sandstone and siltstone)
 - Interlaminated units: beds generally <1 cm in thickness (e.g. siltstone and mudstone laminite)
 - Clay-pellet or mud-pellet conglomerate
 - Quartz pebble conglomerate
 - Coal
 - Quartzose sandstone—fine to coarse grainsize
- PERMIAN (LOWER PARMEENER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerate
- IGNEOUS ROCKS
 - Dolerite
- JURASSIC
 - Unit showing contact thermal metamorphism
 - Breccia (shear zone, fault zone?)
 - Weathered unit
 - No core recovered

TASMANIA DEPARTMENT OF MINES
AREA EXEMPT FROM THE MINING ACT 1928

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 37

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
R.H. CASTLEDEN & C.A. BACON DEC1980

FIGURE 54

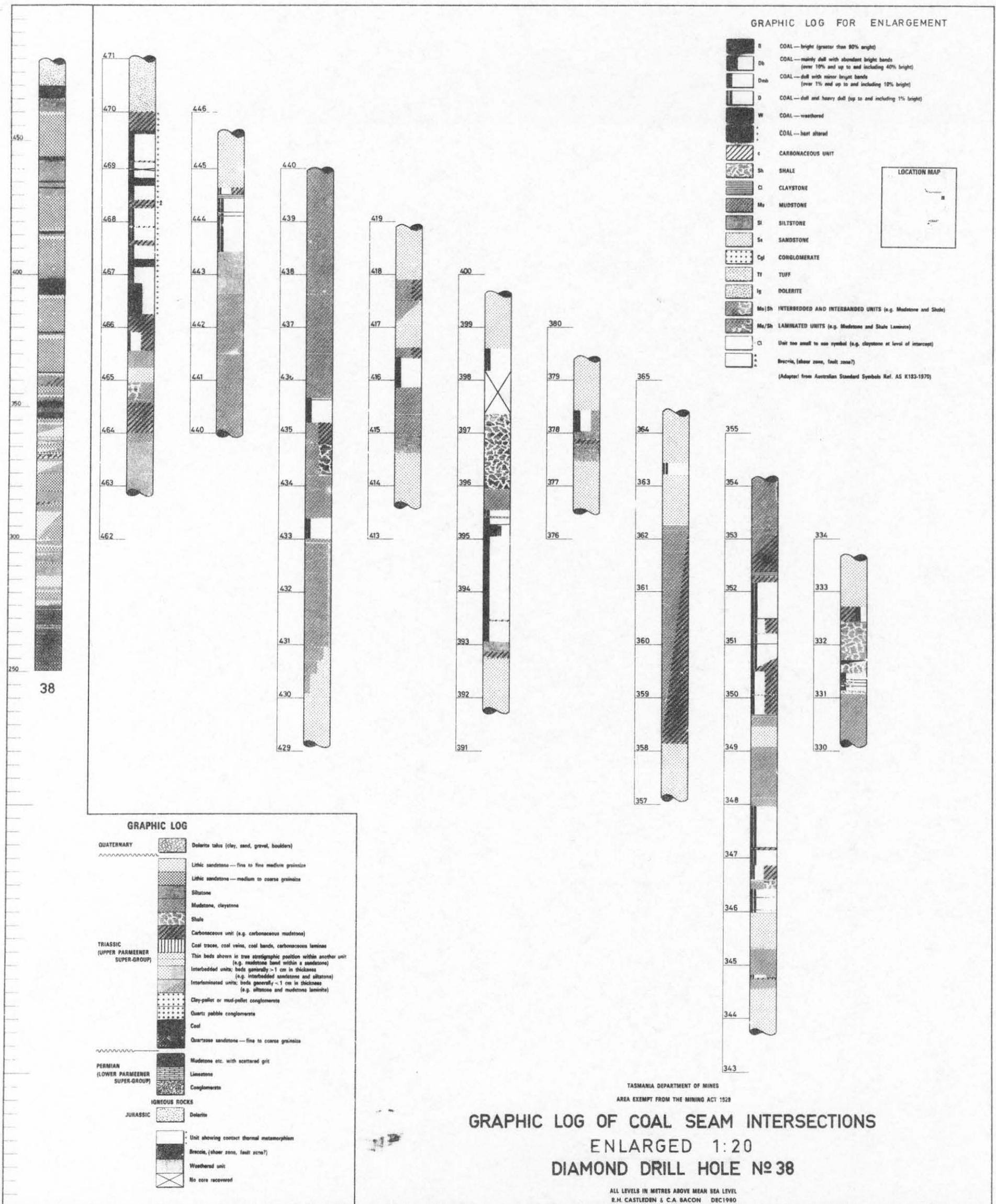


FIGURE 55

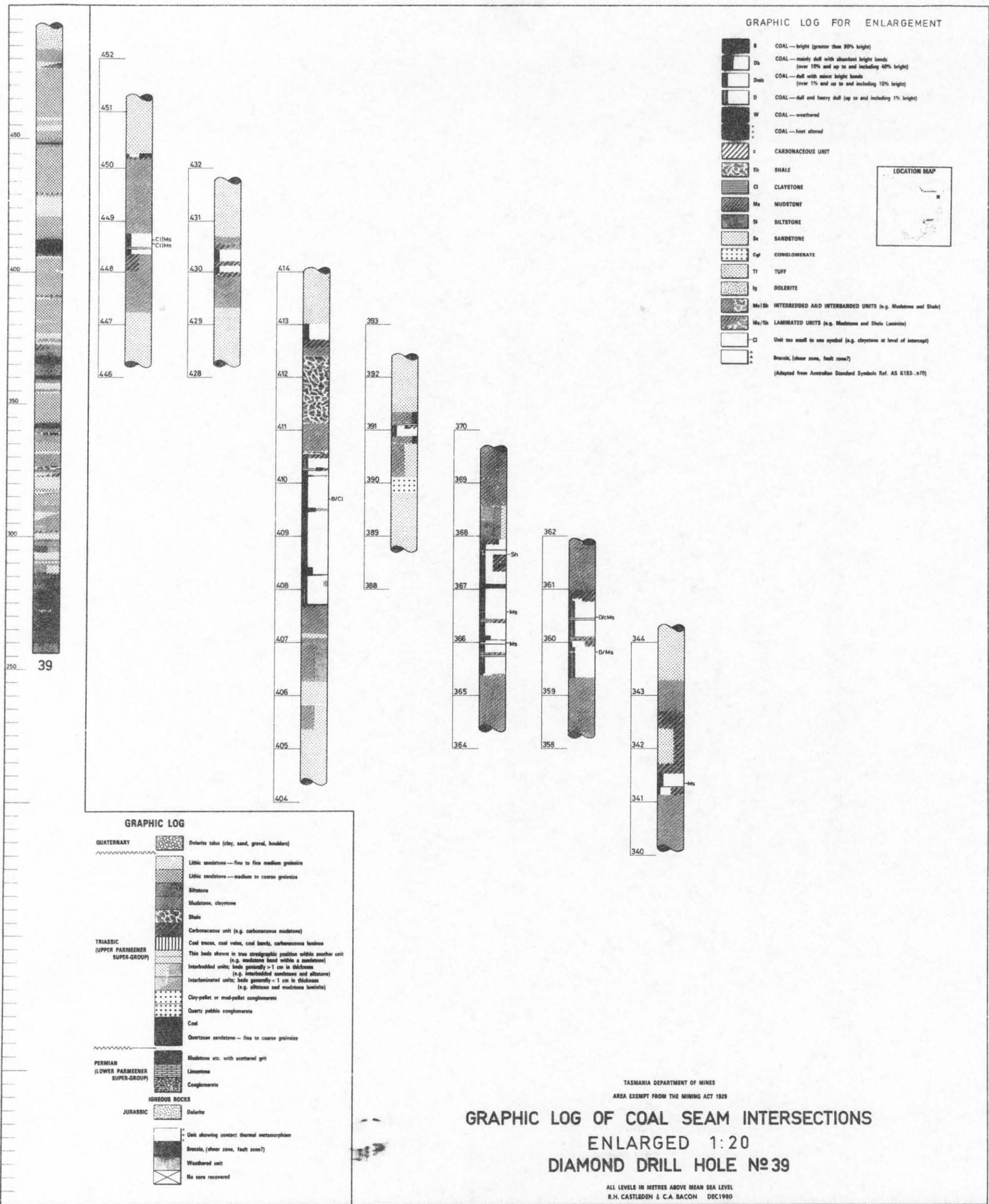
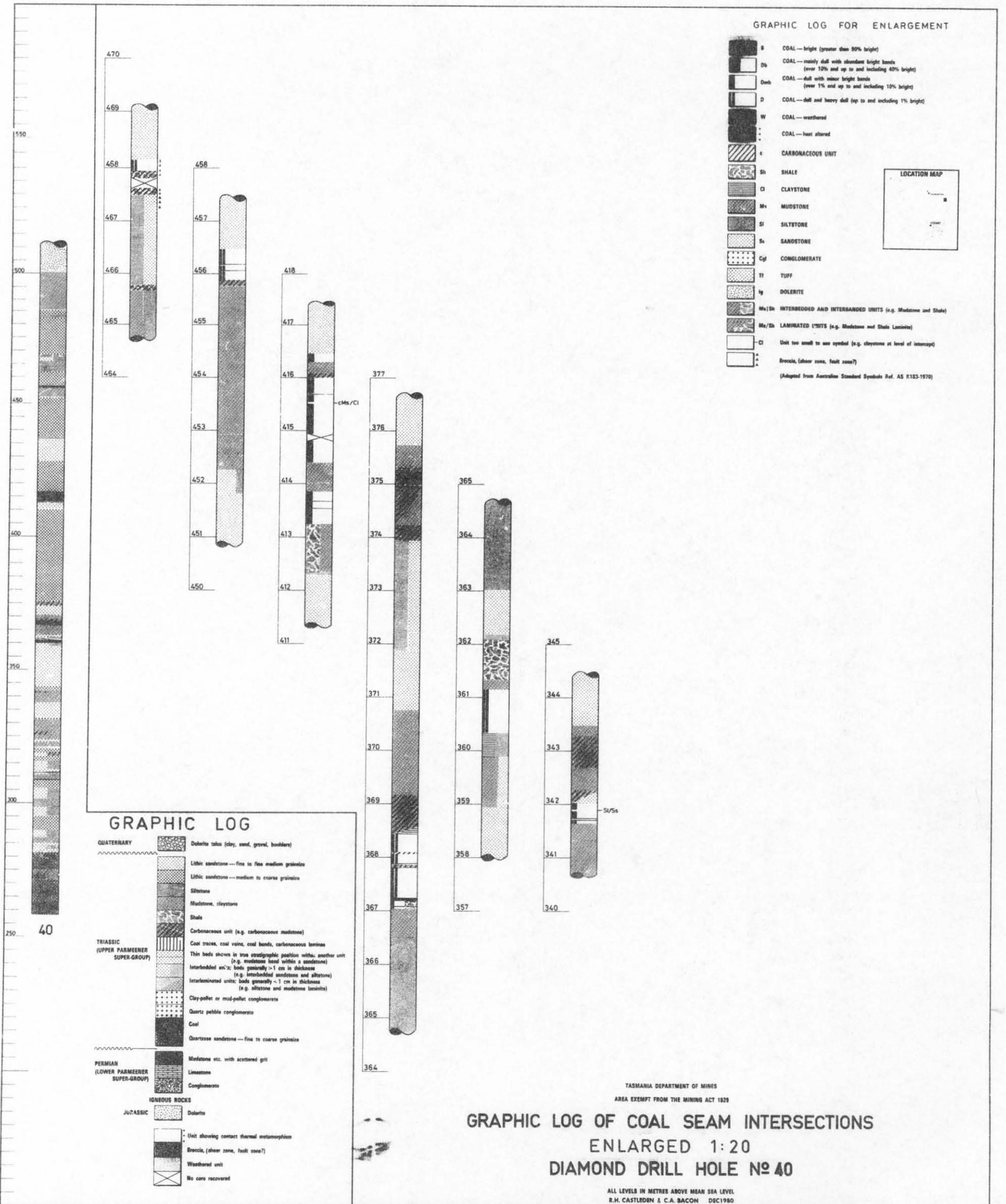


FIGURE 56



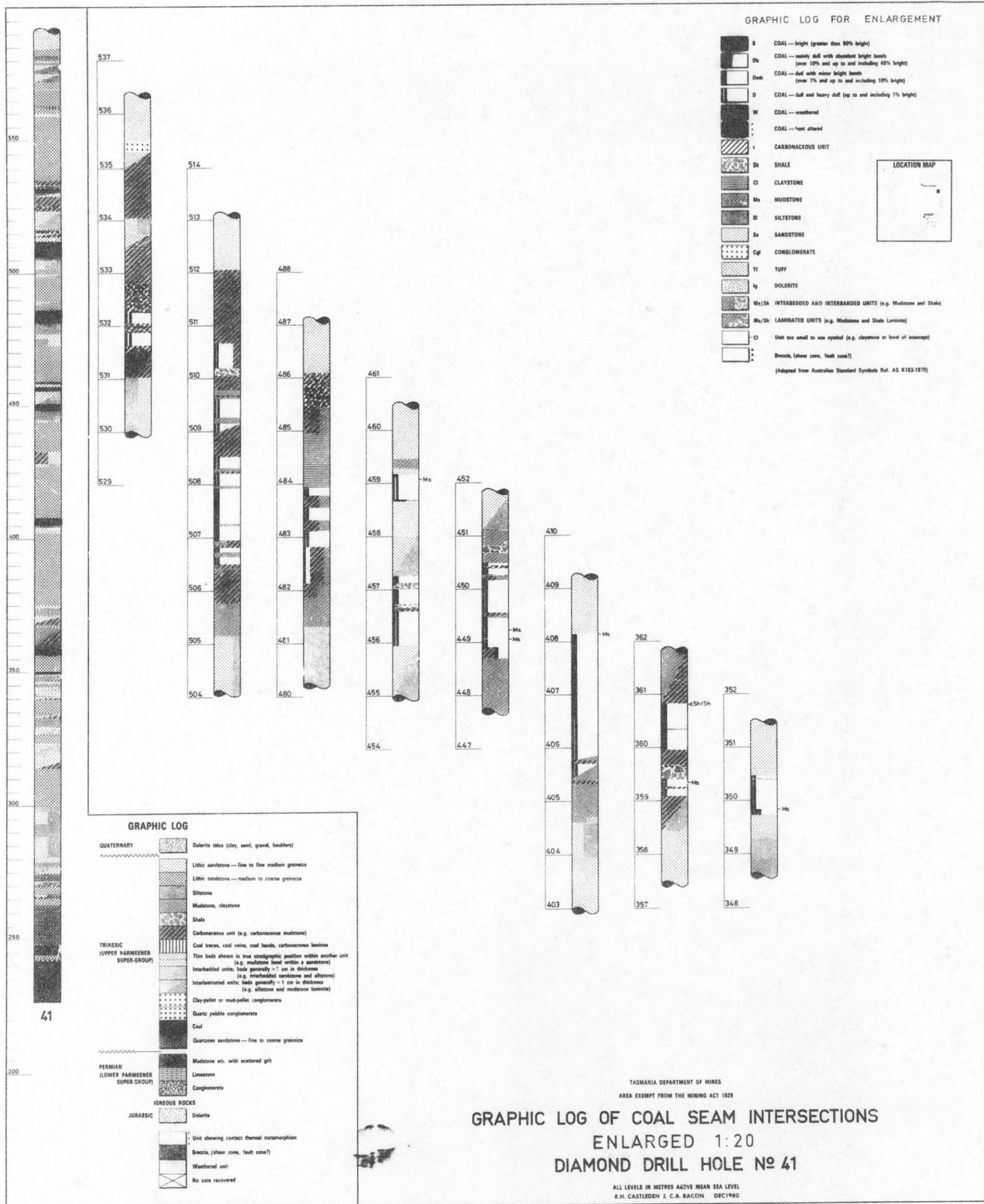
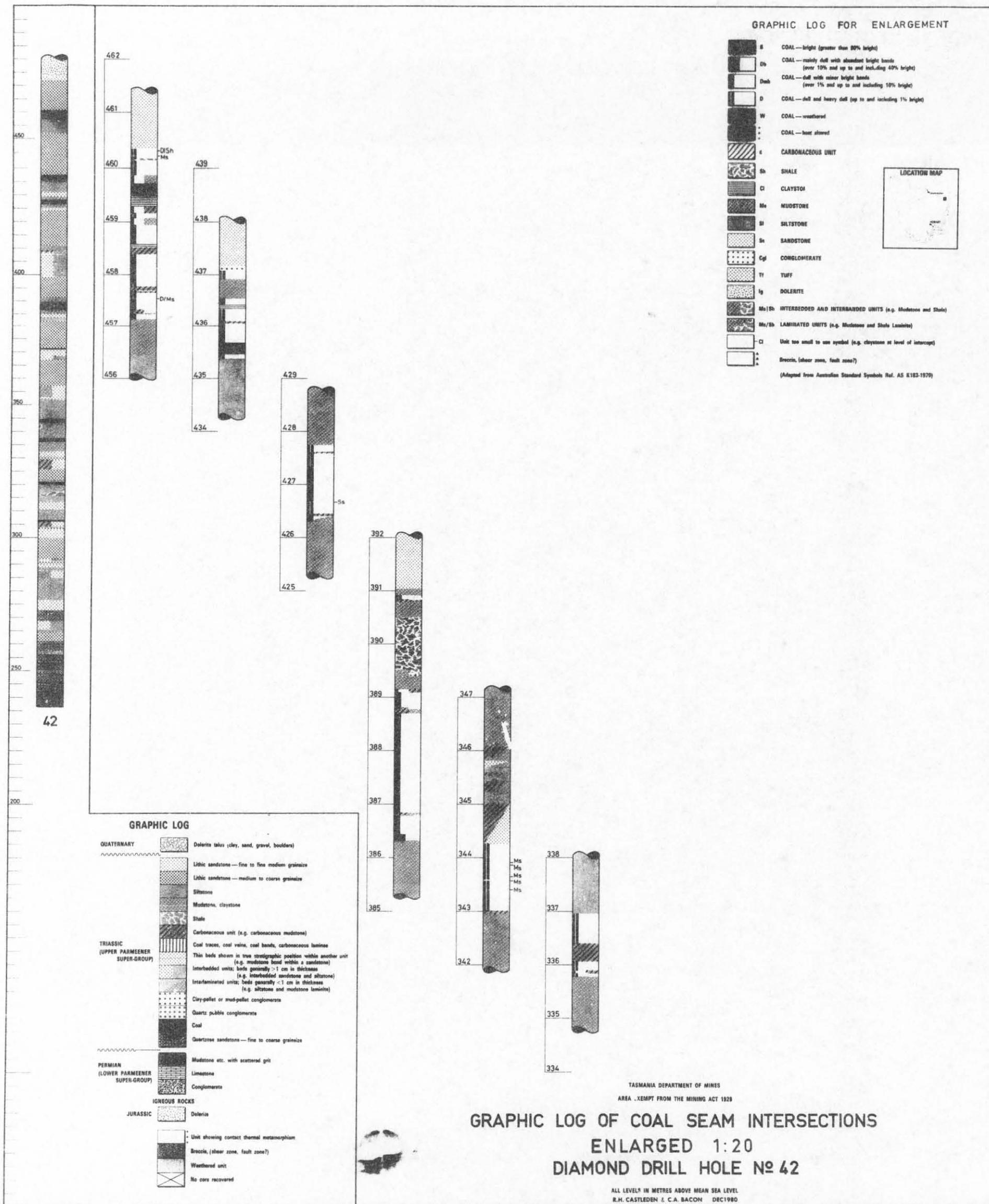
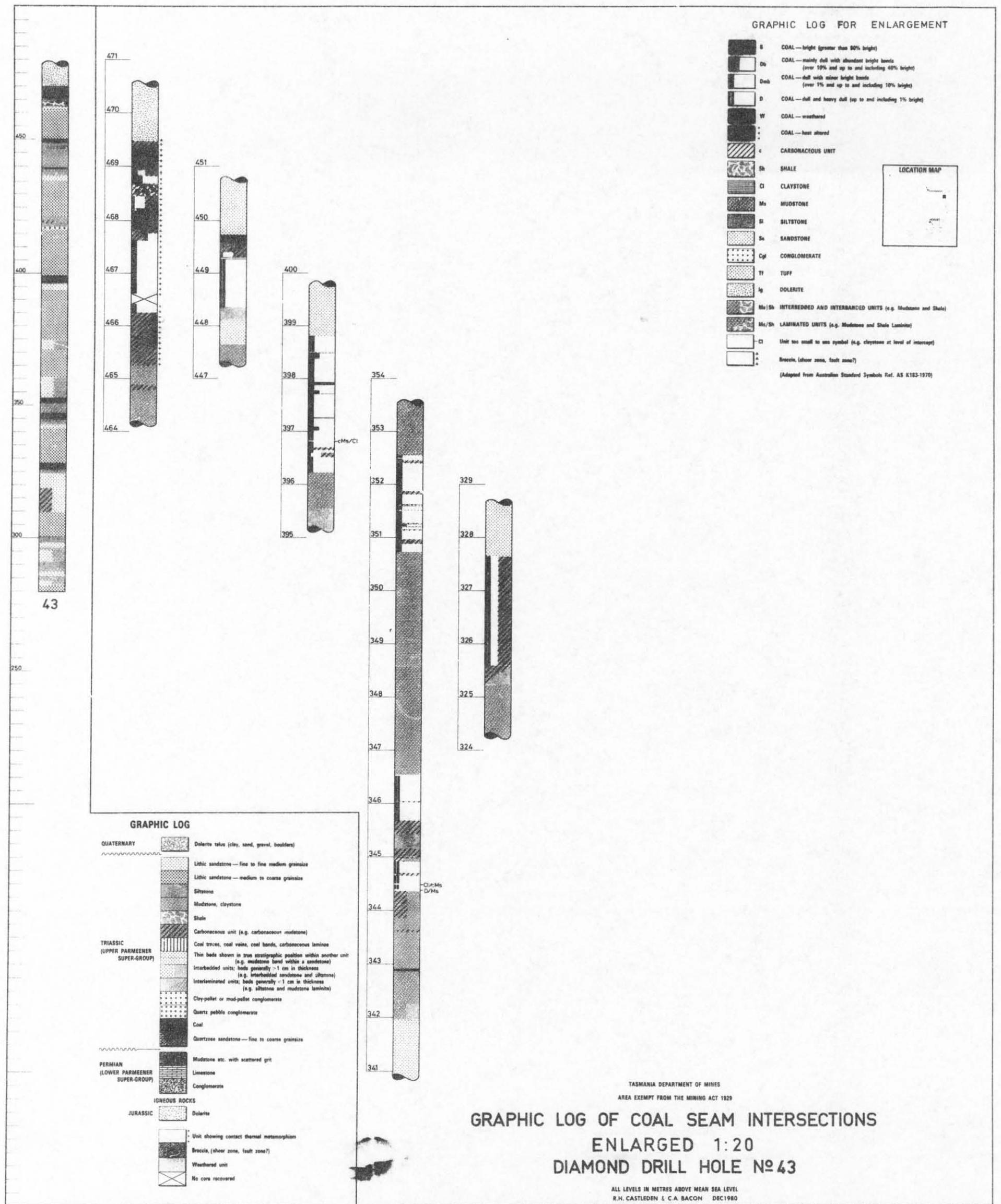


FIGURE 58





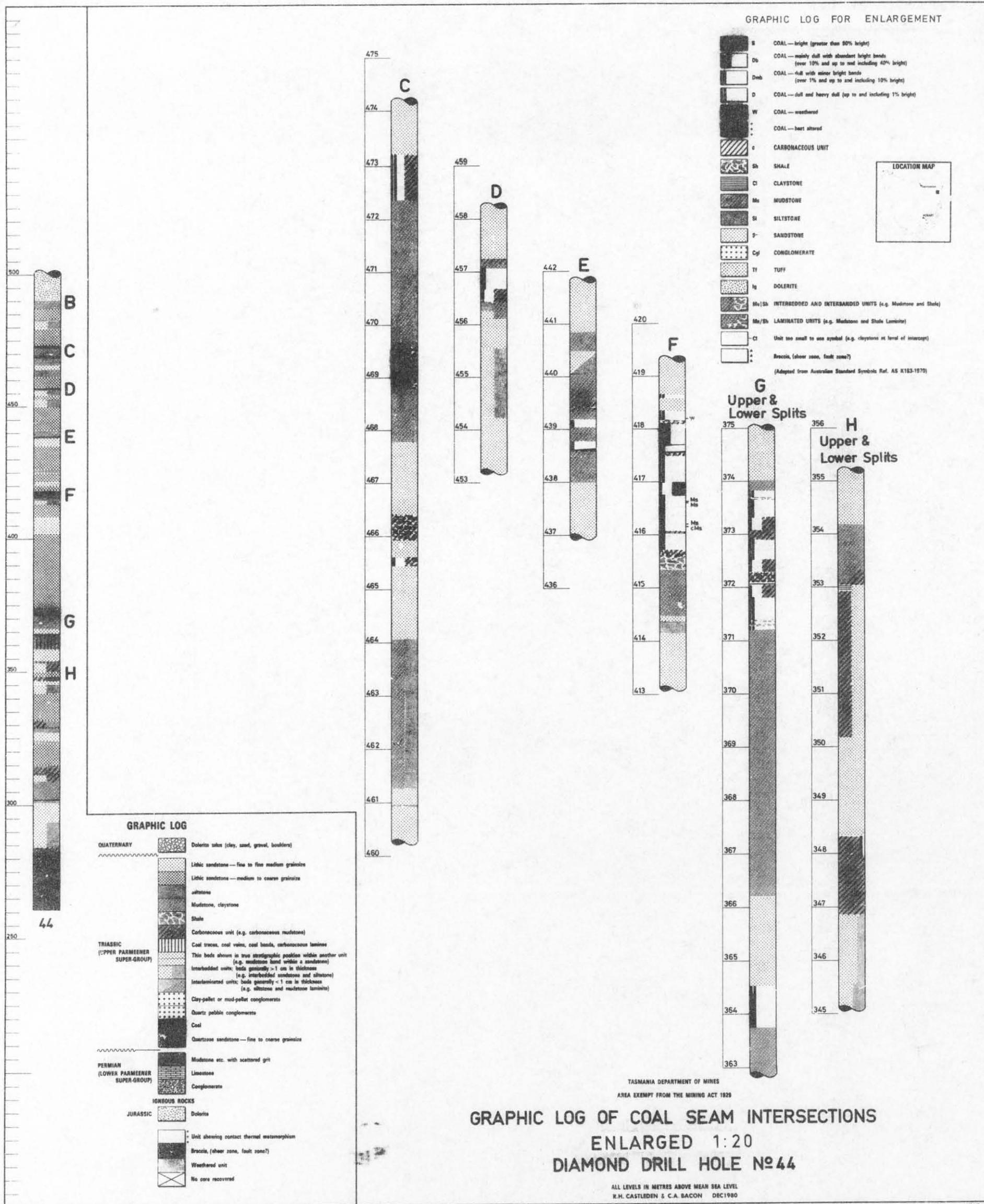
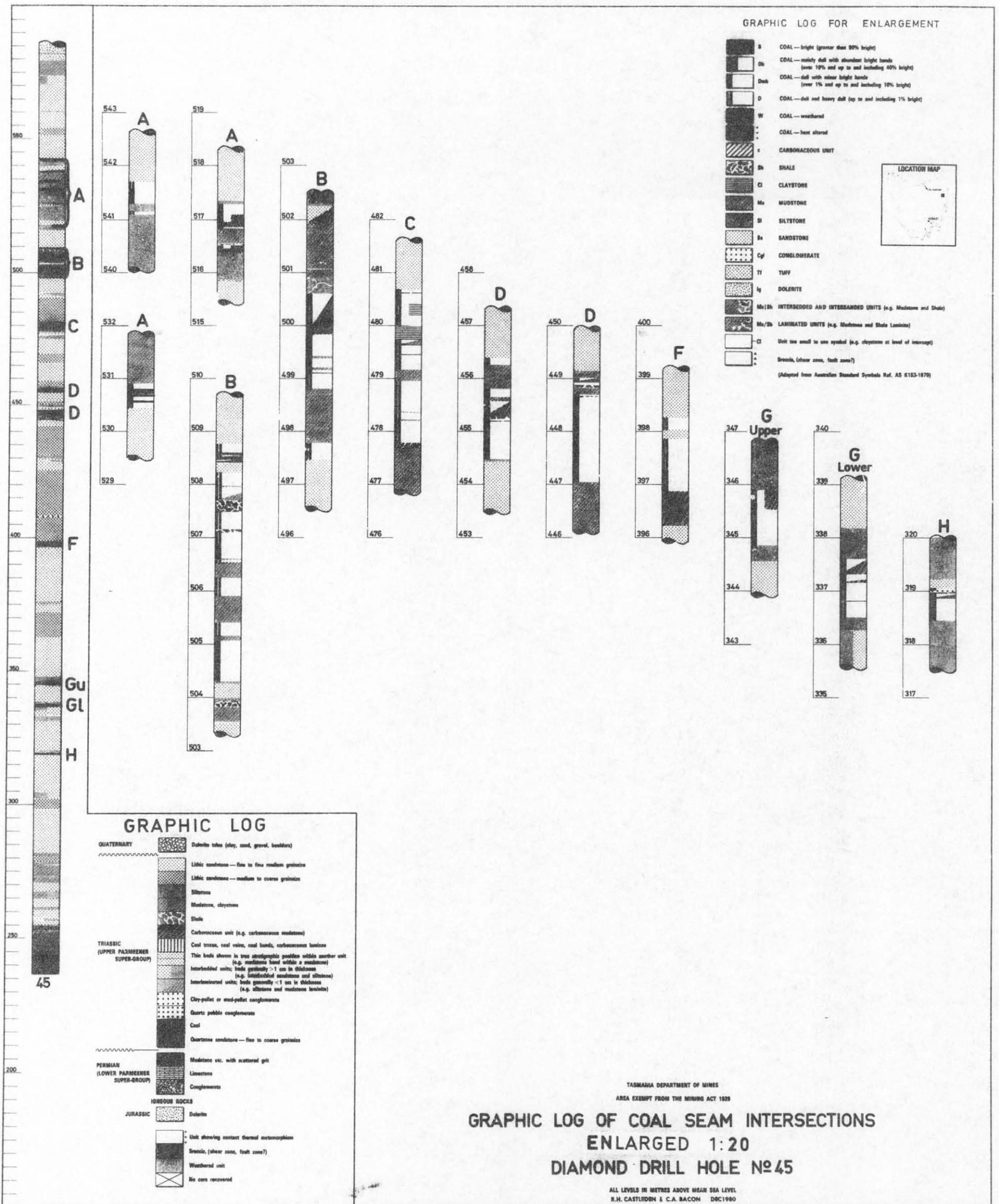
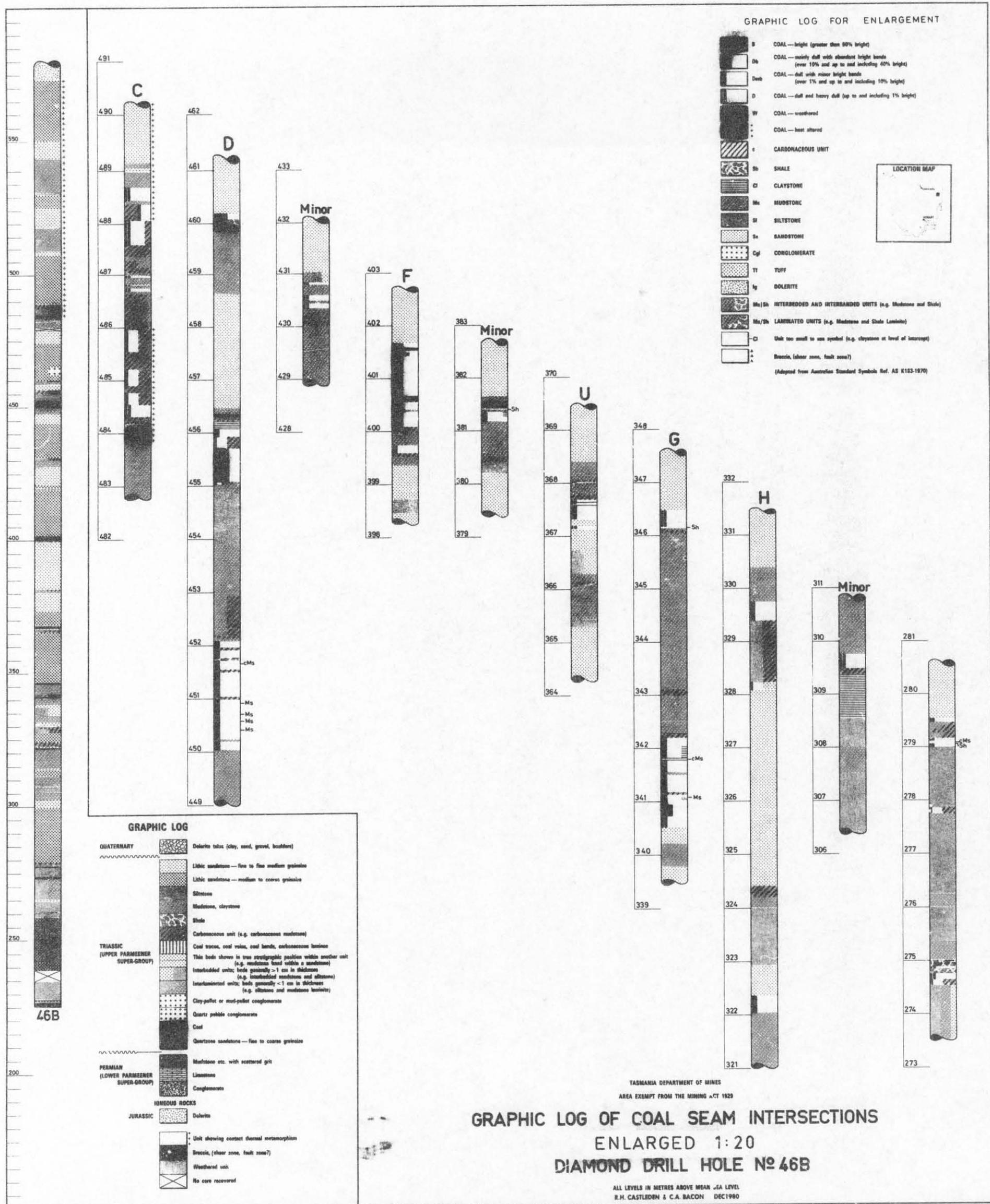


FIGURE 61





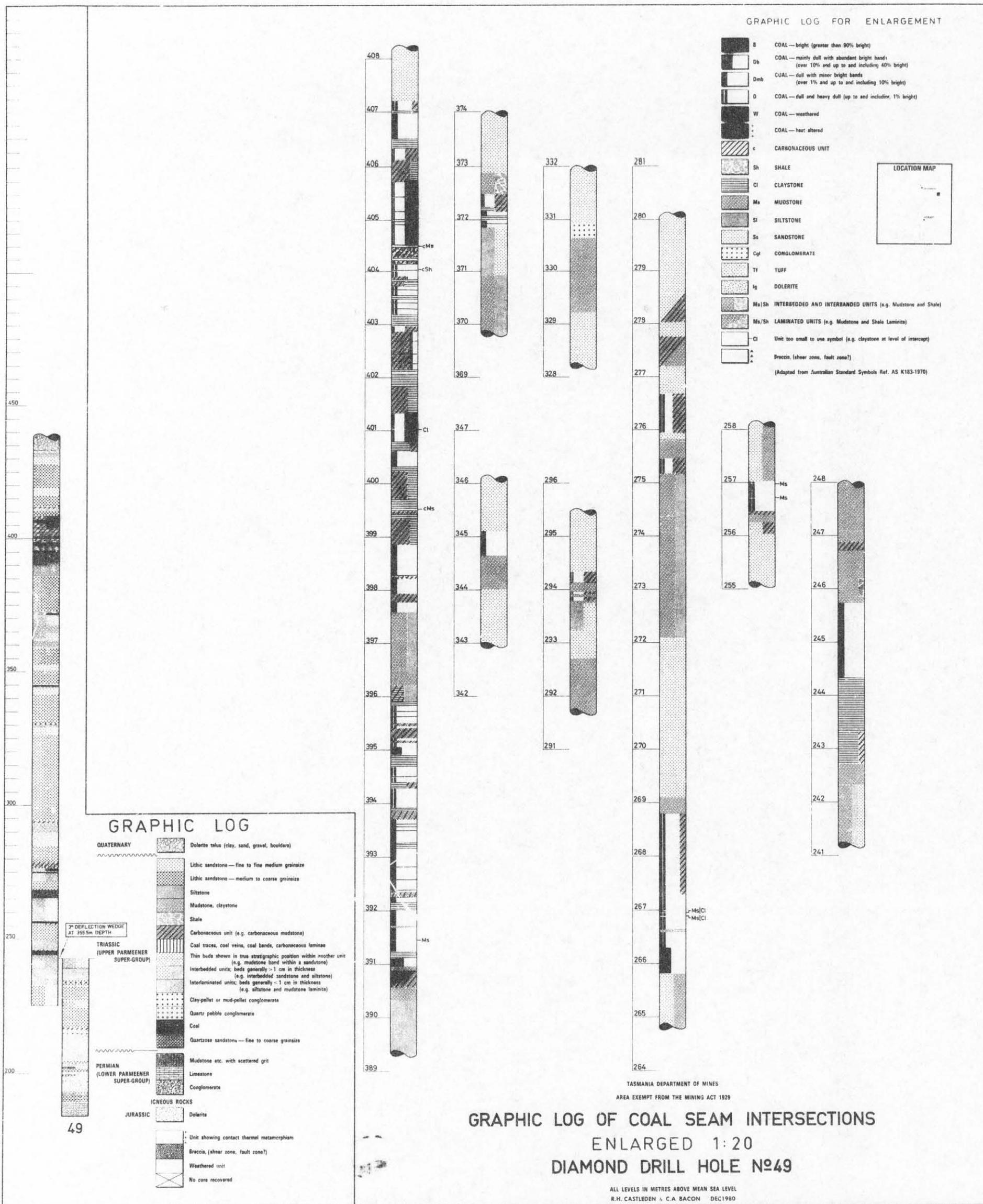


FIGURE 64

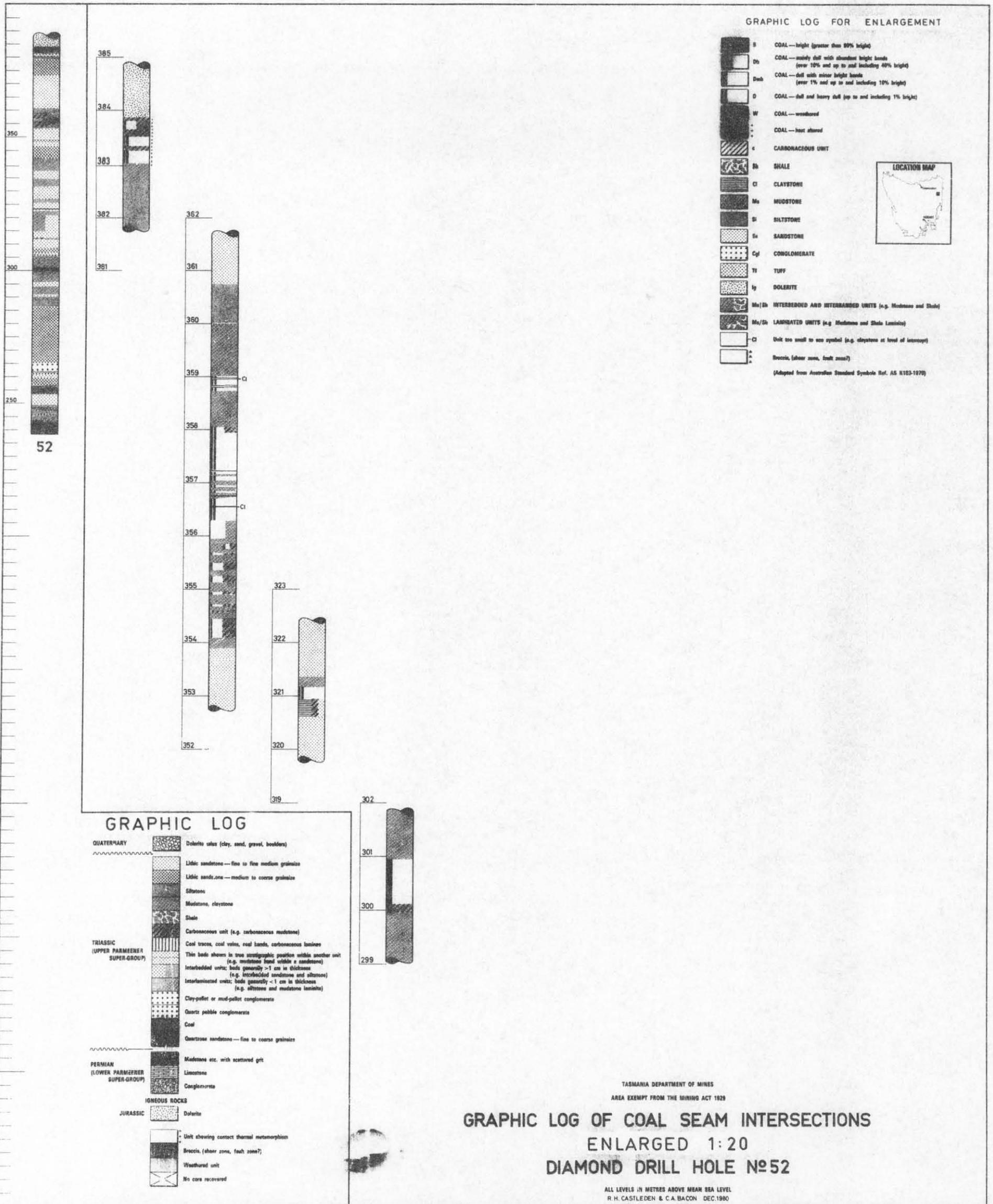


FIGURE 65

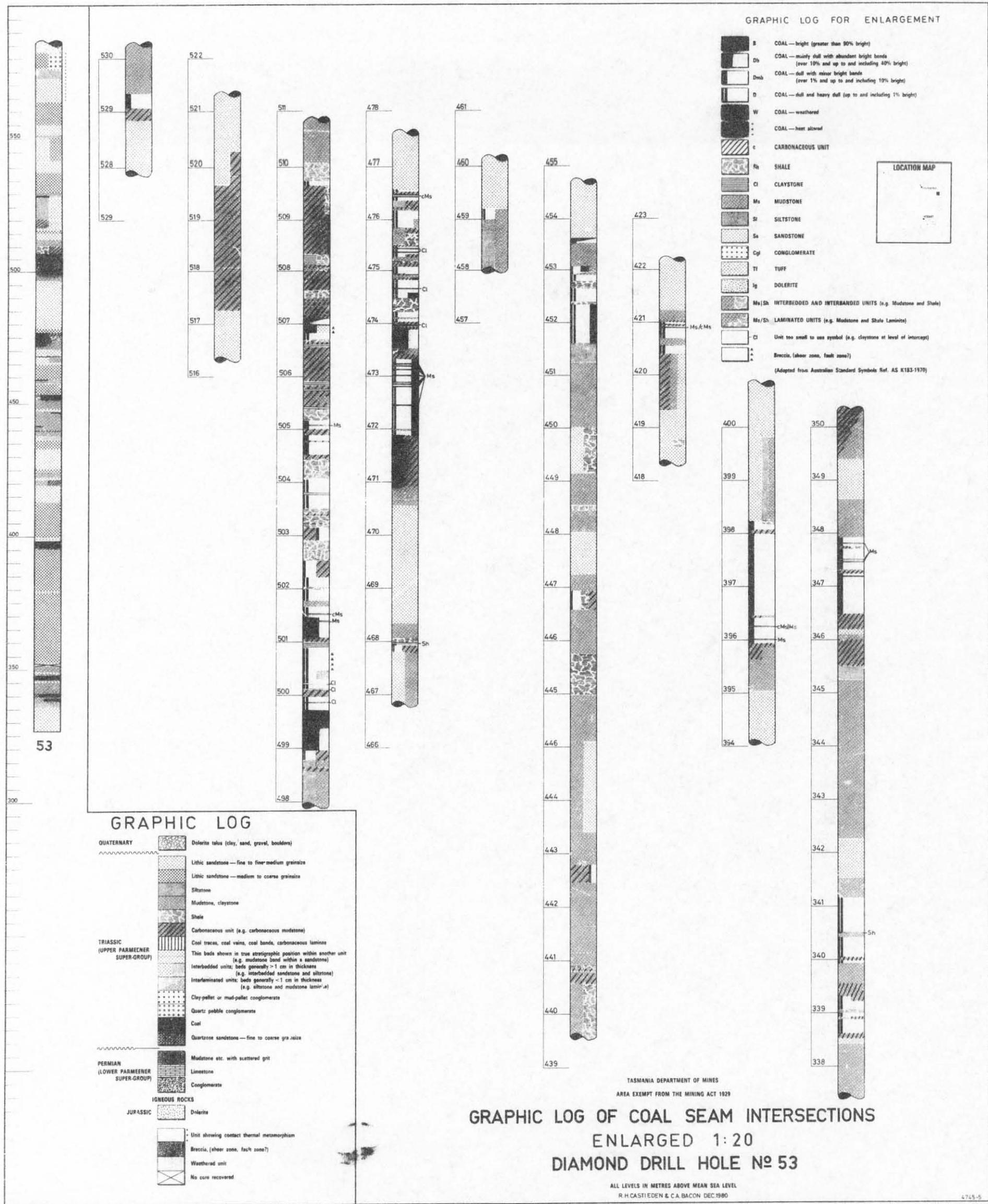


FIGURE 66

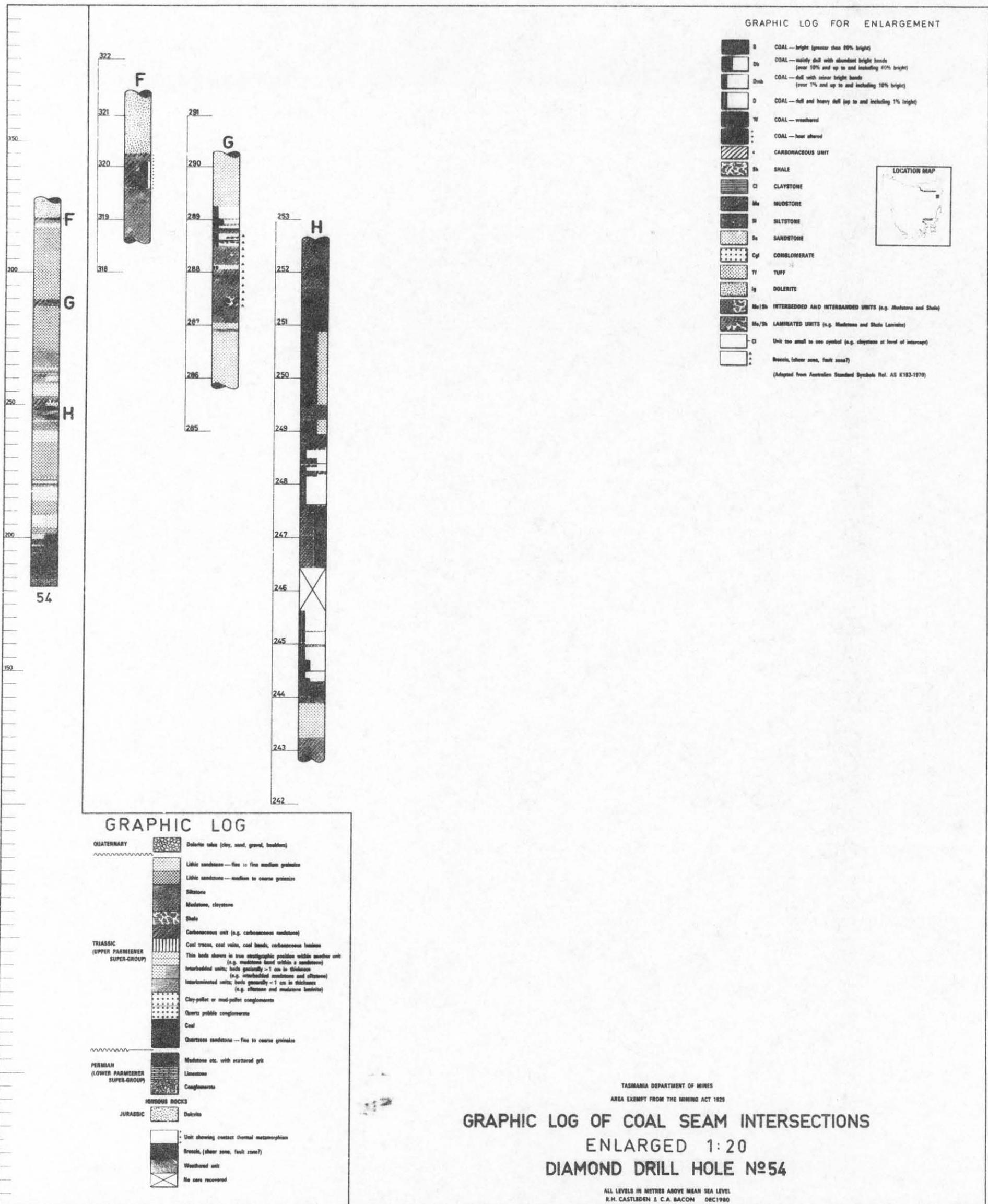


FIGURE 67

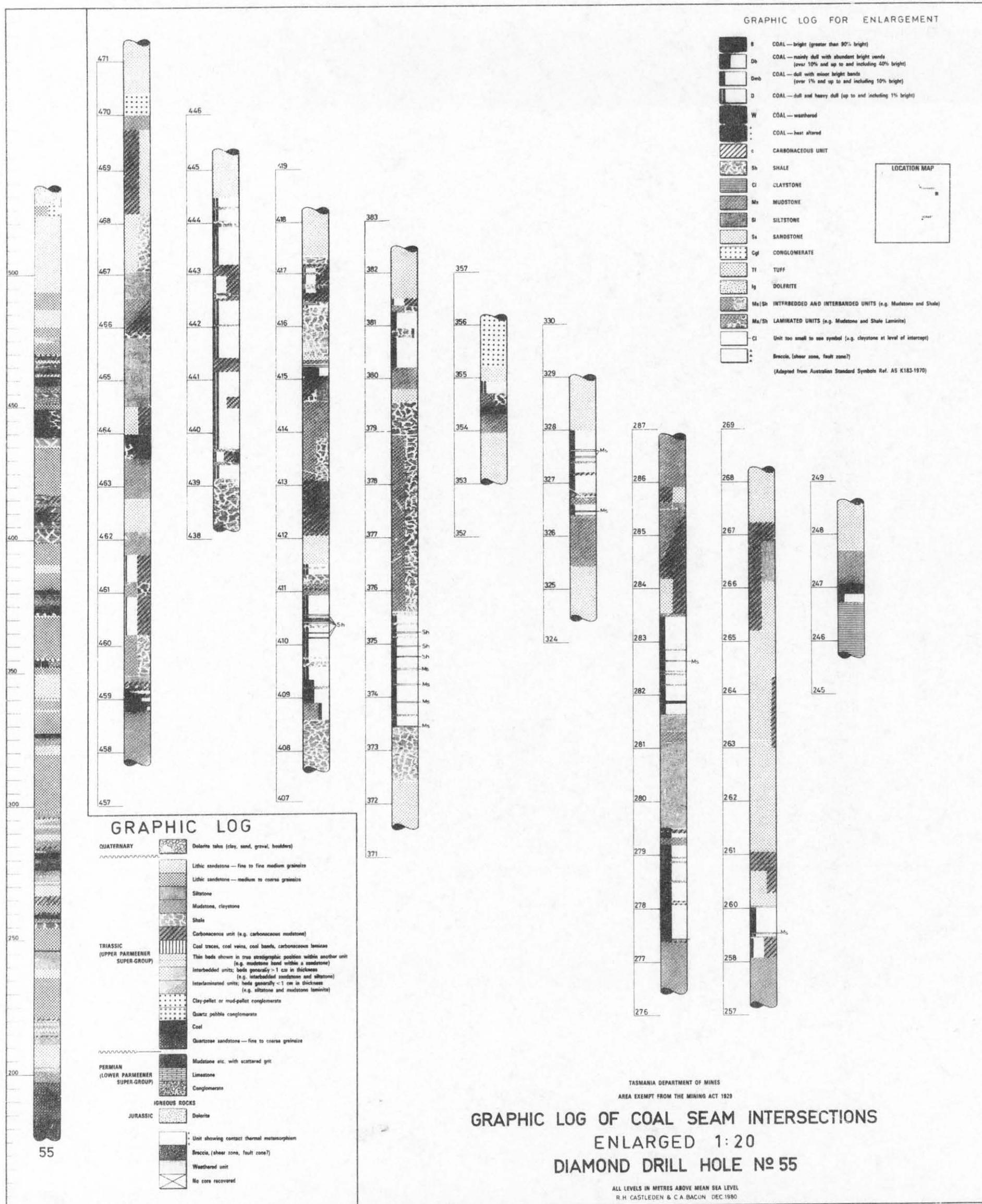


FIGURE 68

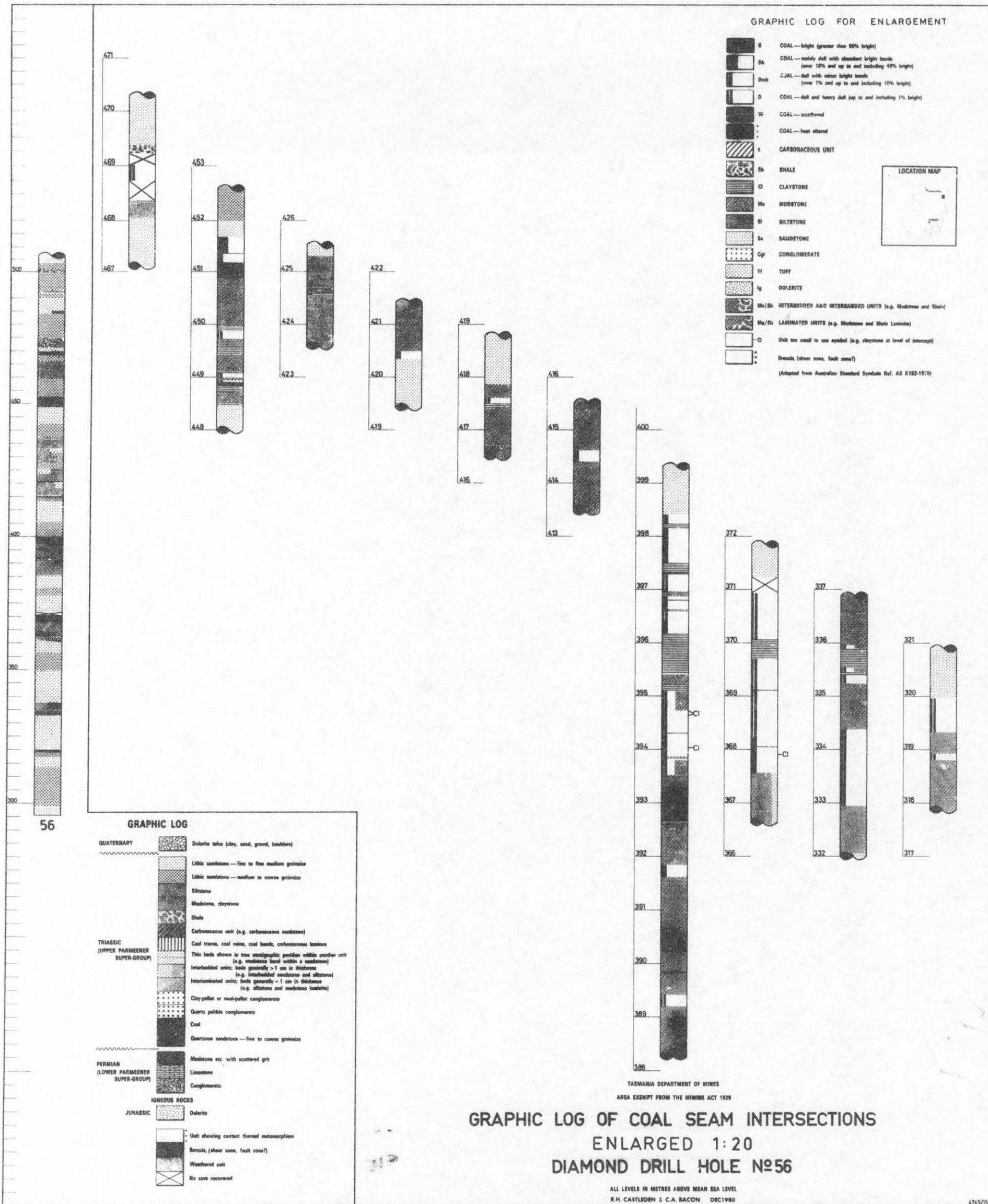


FIGURE 69

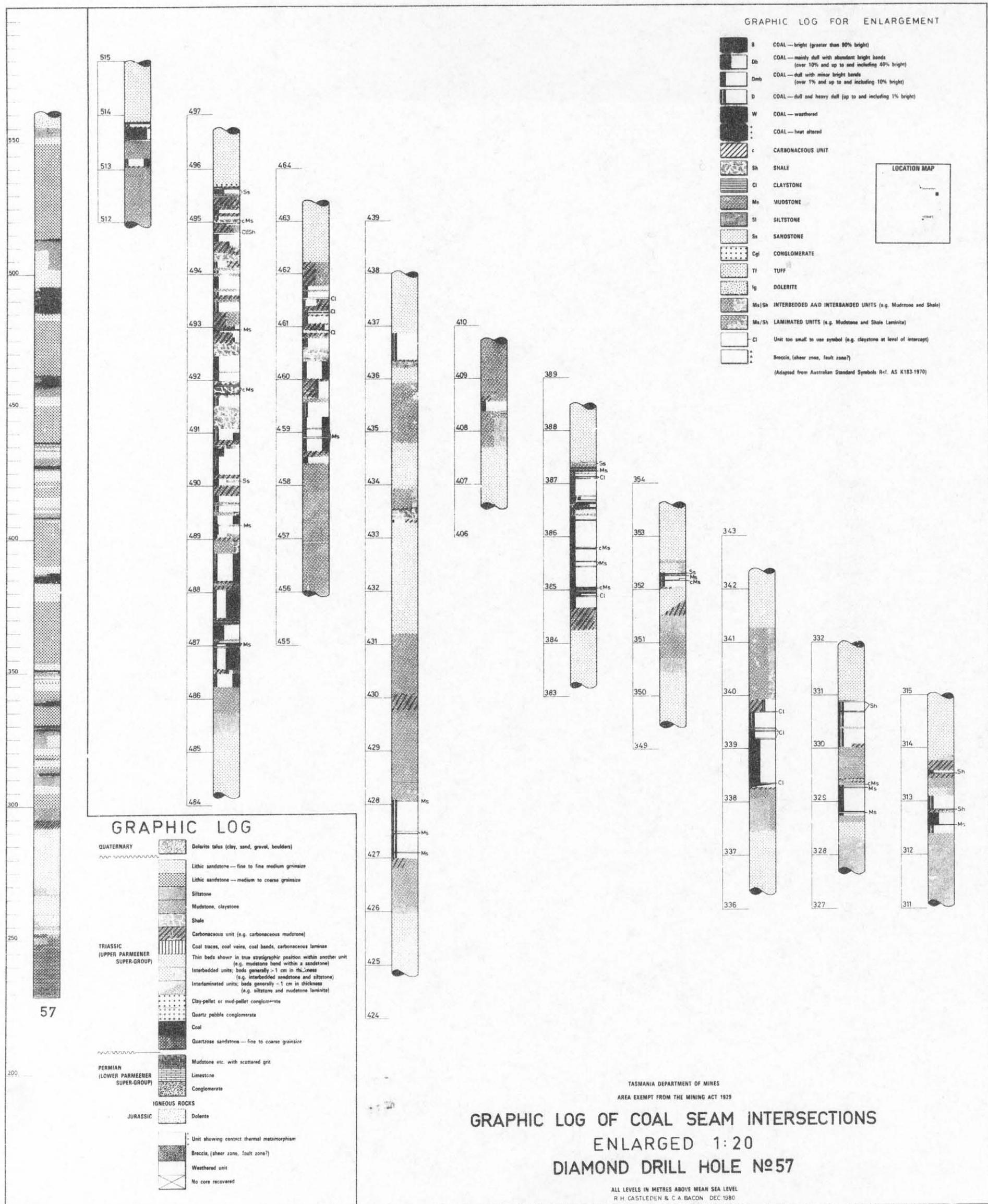
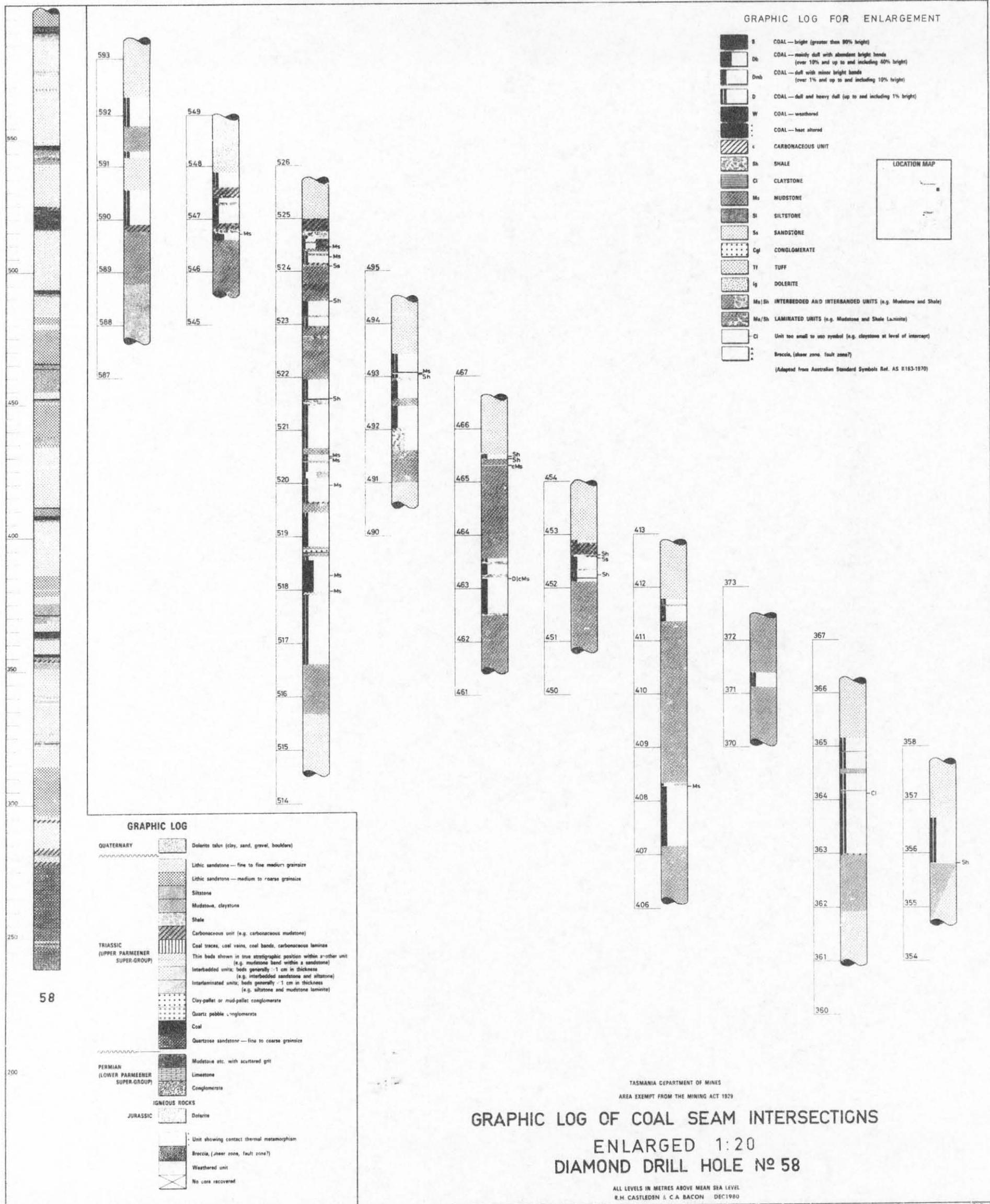


FIGURE 70



GRAPHIC LOG

QUATERNARY	Dolerite talus (clay, sand, gravel, boulders)
	Lithic sandstone — fine to fine medium grained
	Lithic sandstone — medium to coarse grained
	Siltstone
	Mudstone, claystone
	Shale
	Carbonaceous unit (e.g. carbonaceous mudstone)
TRIASSIC (UPPER PARMEENER SUPER-GROUP)	Coal traces, coal veins, coal bands, carbonaceous laminae These beds shown in true stratigraphic position within another unit (e.g. mudstone band within a sandstone)
	Interbedded units; beds generally 1 cm in thickness (e.g. interbedded sandstone and siltstone)
	Interlaminated units; beds generally 1 cm in thickness (e.g. siltstone and mudstone laminae)
	Clay-pellet or mud-pellet conglomerate
	Quartz pebble conglomerate
	Coal
	Quartzose sandstone — fine to coarse grained
PERMIAN (LOWER PARMEENER SUPER-GROUP)	Mudstone etc. with scurfed grit
	Limestone
	Conglomerate
IGNEOUS ROCKS	Dolerite
JURASSIC	
	Unit showing contact thermal metamorphism
	Breccia, (shear zone, fault zone?)
	Weathered unit
	No core recovered

58

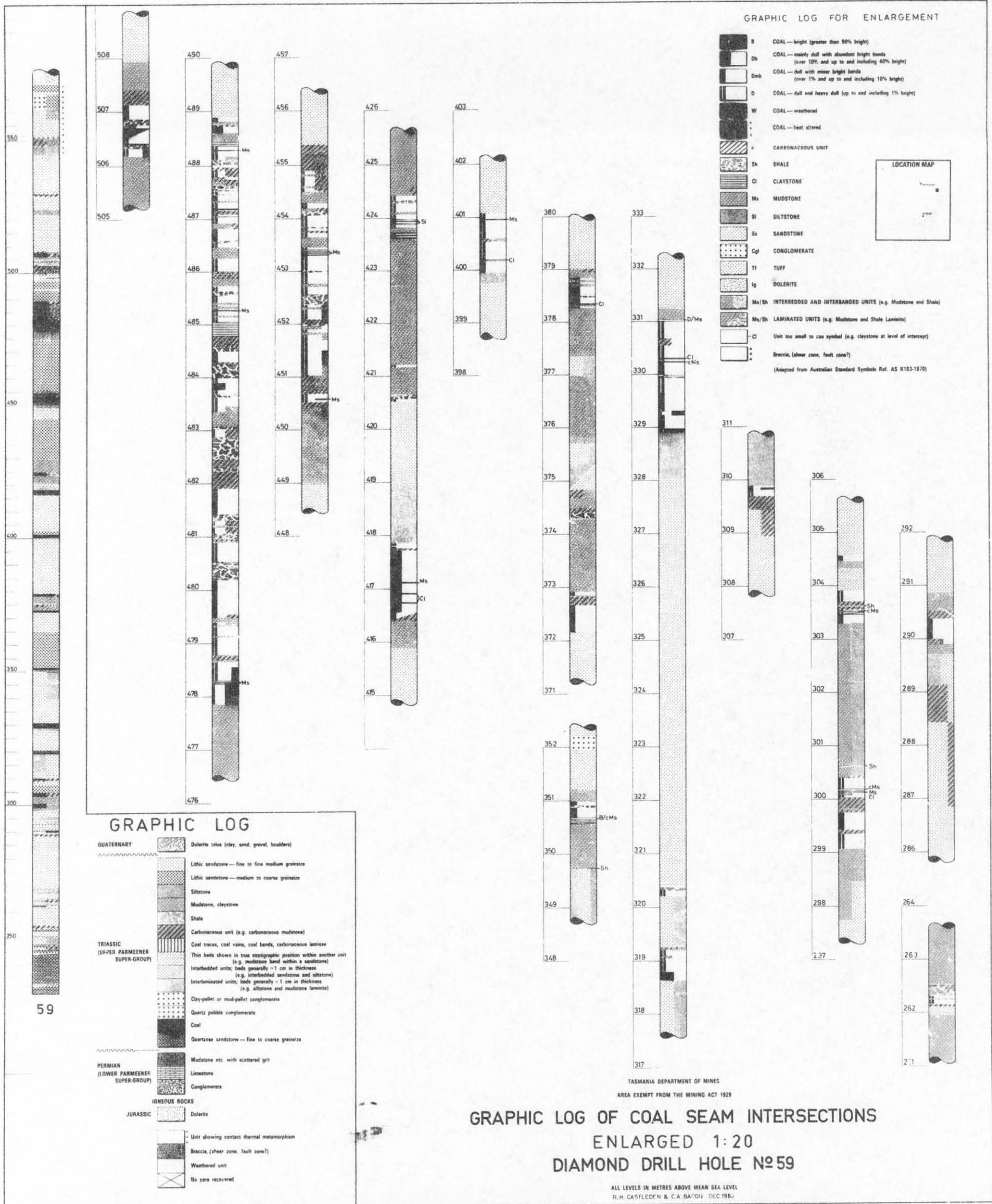


FIGURE 72

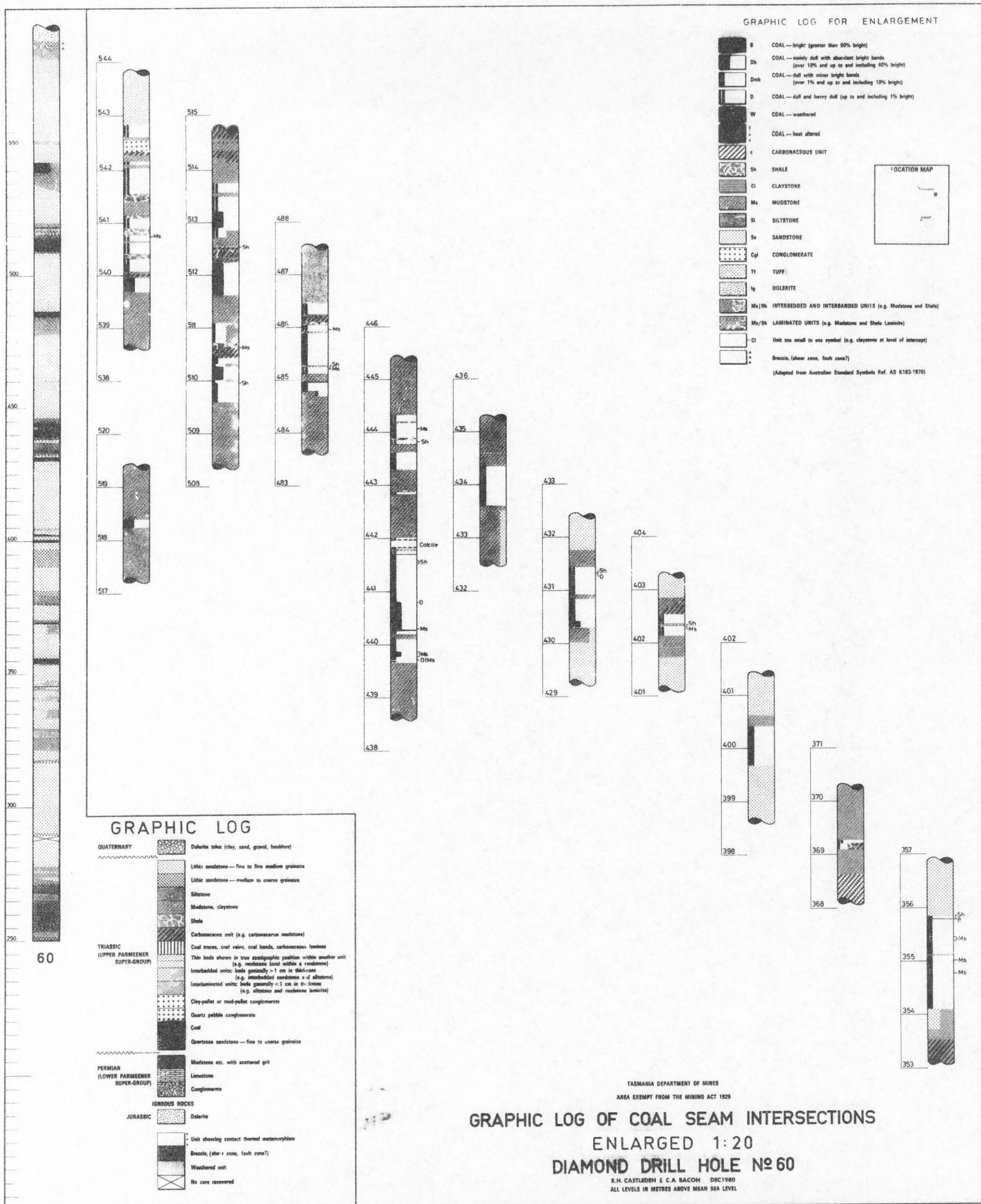


FIGURE 73

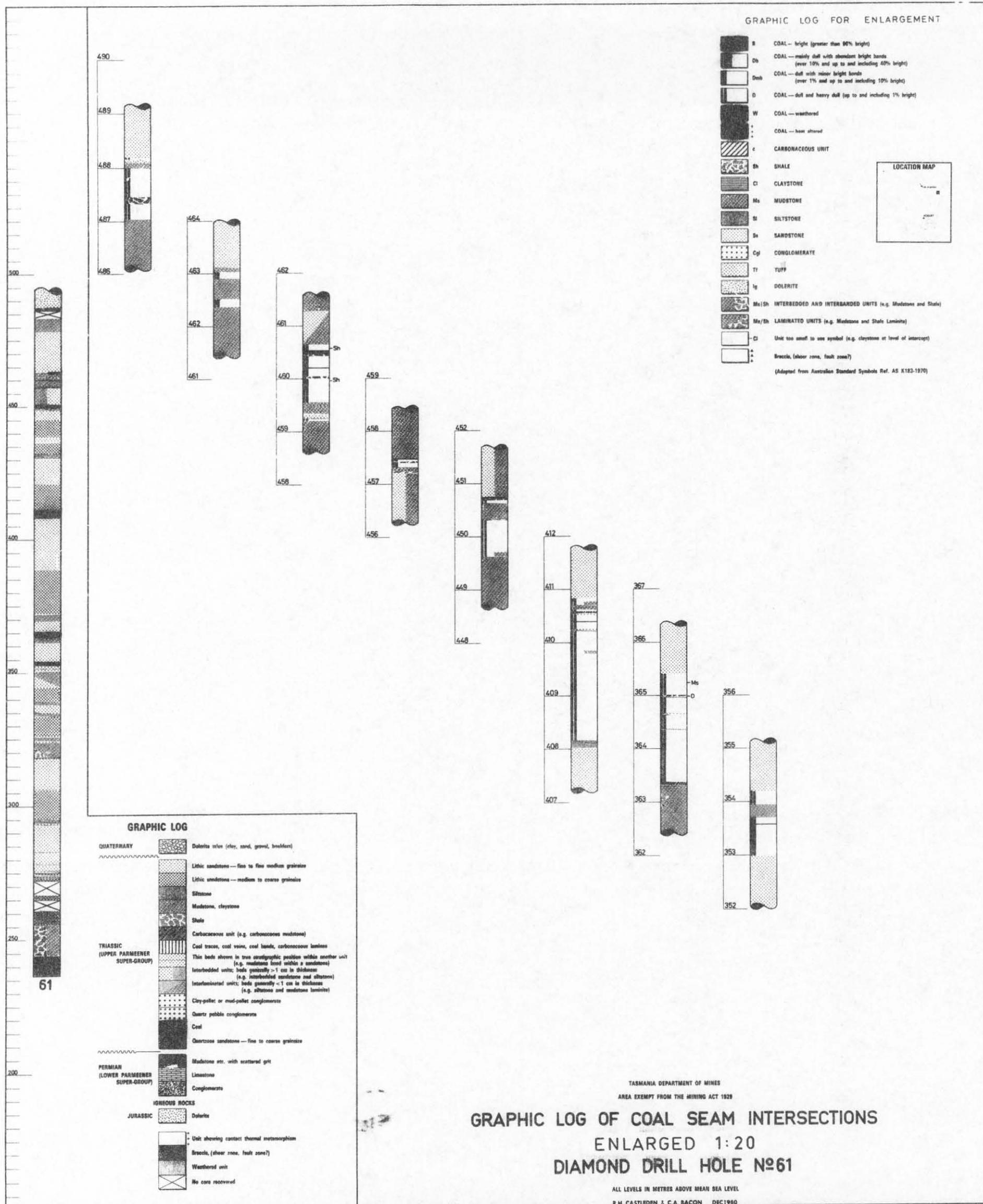
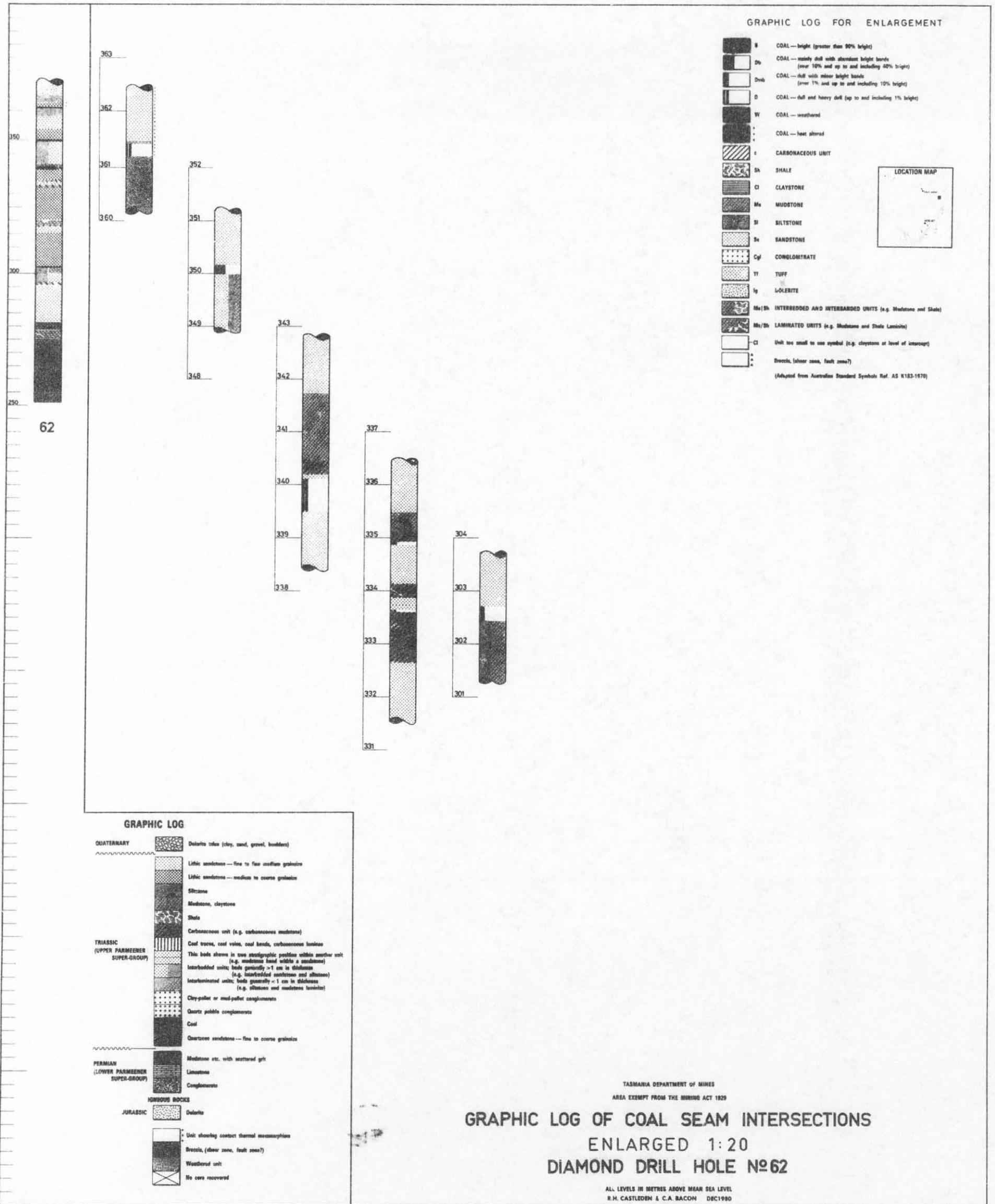


FIGURE 74



GRAPHIC LOG FOR ENLARGEMENT

- B COAL — bright (greater than 90% bright)
 - D₉₀ COAL — mainly dull with abundant bright bands (over 10% and up to and including 40% bright)
 - D₁₀ COAL — dull with minor bright bands (over 1% and up to and including 10% bright)
 - D COAL — dull and heavy dull (up to and including 1% bright)
 - W COAL — weathered
 - COAL — heat altered
 - C CARBONACEOUS UNIT
 - Sh SHALE
 - Cl CLAYSTONE
 - Ms MUDSTONE
 - Sl SILTSTONE
 - Ss SANDSTONE
 - Cgl CONGLOMERATE
 - Tf TUFF
 - Lp LOPHERITE
 - Ms/Sh INTERBEDDED AND INTERBARBED UNITS (e.g. Mudstone and Shale)
 - Ms/Sh LAMINATED UNITS (e.g. Mudstone and Shale Lenticles)
 - Cl Unit too small to use symbol (e.g. claystone at level of intercept)
 - Breccia, (shear zone, fault zone?)
- (Adapted from Australian Standard Symbols Ref. AS 1183-1970)



GRAPHIC LOG

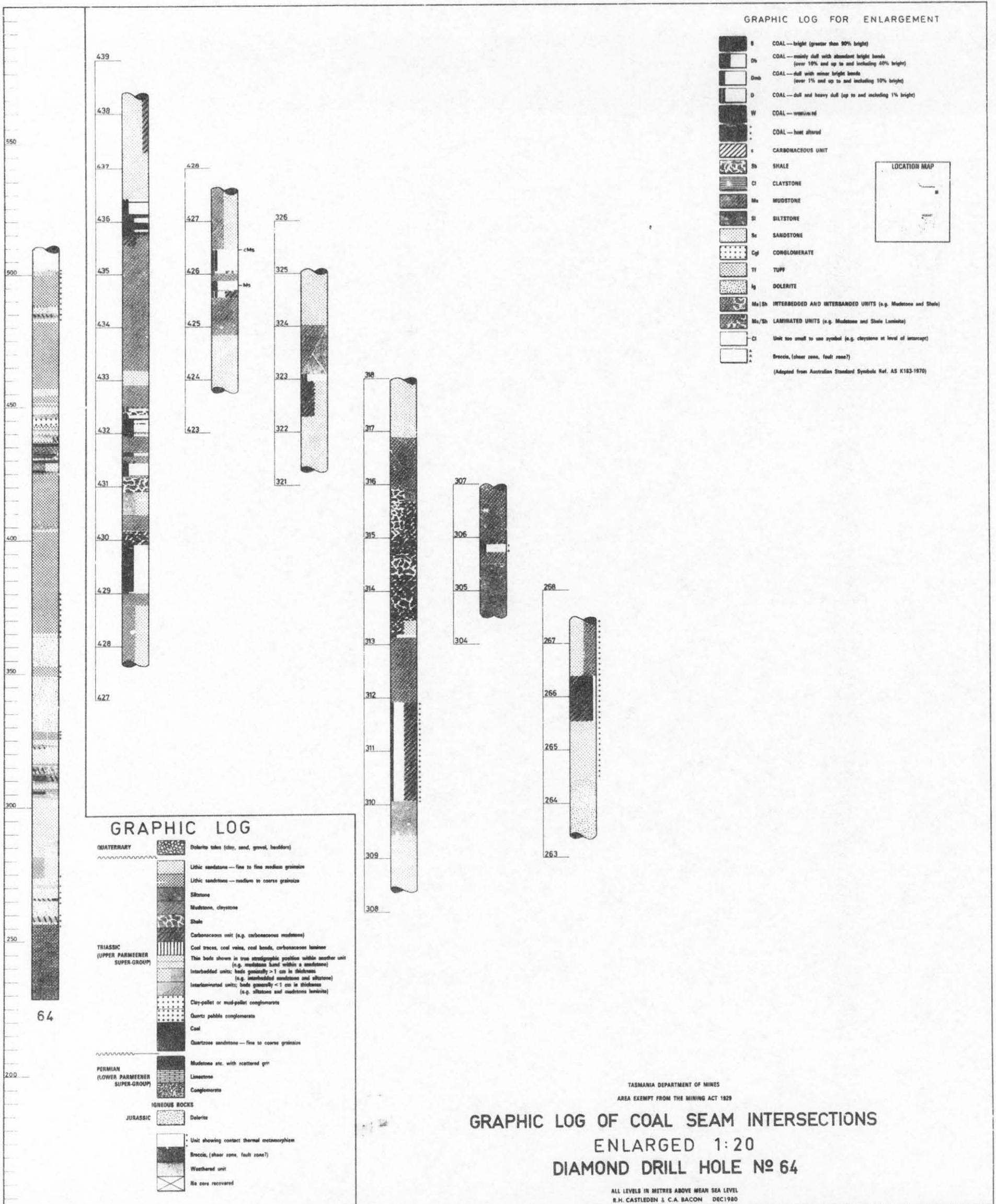
- QUATERNARY
 - Debris talus (clay, sand, gravel, boulders)
 - Litic sandstone — fine to fine medium grained
 - Litic sandstone — medium to coarse grained
 - Siltstone
 - Mudstone, claystone
 - Shale
 - Carbonaceous unit (e.g. carbonaceous mudstone)
- TRIASSIC (UPPER PARMEERER SUPER-GROUP)
 - Coal trace, coal vein, coal bands, carbonaceous limestone
 - This beds shows in new stratigraphic position within upper unit (e.g. mudstone band within a sandstone)
 - Interbedded units; beds generally >1 cm in thickness (e.g. interbedded sandstone and siltstone)
 - Interbedded units; beds generally <1 cm in thickness (e.g. siltstone and mudstone lenticles)
 - Clay-pellet or mud-pellet conglomerate
 - Quartz pebble conglomerate
 - Coal
 - Quartzite sandstone — fine to coarse grained
- PERMIAN (LOWER PARMEERER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerate
- IGNEOUS ROCKS
 - Debris
- JURASSIC
 - Unit showing contact thermal metamorphism
 - Breccia, (shear zone, fault zone?)
 - Weathered unit
 - No core recovered

TASMANIA DEPARTMENT OF MINES
AREA EXEMPT FROM THE MINING ACT 1925

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 62

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
R.H. CASTLEDEN & C.A. BACON DEC 1980

FIGURE 75



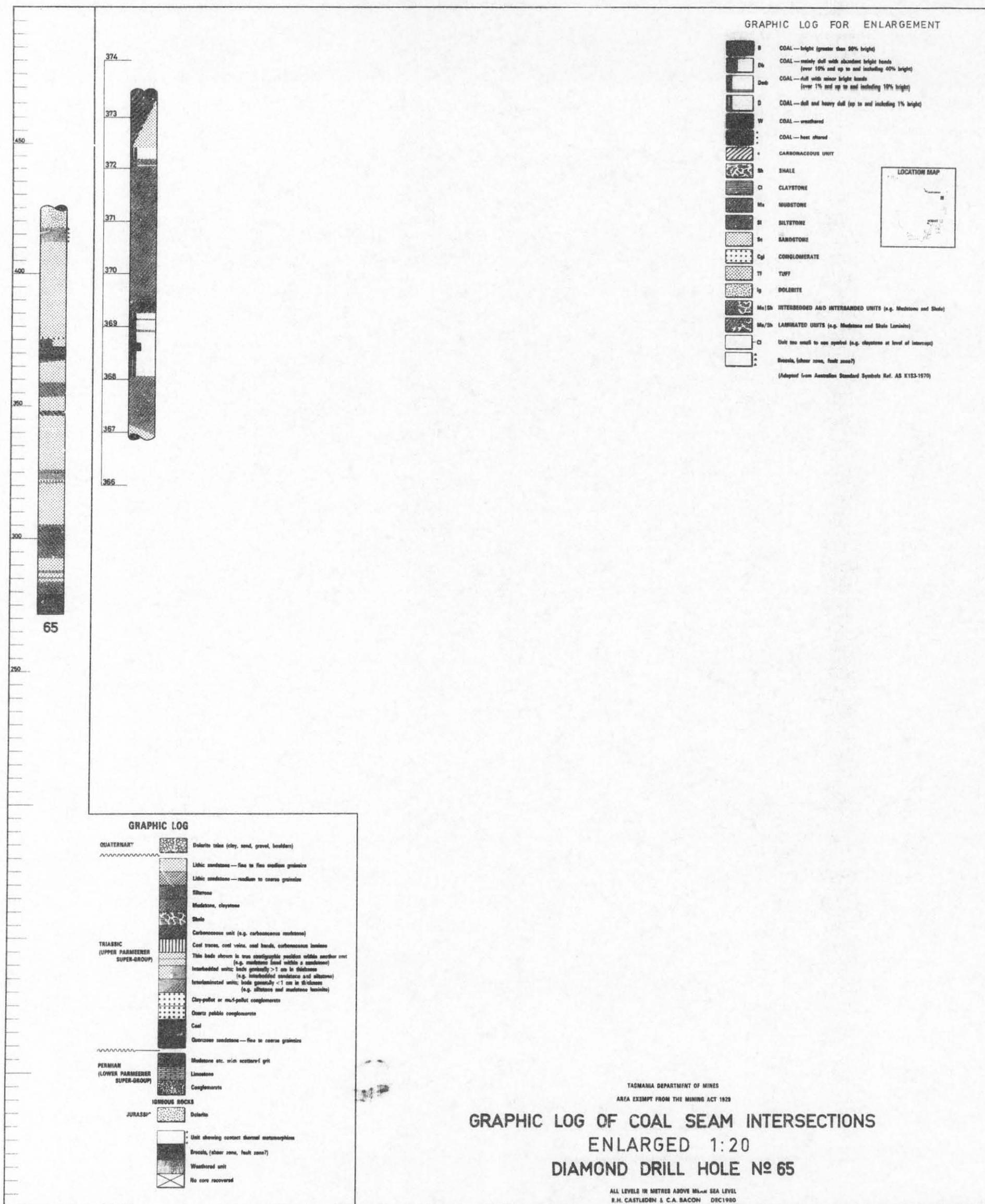


FIGURE 77

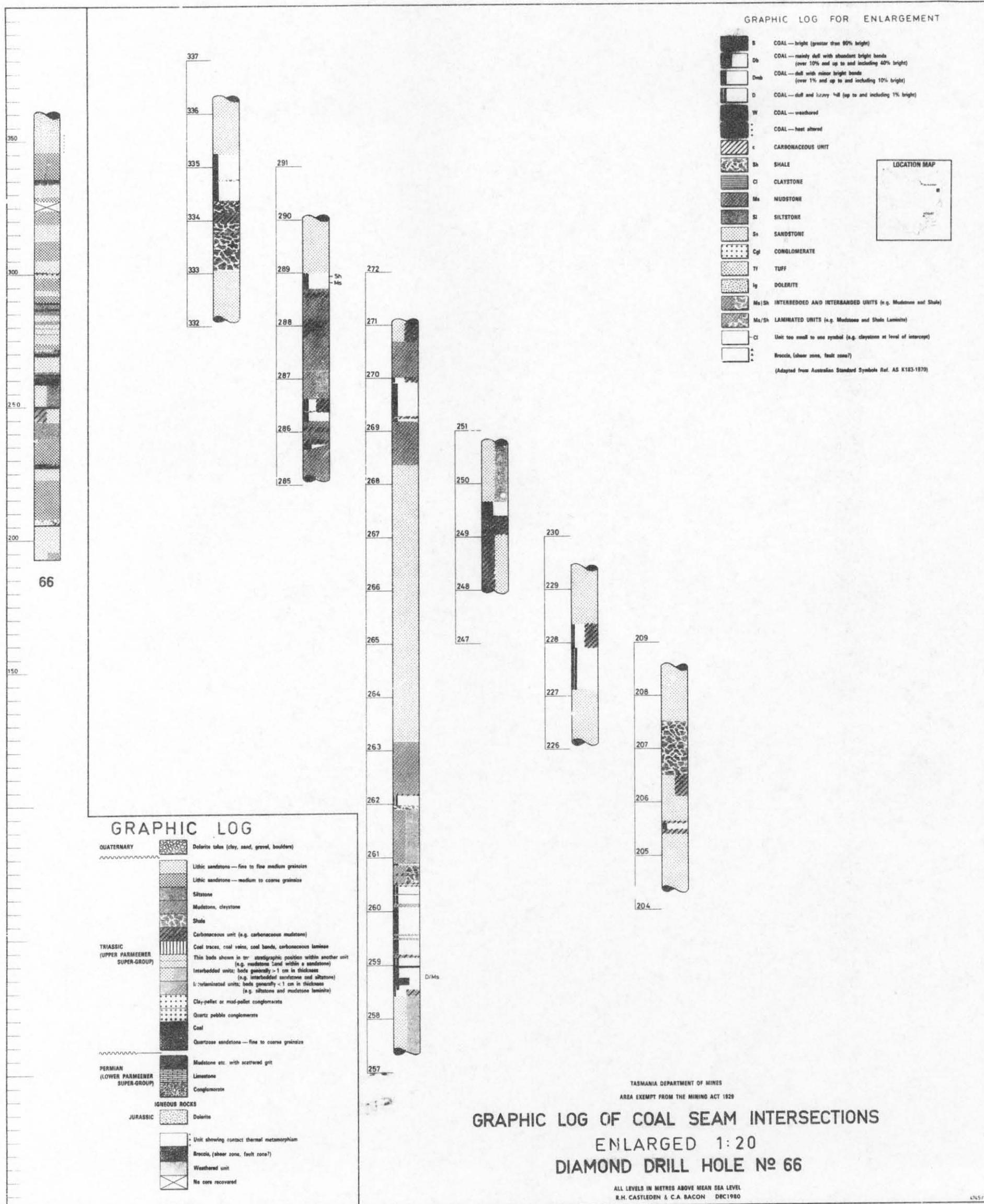
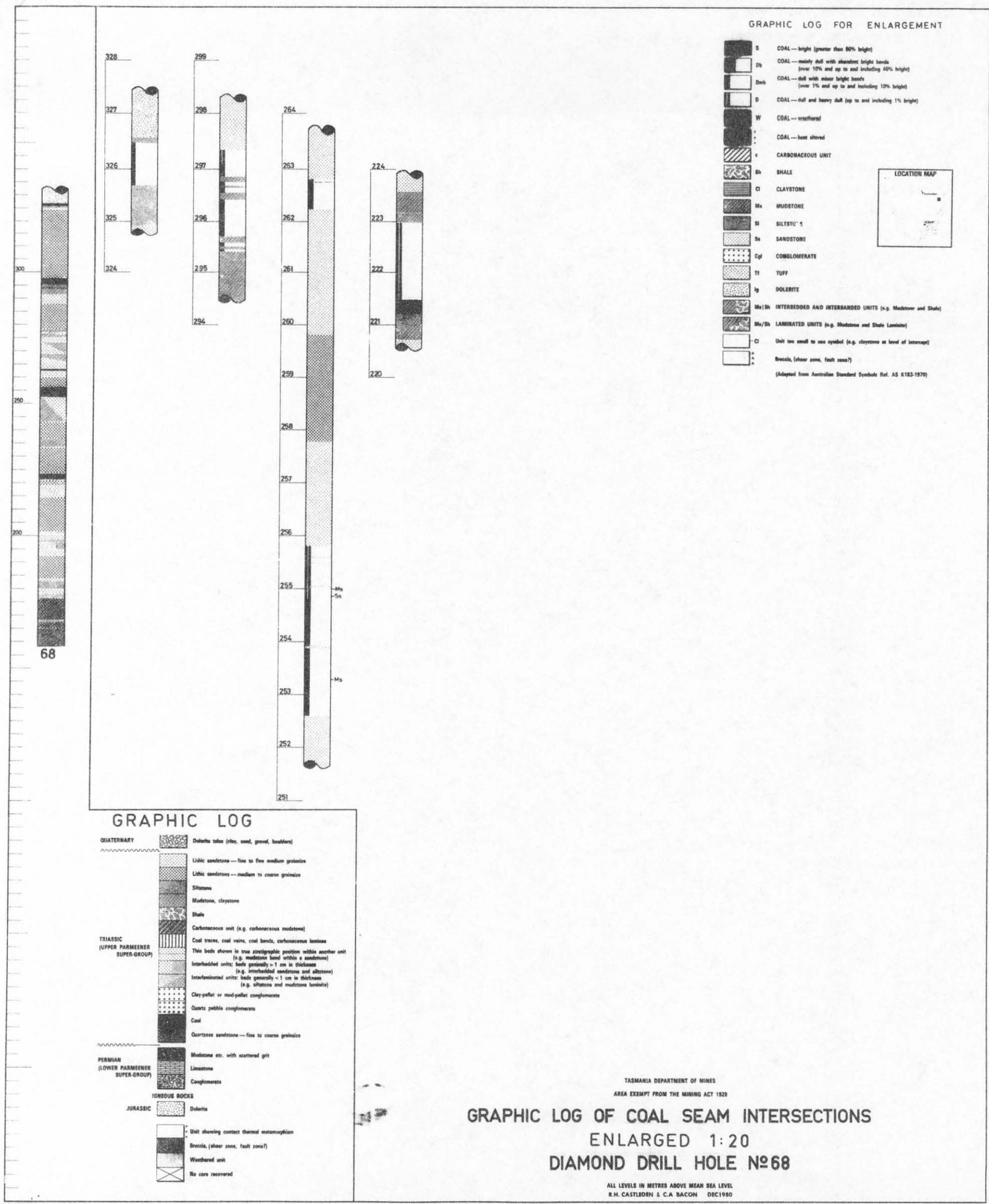


FIGURE 78



GRAPHIC LOG FOR ENLARGEMENT

- S COAL—bright (greater than 80% bright)
 - Ob COAL—mainly dull with abundant bright bands (over 10% and up to and including 40% bright)
 - Obm COAL—dull with minor bright bands (over 1% and up to and including 10% bright)
 - O COAL—dull and heavy dull (up to and including 1% bright)
 - W COAL—weathered
 - COAL—heat altered
 - C CARBONACEOUS UNIT
 - Sh SHALE
 - Cl CLAYSTONE
 - Ms MUDSTONE
 - Sl SILTSTONE
 - Ss SANDSTONE
 - Cgl CONGLOMERATE
 - Tl TUFF
 - Dp DOLERITE
 - Ms/Sh INTERBEDDED AND INTERBANDED UNITS (e.g. Mudstone and Shale)
 - Ms/Sh LAMINATED UNITS (e.g. Mudstone and Shale Laminar)
 - Cl Unit too small to use symbol (e.g. claystone at level of intercept)
 - Br Brachi, (shear zone, fault zone?)
- (Adapted from Australian Standard Symbols Ref. AS 1183-1970)



GRAPHIC LOG

- QUATERNARY
 - Dolerite talus (rhy. sand, gravel, boulders)
- TRIASSIC (UPPER PARMEENER SUPER-GROUP)
 - Litic sandstone—fine to fine medium grainsize
 - Litic sandstone—medium to coarse grainsize
 - Siltstone
 - Mudstone, claystone
 - Shale
 - Carbonaceous unit (e.g. carbonaceous mudstone)
 - Coal traces, coal veins, coal bould, carbonaceous laminae
 - This beds shown in true stratigraphic position within another unit (e.g. mudstone band within a sandstone)
 - Interbedded units: beds generally > 1 cm in thickness (e.g. interbedded sandstone and siltstone)
 - Interfingered units: beds generally < 1 cm in thickness (e.g. siltstone and mudstone laminae)
 - Clay-pellet or mud-pellet conglomerate
 - Quartz pebble conglomerate
 - Coal
 - Quartzose sandstone—fine to coarse grainsize
- PERMIAN (LOWER PARMEENER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerate
- IDNEOUS ROCKS
 - Dolerite
- JURASSIC
 - Unit showing contact thermal metamorphism
 - Brachi, (shear zone, fault zone?)
 - Weathered unit
 - No core recovered

TASMANIA DEPARTMENT OF MINES
AREA EXEMPT FROM THE MINING ACT 1923

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 68

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
R.H. CASTLEDEN & C.A. BACON DEC 1980

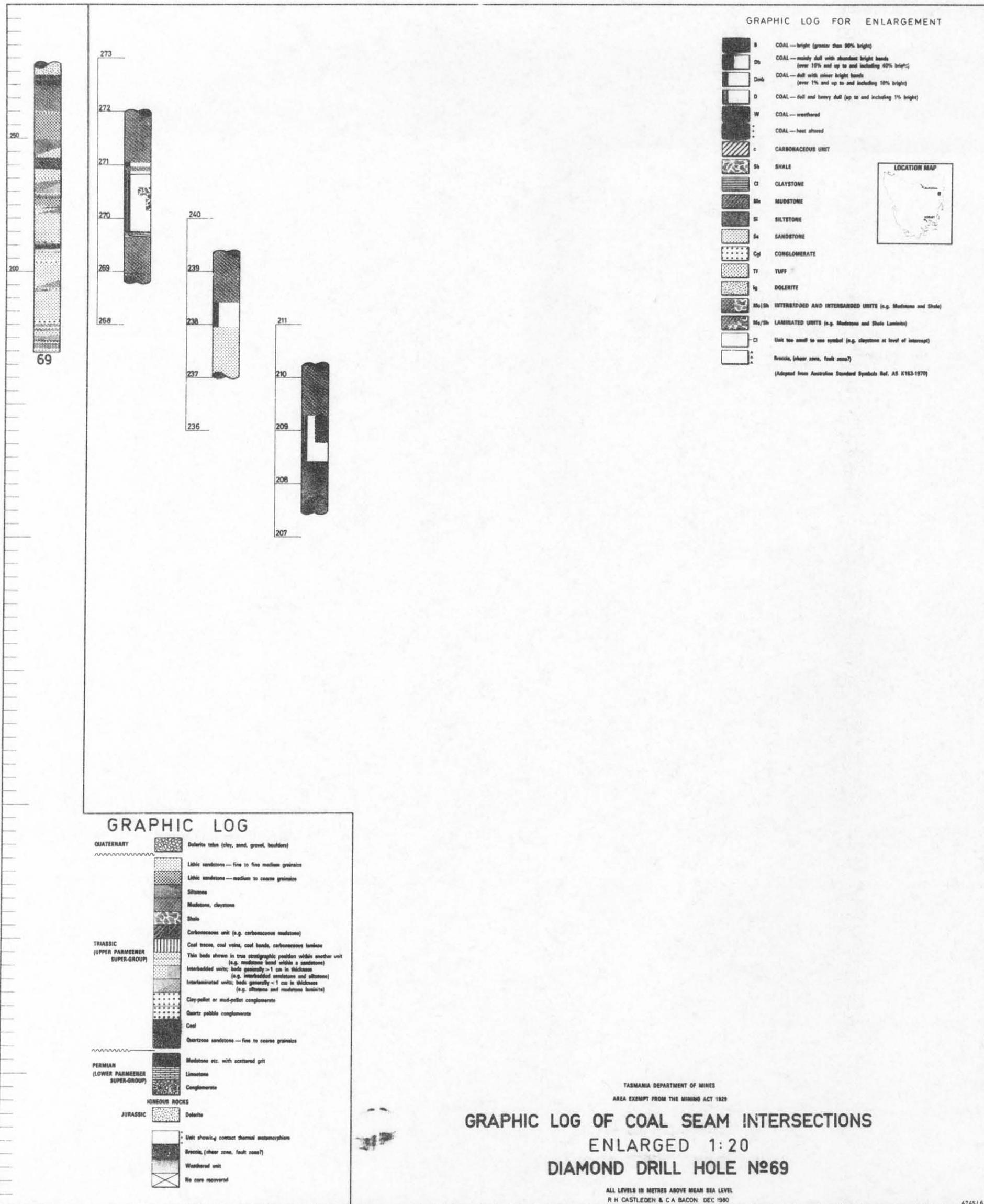
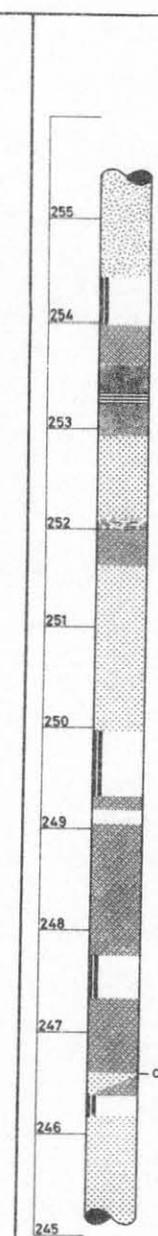
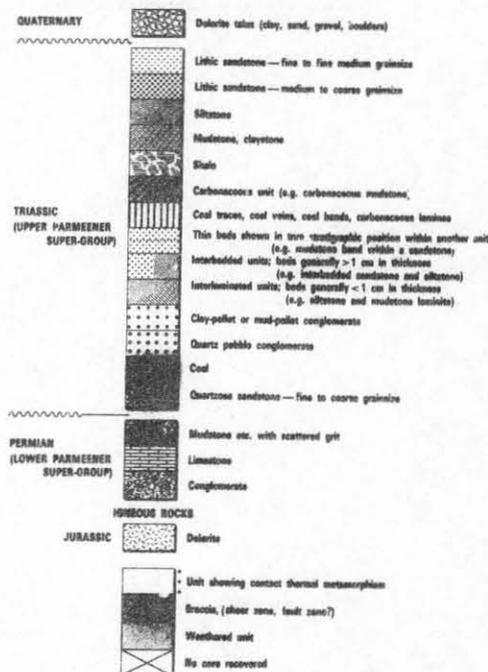


FIGURE 80

GRAPHIC LOG FOR ENLARGEMENT



GRAPHIC LOG



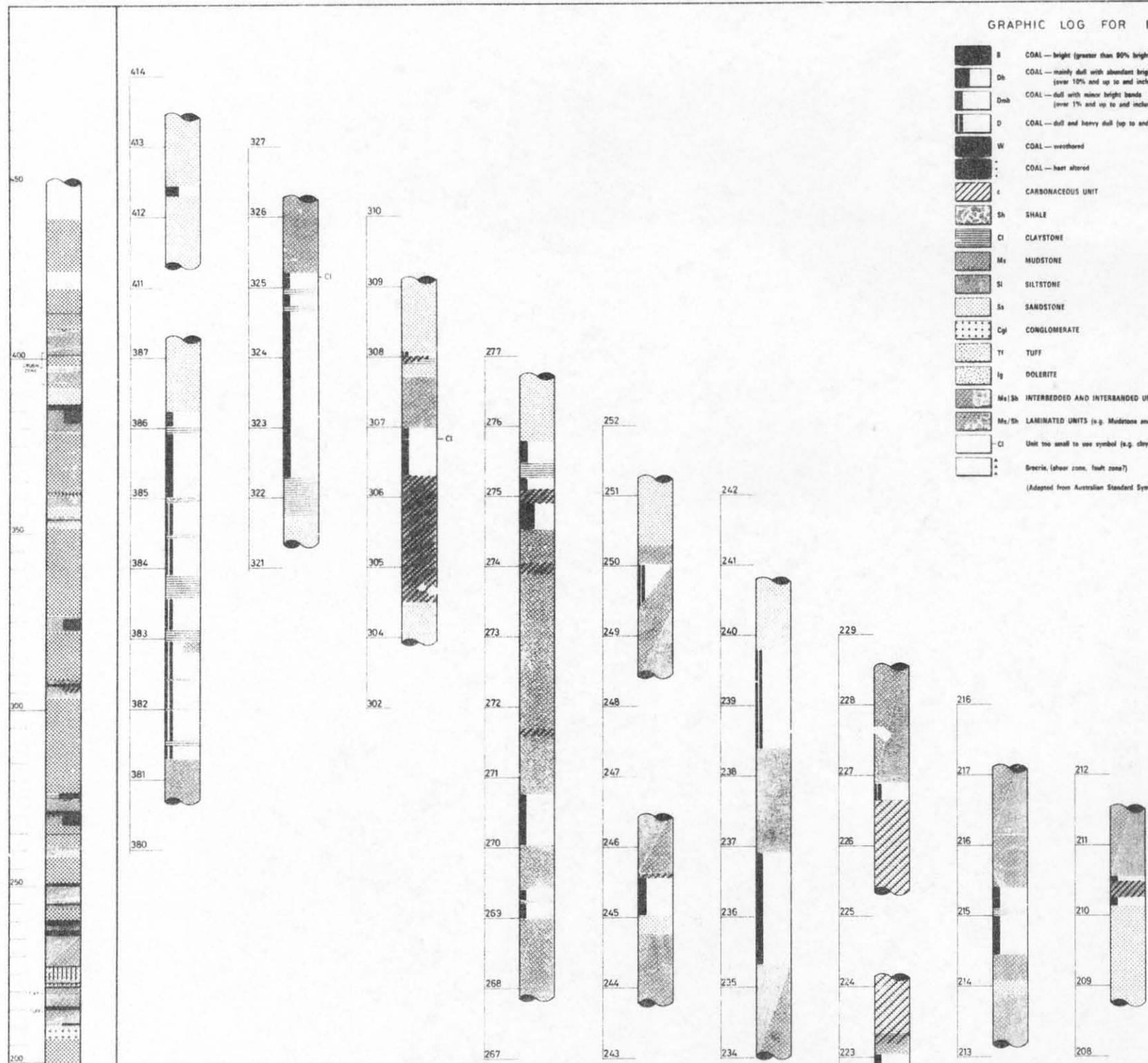
TASMANIA DEPARTMENT OF MINES
 AREA EXEMPT FROM THE MINING ACT 1929

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
 ENLARGED 1:20
 DIAMOND DRILL HOLE No 70

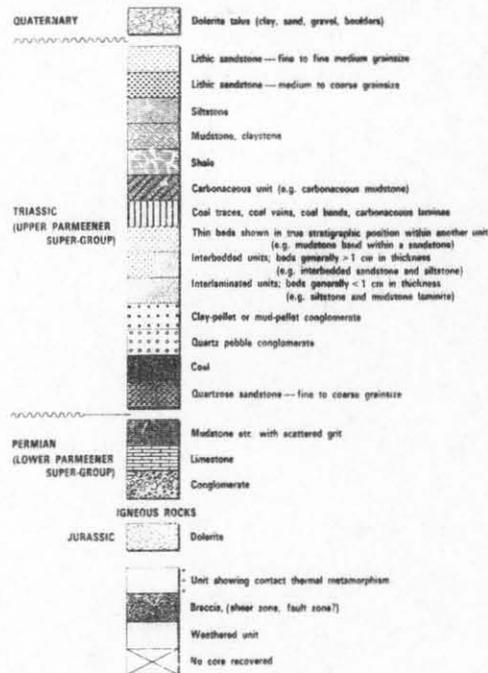
ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
 R. H. CASTLEDEN & C.A. BACON DEC. 1980

FIGURE 81

GRAPHIC LOG FOR ENLARGEMENT

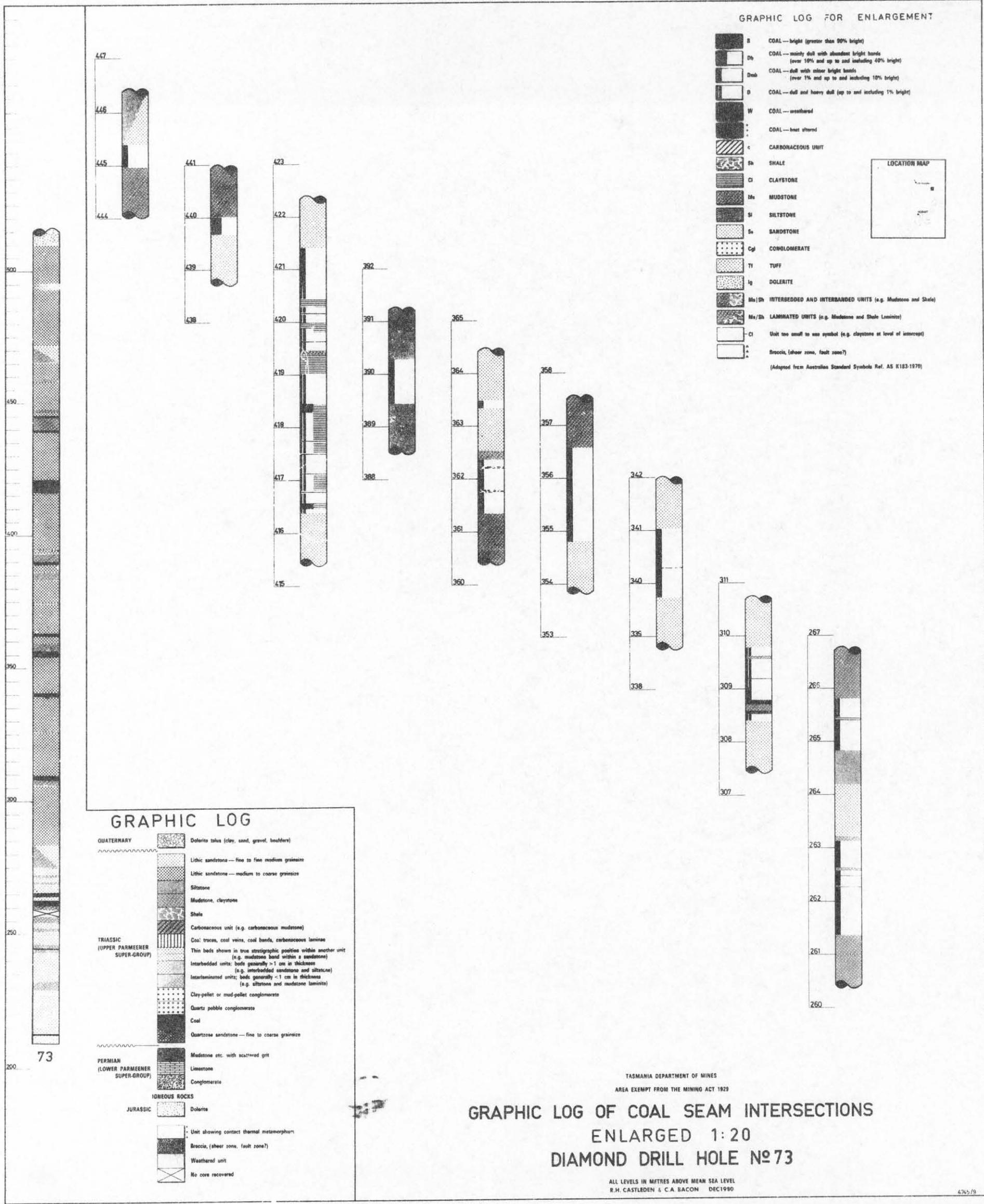


GRAPHIC LOG



GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 71

TASMANIA DEPARTMENT OF MINES
AREA EXEMPT FROM THE MINING ACT 1929



GRAPHIC LOG FOR ENLARGEMENT

- B COAL — bright (greater than 80% bright)
 - D_b COAL — mainly dull with abundant bright bands (over 10% and up to and including 40% bright)
 - D_{mb} COAL — dull with minor bright bands (over 1% and up to and including 10% bright)
 - D COAL — dull and heavy dull (up to and including 1% bright)
 - W COAL — weathered
 - COAL — heat altered
 - c CARBONACEOUS UNIT
 - Sh SHALE
 - Cl CLAYSTONE
 - Ms MUDSTONE
 - Sl SILTSTONE
 - Ss SANDSTONE
 - Cgl CONGLOMERATE
 - Tf TUFF
 - Dol DOLERITE
 - Ms/Sh INTERBEDDED AND INTERBANDED UNITS (e.g. Mudstone and Shale)
 - Ms/Sh LAMINATED UNITS (e.g. Mudstone and Shale Laminite)
 - Cl Unit too small to use symbol (e.g. claystone at level of intercept)
 - Br Brucia, (shear zone, fault zone?)
- (Adapted from Australian Standard Symbols Ref. AS K183-1970)



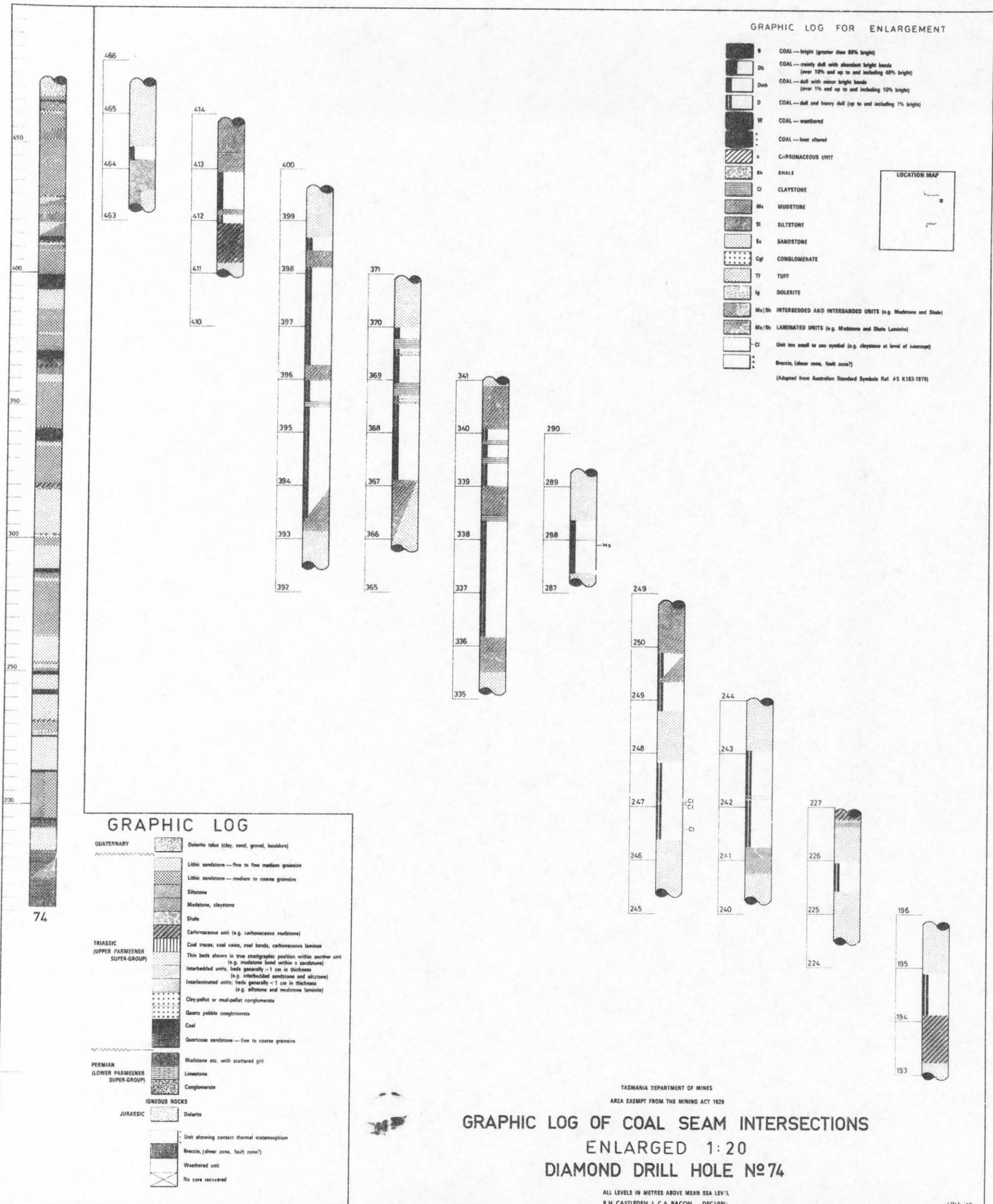
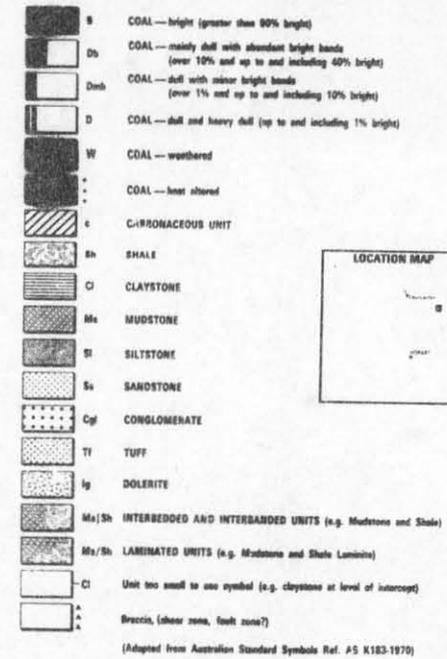
GRAPHIC LOG

- QUATERNARY
 - Dolerite talus (clay, sand, gravel, boulders)
 - Litic sandstone — fine to fine medium grained
 - Litic sandstone — medium to coarse grained
 - Siltstone
 - Mudstone, claystone
 - Shale
 - Carbonaceous unit (e.g. carbonaceous mudstone)
- TRIASSIC (UPPER PARMEERER SUPER-GROUP)
 - Coal traces, coal veins, coal bands, carbonaceous laminae
 - Thin beds shown in true stratigraphic position within another unit (e.g. mudstone band within a sandstone)
 - Interbedded units: beds generally > 1 cm in thickness (e.g. interbedded sandstone and siltstone)
 - Interlaminated units: beds generally < 1 cm in thickness (e.g. siltstone and mudstone laminite)
 - Clay-pellet or mud-pellet conglomerate
 - Quartz pebble conglomerate
 - Coal
 - Quartzose sandstone — fine to coarse grained
- PERMIAN (LOWER PARMEERER SUPER-GROUP)
 - Mudstone etc. with scattered grit
 - Limestone
 - Conglomerate
- IGNEOUS ROCKS
 - JURASSIC
 - Dolerite
 - Unit showing contact thermal metamorphism
 - Brucia, (shear zone, fault zone?)
 - Weathered unit
 - No core recovered

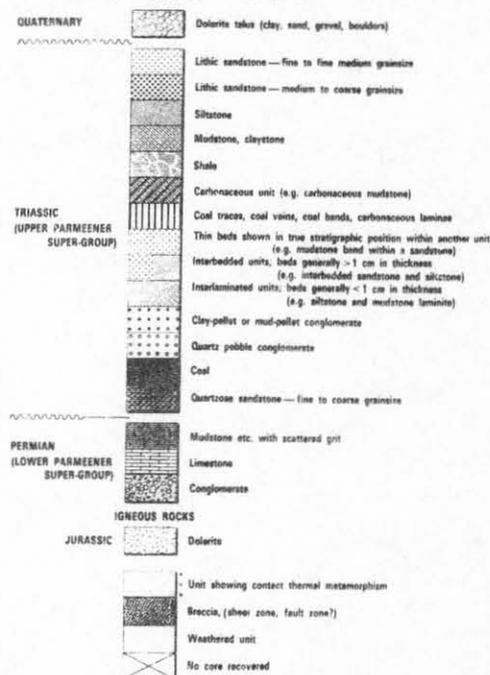
TASMANIA DEPARTMENT OF MINES
 AREA EXEMPT FROM THE MINING ACT 1929
GRAPHIC LOG OF COAL SEAM INTERSECTIONS
ENLARGED 1:20
DIAMOND DRILL HOLE No 73
 ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
 R.H. CASTLEDEN & C.A. BACON DEC/1980

FIGURE 83

GRAPHIC LOG FOR ENLARGEMENT



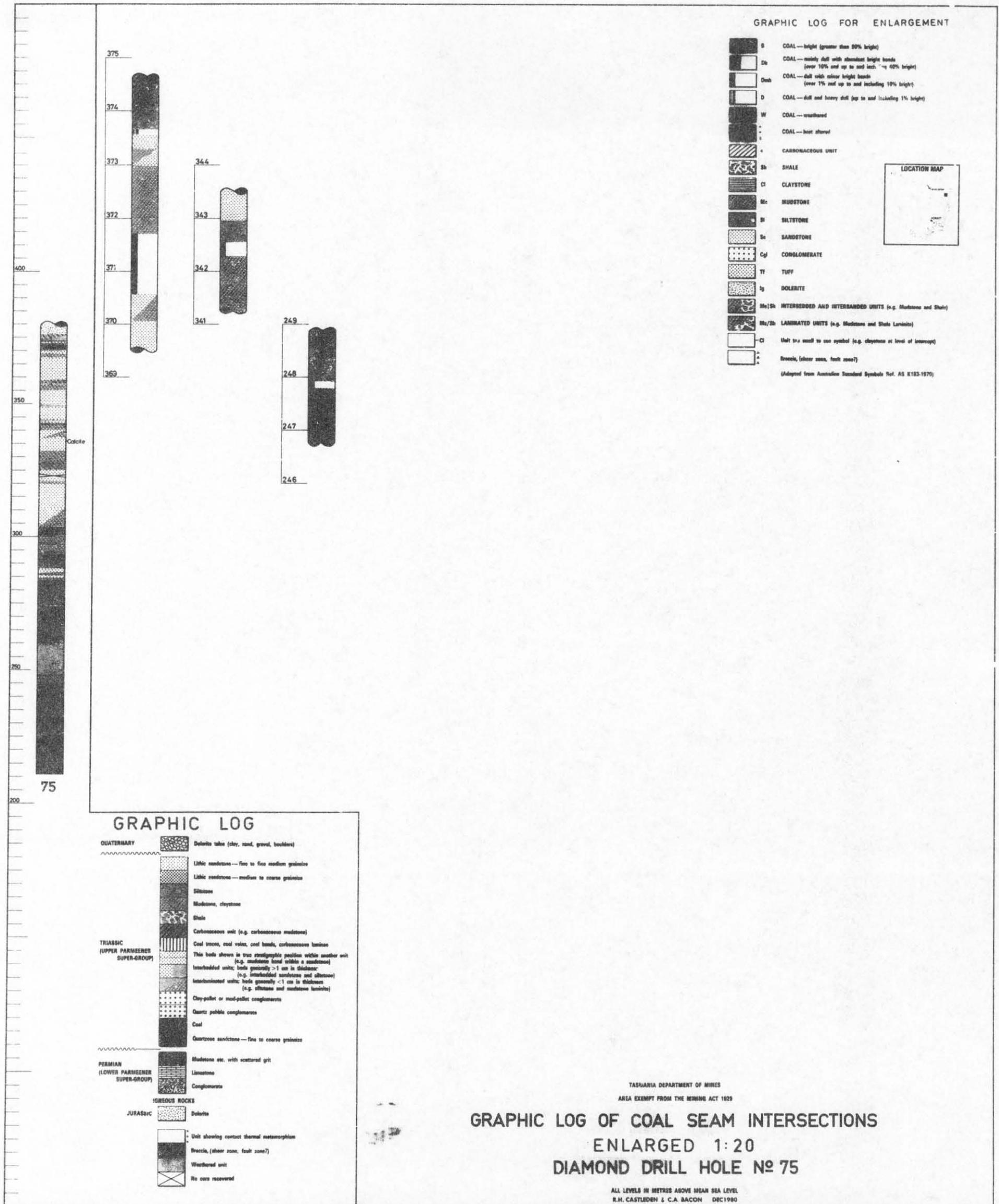
GRAPHIC LOG

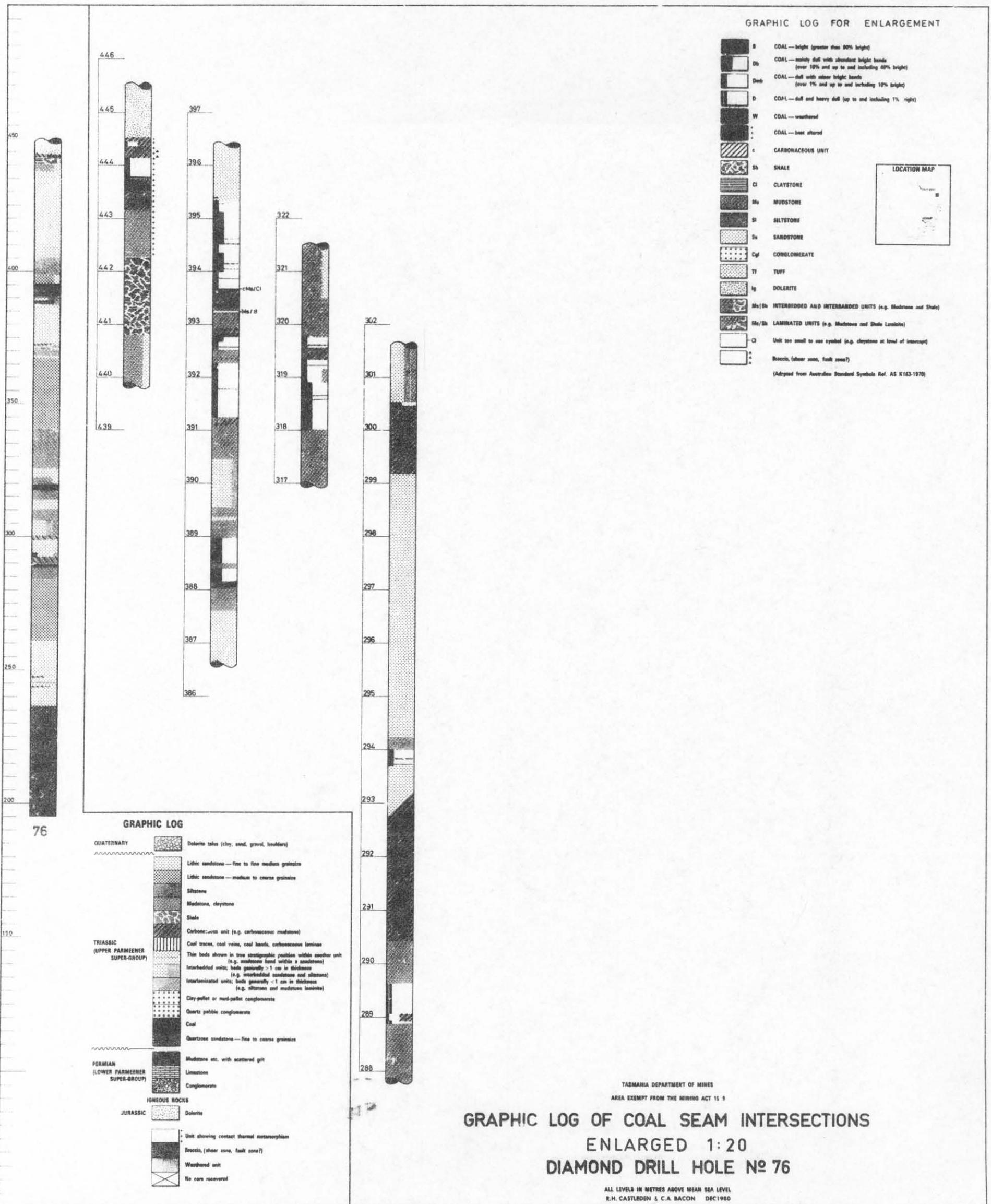


TASMANIA DEPARTMENT OF MINES
 AREA EXEMPT FROM THE MINING ACT 1929

GRAPHIC LOG OF COAL SEAM INTERSECTIONS
 ENLARGED 1:20
 DIAMOND DRILL HOLE No 74

ALL LEVELS IN METRES ABOVE MEAN SEA LEVEL
 R.H. CASTLEDEN & C.A. BACON DEC 1981





APPENDIX 7

Sections through S.R. 32/81 and E.L. 17/81

Microfiche of sections drawn connecting certain boreholes are included with this report. These sections are all on Fiche 13.

<i>Figure</i>	<i>Section</i>	<i>Holes</i>
87	East-west, 5386000 mN	44-40-43-42-70-74-71
88	East-west, 5387000 mN	26-27-21-38-46B-55-73-56
89	East-west, 5388000 mN	1-32-2-7-17-24-54-68-69
90	East-west, 5389000 mN	3-6-19-25-20-31-52-66
91	East-west, 5390000 mN	5-37-HEC1-49
92	North-south, 586700 mE	6-27-40-61-58-59
93	North-south, 588000 mE	4-37-25-17-38-43-53-57-59
94	North-south, 589000 mE	C1-31-24-41-42-53-57-59
95	North-south, 590000 mE	HEC2-HEC1-31-46B-45
96	North-south, 591000 mE	49-54-55-70-72
97	North-south, 592000 mE	66-68-73-74
98	North-south, 593000 mE	69-56-71
99	NW-SE (1)	4-37-20-24-46B-70
100	NW-SE (2)	1-32-30-26-44-58-59
101	SW-NE	44-39-38-23-24-52

For locations of drill holes see Figure 2 (p. 6).

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 E-W SECTION

42
 1795.1

	Dolomite shale
	Conglomerate, with rounded (lithic) pebbles and conglomerate (siliceous)
	Coal, Carbonaceous mudstone, minor interbedded sandstone, siltstone, mudstone
	Mudstone, Siltstone, interbedded siltstone and fine grain sandstone
	Lithic sandstone, minor interbedded conglomerate
	Quartzite sandstone, minor interbedded carbonaceous mudstone and grey mudstone
	Chert-bearing mudstone, Siltstone, minor quartzite grey
	Dolomite

1:1000
 HORIZONTAL SCALE
 VERTICAL EXAGGERATION 40:1
 ALL ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL
 R. CASTLEDEN NOVEMBER 1967

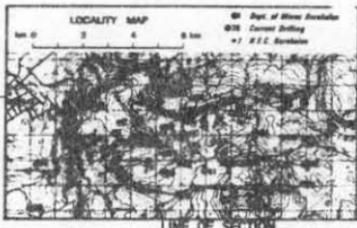
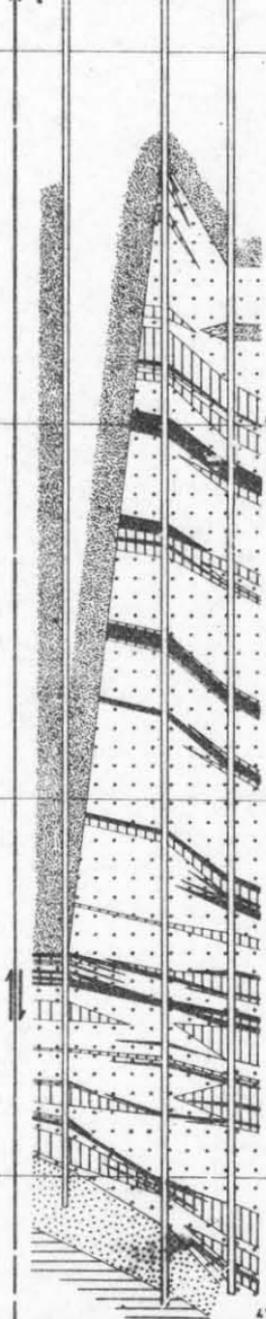
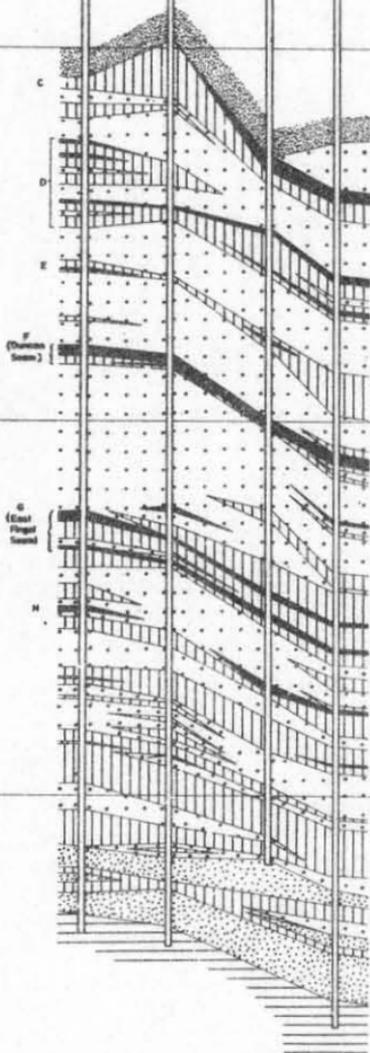
40
 1794.7

44
 1668.5

70
 1625.1

71
 1653.5

72
 1630.0



LINE OF SECTION

4721/3

FIGURE 87

36
(3627) COAL EXPLORATION
AREA EXEMPT FROM THE MINING ACT 1929
L-W SECTION
5 387 000mN

800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0

26
(7238)

27
(837)

21
(7584)

46B
(7730)

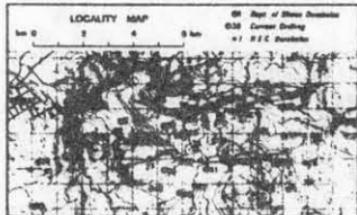
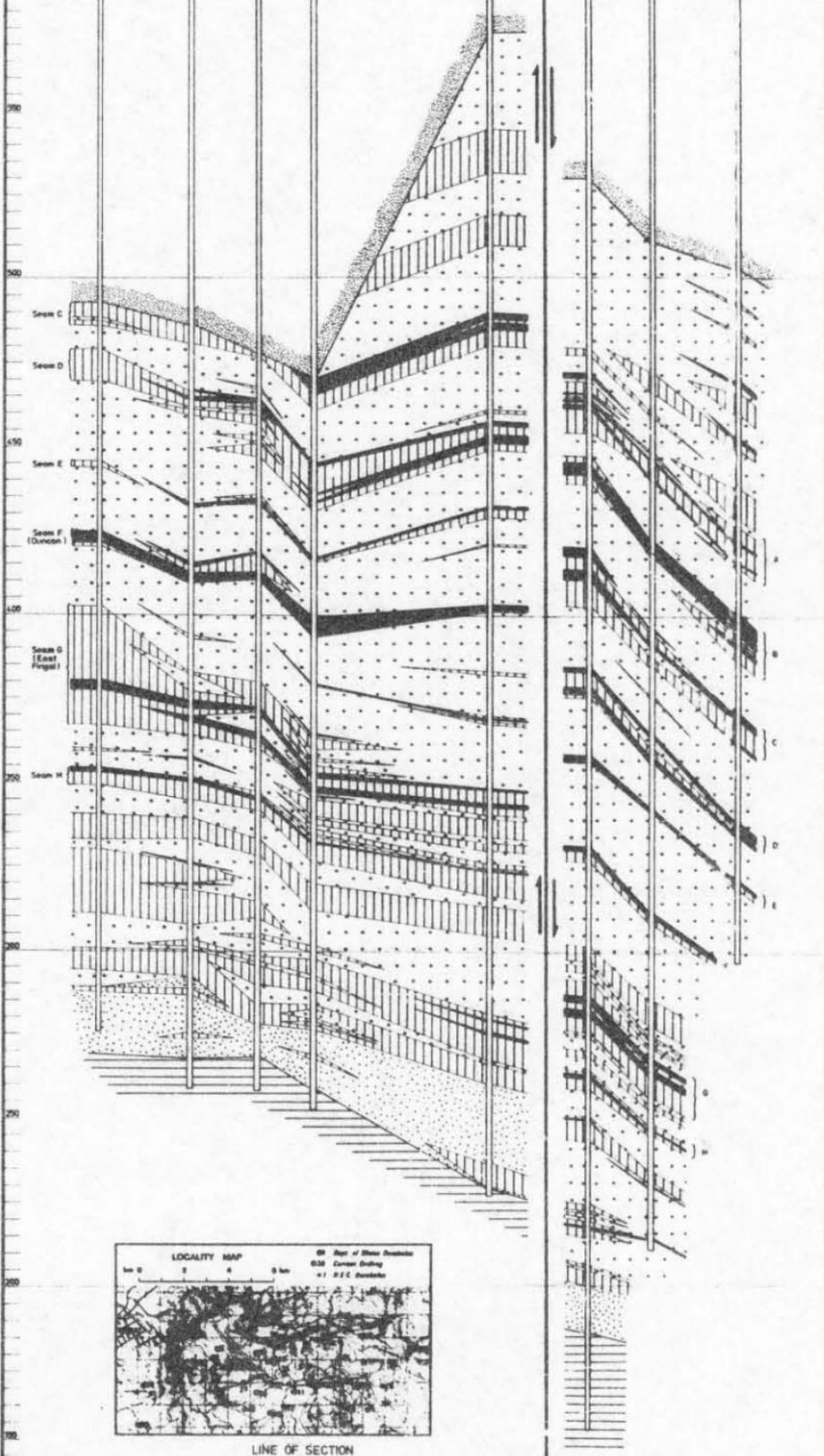
73
(7088)

56
(7099)

55
(6264)

	Dolomite beds
	Conglomerate, interbedded with sandstone and conglomerate (caliche)
	Coal
	Carbonaceous mudstone, upper interbedded shale, lignite, and shale
	Mudstone, sandstone, interbedded sandstone and fine-grained shale sandstone
	Lignite sandstone, minor interbedded conglomerate
	Quartzite sandstone, minor interbedded carbonaceous mudstone and grey mudstone
	Caliche-bearing mudstone, sandstone, interbedded shale
	Dolomite

HORIZONTAL SCALE
VERTICAL EXAGGERATION 40:1
ALL ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL
W. CASTLETON NOVEMBER 1980



LINE OF SECTION

MAY 1984

4721/2

FIGURE 88

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 E-W SECTION
 5 388 000 m N

	Basaltic tuff
	Conglomerate, sandstone, siltstone, shale and conglomerate (caliche)
	Coal (Carboniferous, Permian, Triassic)
	Massive, friable, interbedded sandstone and fine-grained siltstone
	Lentic sandstone, thin interbedded conglomerate
	Shaly sandstone, thin interbedded conglomerate, mudstone and grey mudstone
	Shale - coarse mudstone, Siltstone, micaceous grey
	Sandstone

VERTICAL EXAGGERATION 40:1
 ALL ELEVATIONS IN METERS ABOVE MEAN SEA LEVEL
 W. CASTLEMAN NOVEMBER 1981

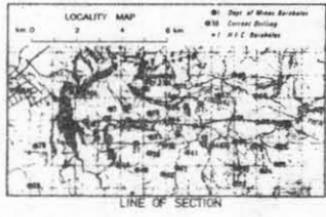
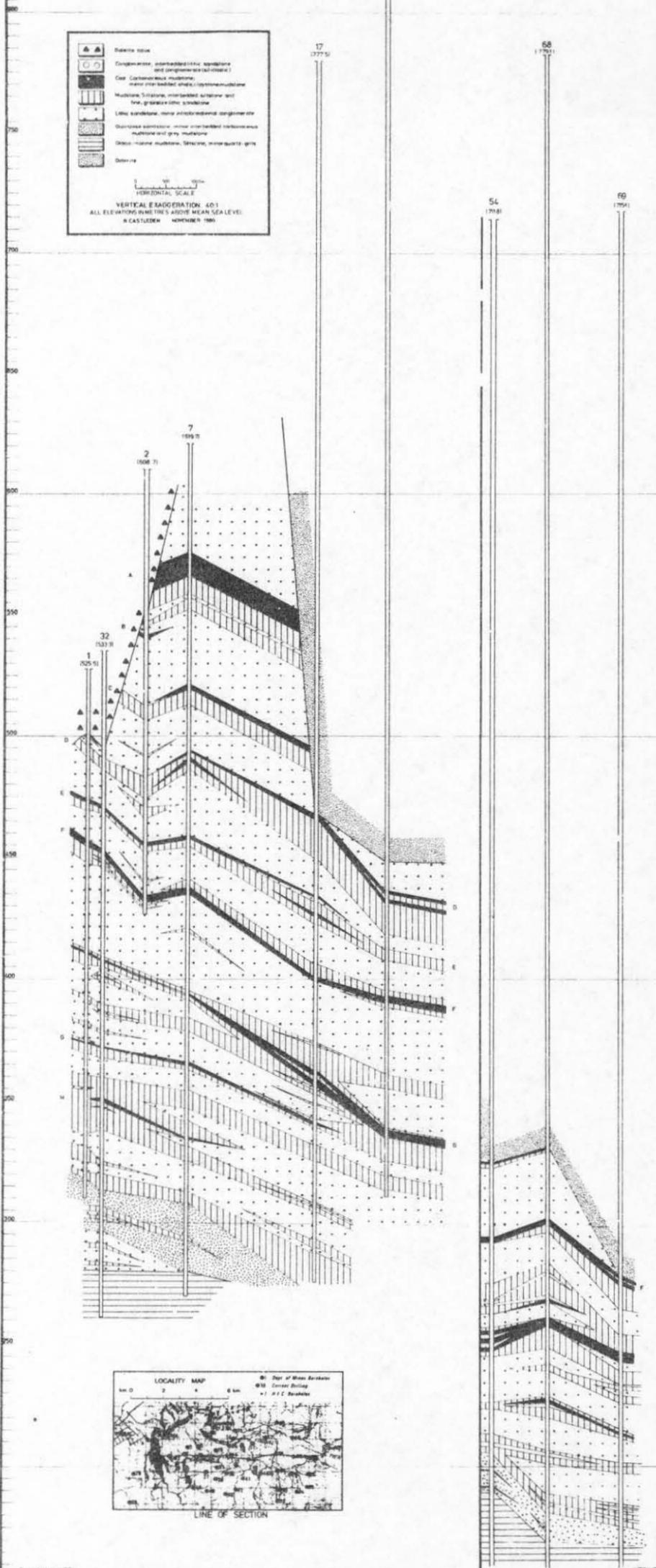


FIGURE 89

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 E-W SECTION
 5 389 000mN

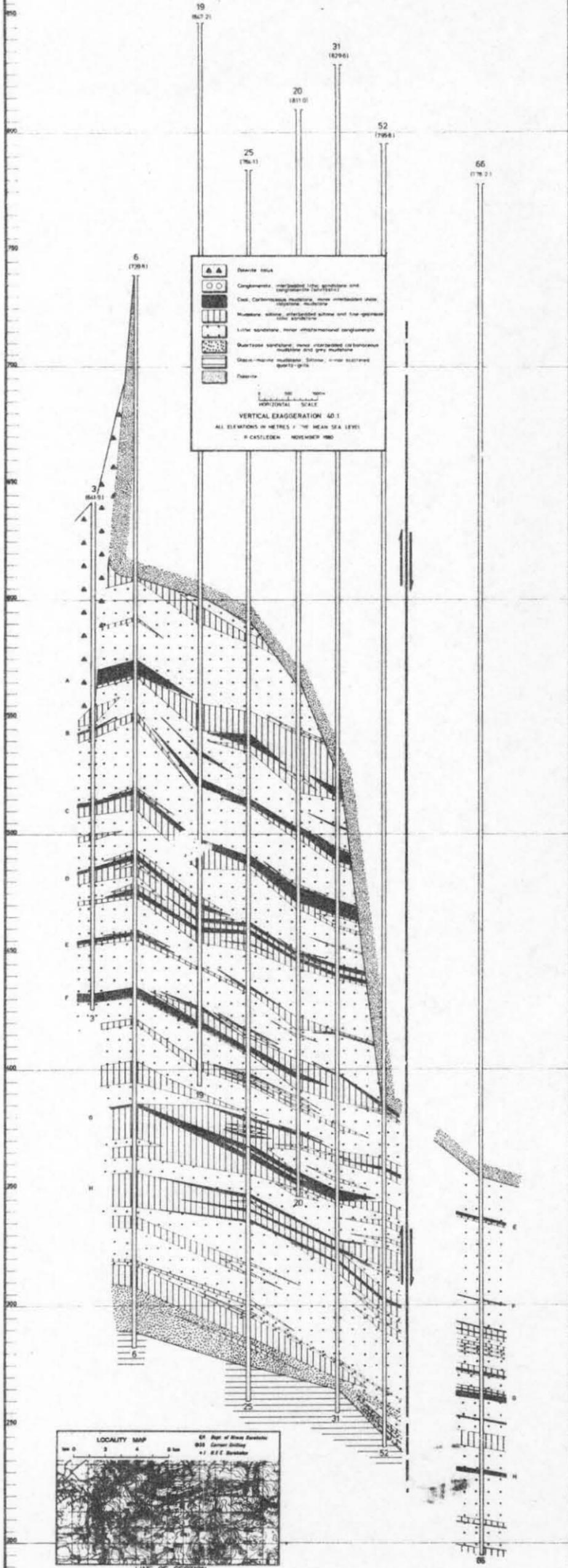


FIGURE 90

COAL EXPLORATION
 AREA EXEMPT FROM
 THE MINING ACT 1929
 E-W SECTION
 5 390 000mN

HORIZONTAL SCALE
 0 100 200 METRES

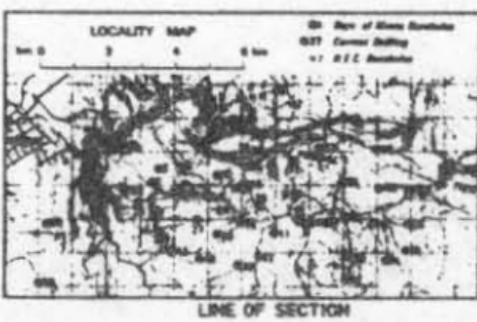
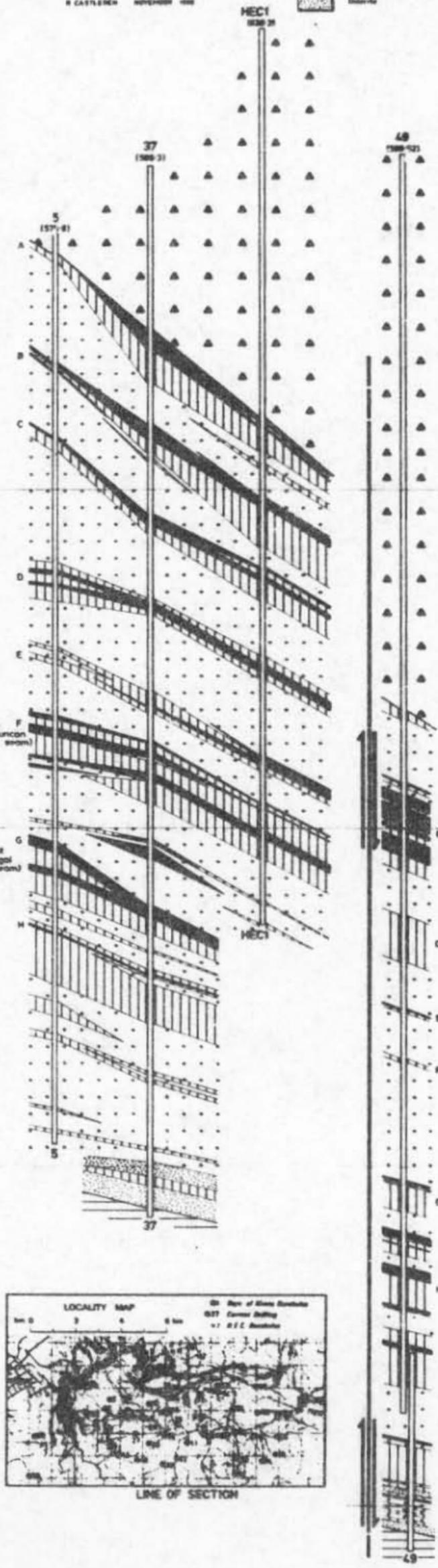
VERTICAL EXAGGERATION 40:1

ALL ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL

8 CASTLEBEN NOVEMBER 1988

- Reference shaft
- Conglomerate, interbedded with sandstone and mudstone (Mudstone)
- Coal, Carbonaceous mudstone, sand interbedded with claystone mudstone
- Mudstone, silty, interbedded siltstone and fine-grained silty sandstone
- Silty sandstone, near interbedded conglomerate
- Sandstone, silty, interbedded carbonaceous mudstone and grey mudstone
- Sandstone, silty, near surface quartz-grit
- Sandstone

650
600
550
500
450
400
350
300
250
200



LINE OF SECTION

FIGURE 91

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 N-5 SECTION
 589 000 mE

31
 (10261)

24
 (10251)

41
 (10241)

42
 (10231)

53
 (10221)

57
 (10211)

58
 (10201)

Legend

- Dolerite sills
- Conglomerate (sandstone, siltstone, and conglomerate (all clasts))
- Coal (Carbonaceous mudstone, fine, interbedded shale, lignite, mudstone)
- Argillite, Siltstone, sandstone, siltstone and fine grained silt, sandstone
- Limestone, shale, interbedded conglomerate
- Quartzite sandstone, some interbedded carbonaceous mudstone and grey mudstone
- Gneiss, mafic, medium, Siltstone, minor quartz, gneiss

Date: 1958

HORIZONTAL SCALE
 1:10000

VERTICAL EXAGGERATION 40:1
 ALL ELEVATIONS IN METRES ABOVE SEA LEVEL
 K. CASTLETON NOVEMBER 1958

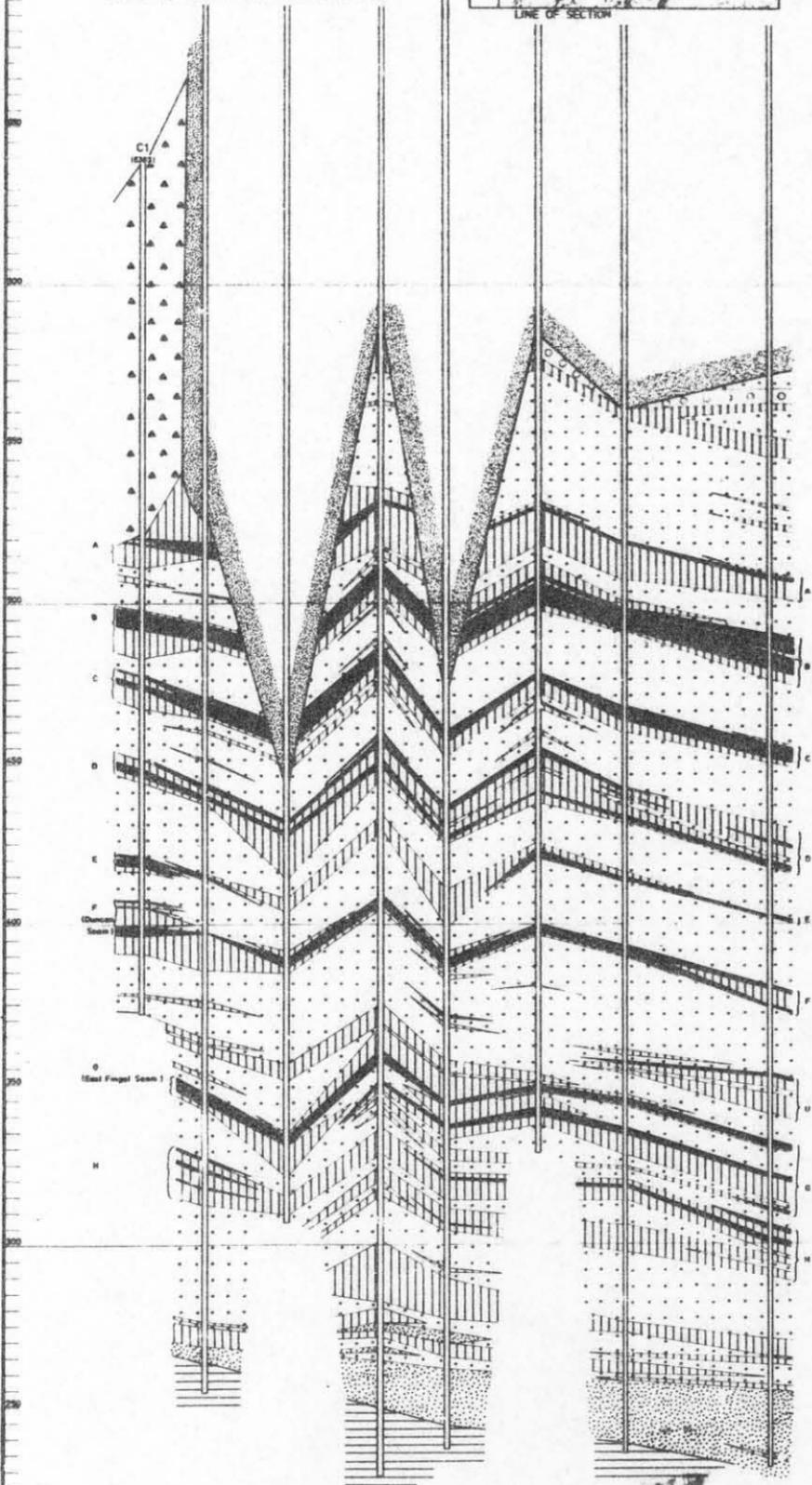
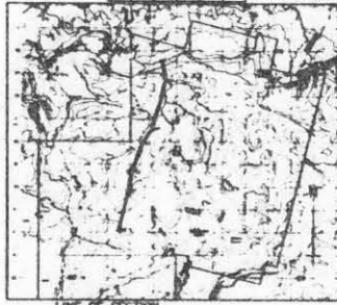


FIGURE 94

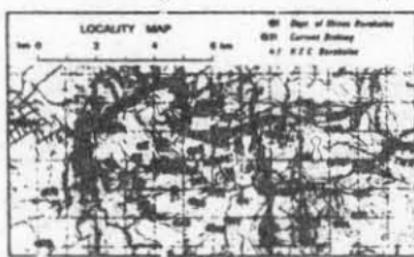
COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 N-S SECTION
 590000mE

31
 1529.6



46B
 773.7

45
 1707.6



LINE OF SECTION

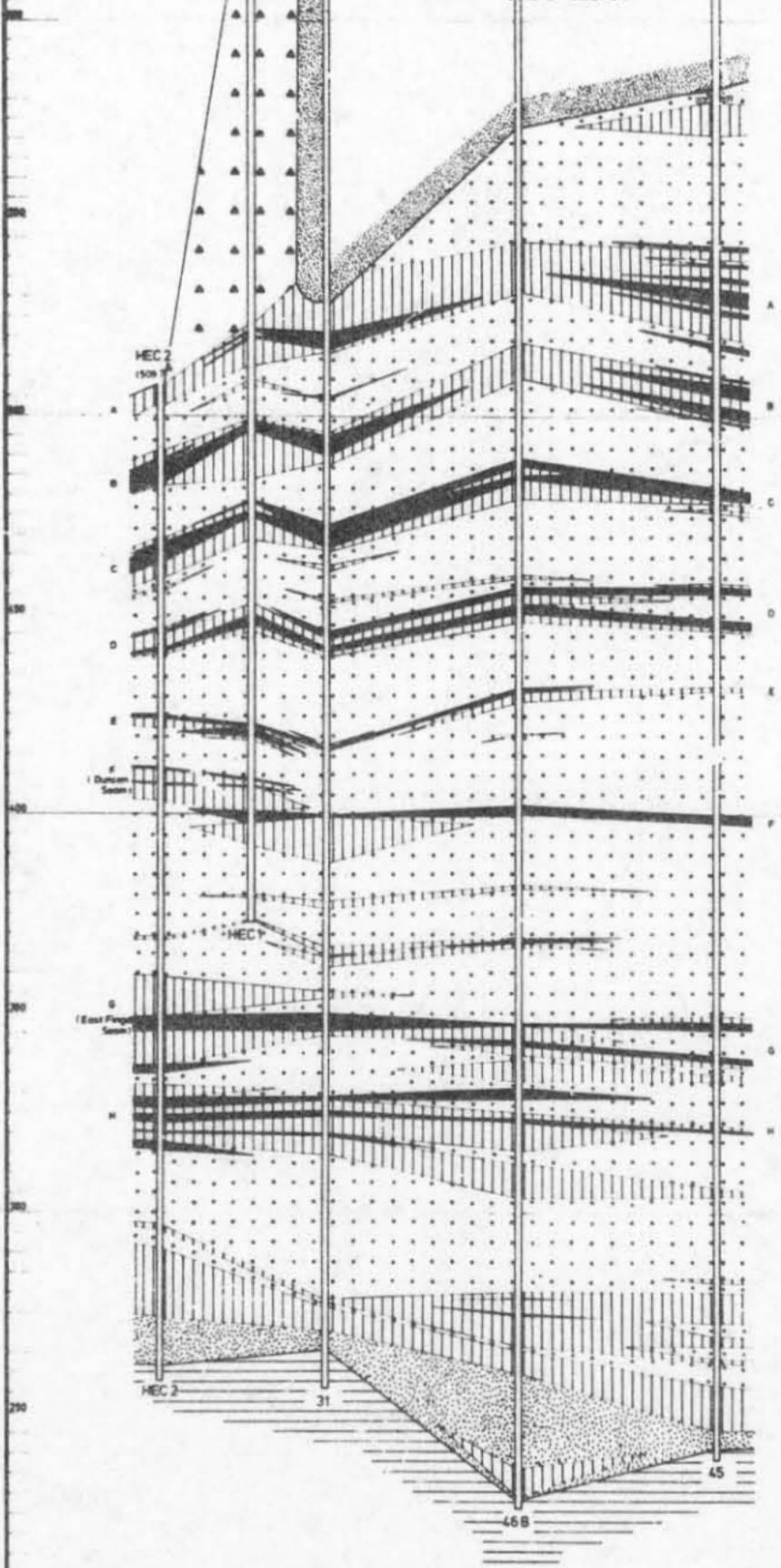


FIGURE 95

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 N-S SECTION

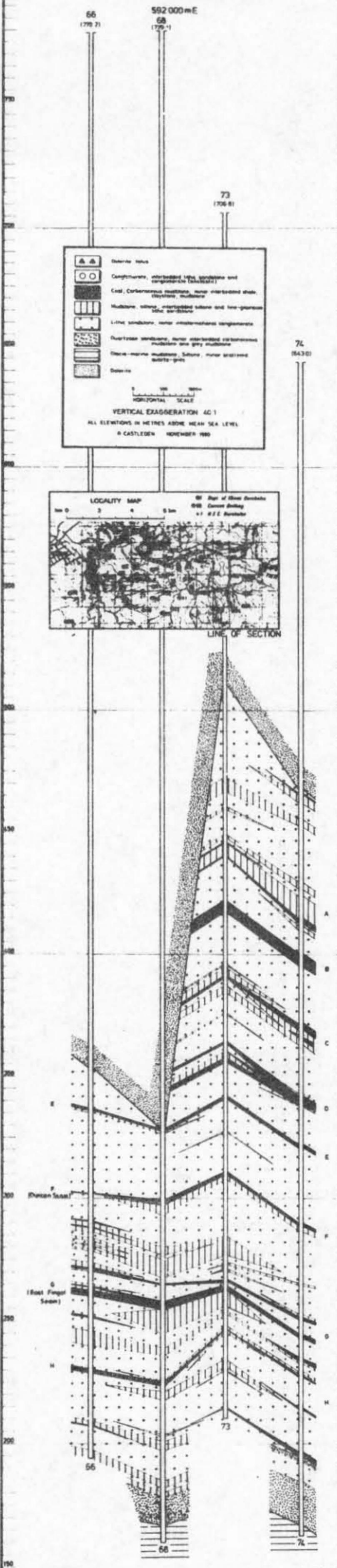
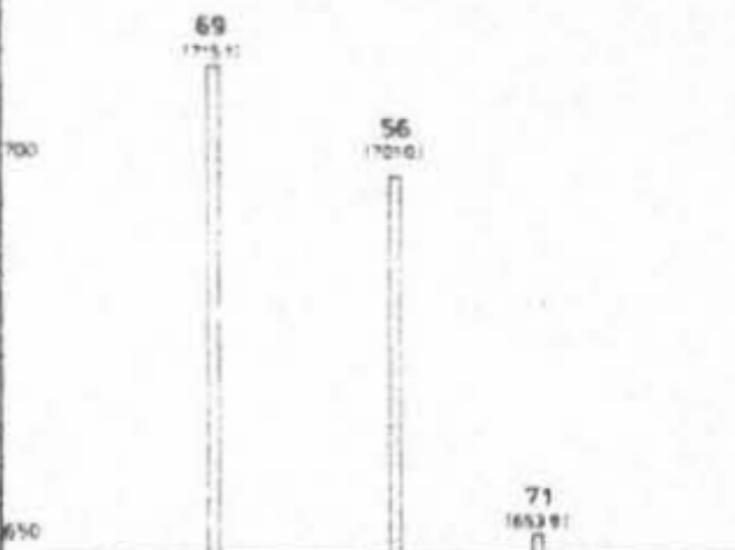


FIGURE 97

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 N-S SECTION
 593 000mE



	Borehole logs
	Conglomerate, interbedded fine sandstone and argillaceous mudstone
	Coal, Carbonaceous mudstone, minor interbedded thin argillaceous mudstone
	Mudstone, silty, interbedded silty and fine granular (fine sandstone)
	Thin sandstone, minor interbedded conglomerate
	Subirregular sandstone, minor interbedded carbonaceous mudstone and grey mudstone
	Sandstone with shale, silty, coarse, minor interbedded subirregular
	Shale

0 100 200
 HORIZONTAL SCALE

VERTICAL EXAGGERATION 40'

ALL ELEVATIONS IN METERS ABOVE MEAN SEA LEVEL

W. J. COLLIER NOVEMBER 1960

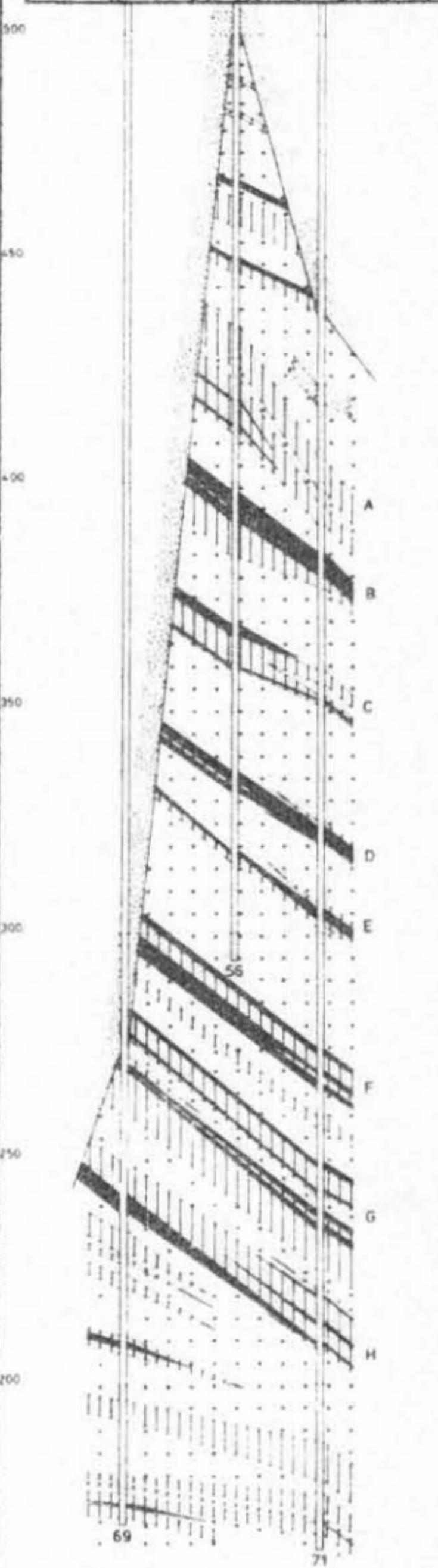
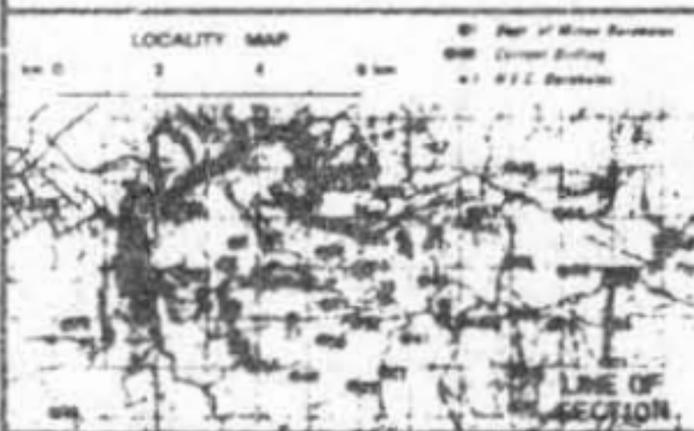


FIGURE 98

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1929
 NW-SE SECTION
 (Nº 1)

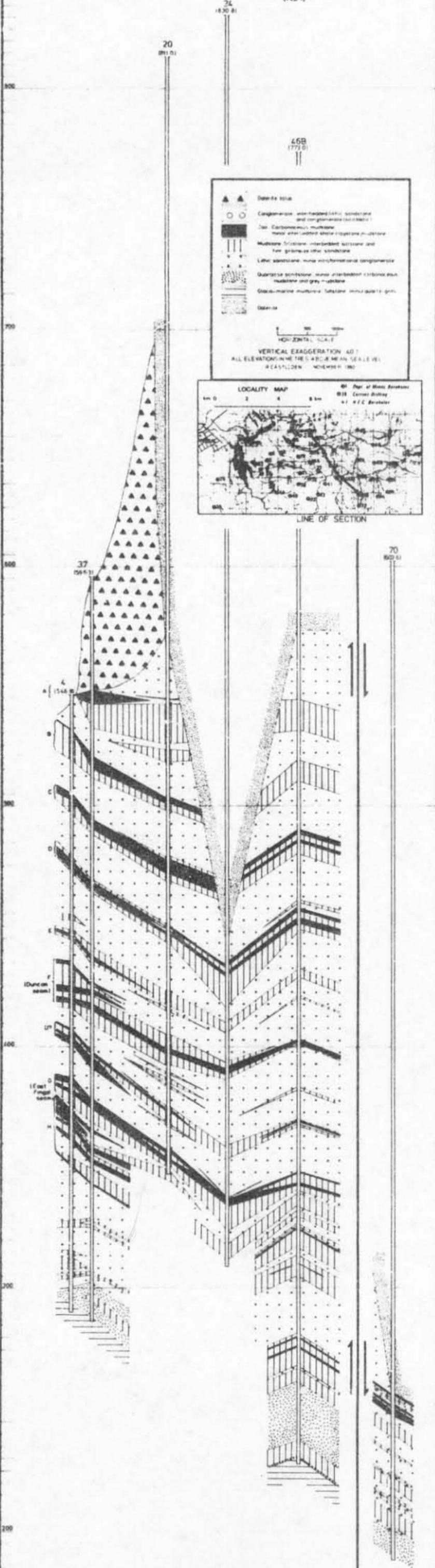


FIGURE 99

COAL EXPLORATION
 AREA EXEMPT FROM THE MINING ACT 1925
 NW-SE SECTION (N° 2)

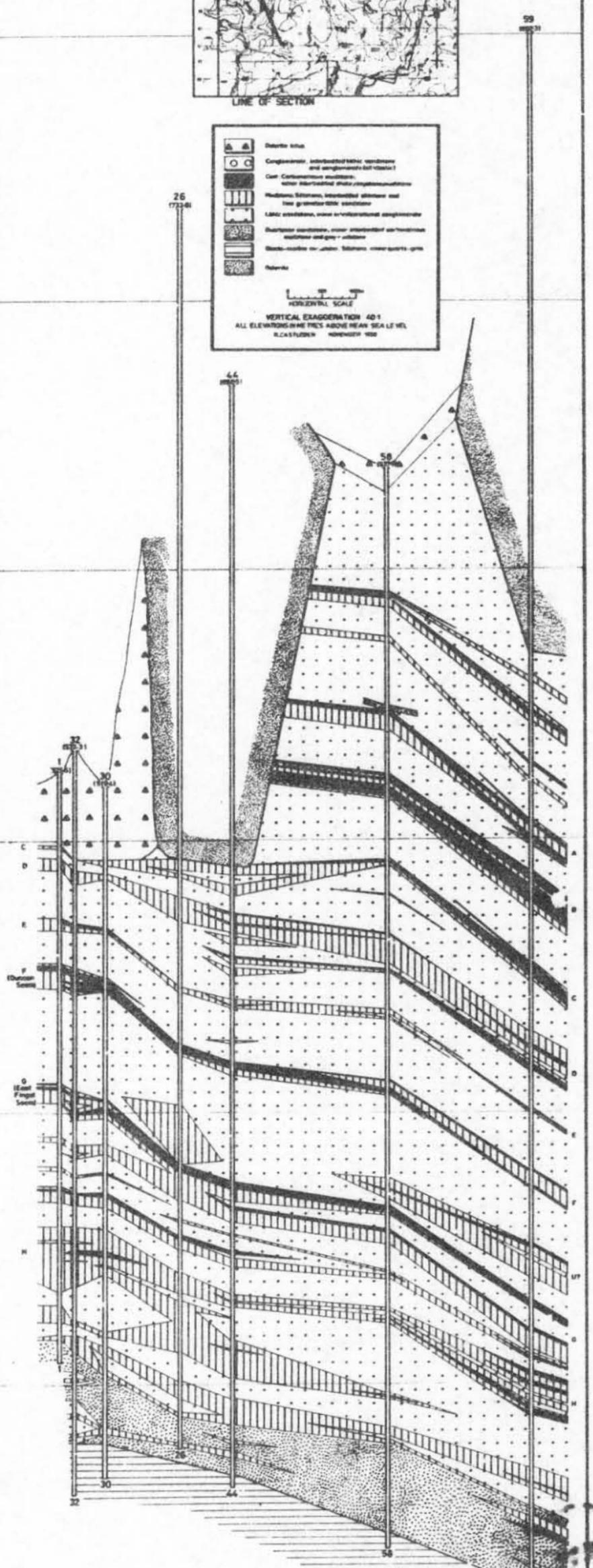
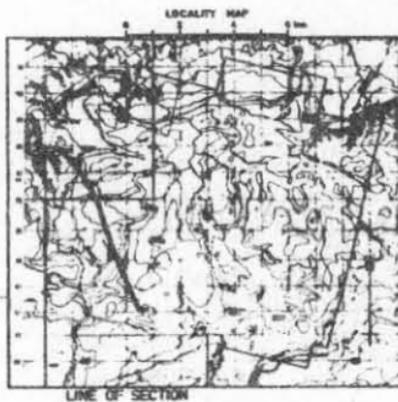


FIGURE 100

Corrected May 1956

472-14

