THE SHELL COMPANY OF AUSTRALIA LIMITED
(Incorporated in Victoria)

AND

INDUSTRIAL AND MINING INVESTIGATIONS PTY. LIMITED
(Incorporated in the A.C.T.)

EL 5/61 GRAY
- TASMANIA -

MOUNT NICHOLAS GEOLOGICAL REPORT

VOLUME 1
TEXT & FIGURES

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650010

1. SUMMARY

This report comprises an appraisal of drilling and related activities undertaken in Joint Venture between The Shell Company of Australia Limited and Industrial and Mining Investigations Pty. Limited, in the Mt. Nicholas area of EL5/61, which is near St. Marys in north-eastern Tasmania.

The prospect comprises about 15 km² of an isolated remnant of Triassic coal measures outcropping along the flanks of the dolerite capped Nicholas Range. Mt. Nicholas is the highest point of the range and is within EL5/61. About two thirds of the area is apparently underlain by coal having development potential.

Four potentially economic coal seams are contained with the coal measures, having thicknesses ranging from under 1m to over 3m. In ascending stratigraphic sequence these are known as the Lower 2 (L2), Lower 1 (L1), Middle 2 (M2), and Middle 1 (M1) Seams. Upper Seams are evidently of no economic significance. The coal is of low rank, and would be classified as a high volatile bituminous type, making it primarily suitable as a domestic steaming coal.

All of the seams are adit accessable, however the existence of extensive colluvial deposits makes this problematic in some areas, and the seams contain structures which effect their mineability, including faults, washouts, and dykes.

The seams have ash contents ranging from 18% to over 40%, however these can generally be brought back to anticipated market levels by beneficiation, with acceptable yields. The specific energy of the product washed to 20% ash (a.d.) and 11% total moisture is approximately 22 MJ/kg. Hardgrove Indices are moderate, averaging 55. Sulphur, chlorine and phosphorus levels are low, as are fouling and slagging propensities. Ash fusion temperatures generally exceed 1500°C.

Reserves are estimated at 48.8 million tonnes In Situ, of which 34.2 million tonnes are Recoverable and up to 26.9 million tonnes Marketable, depending on ultimate market requirements. Approximately 83% of

this reserve may be classified as Measured Reserves, and all of the remainder as Indicated Reserves.

The report summarises the results of all exploration activities in the subject area, with particular emphasis on the 1982 evaluation programme. It also describes work currently in progress and evaluates remaining deficiencies in the geological knowledge of the area having relevance to mining.

650012

2. INTRODUCTION

2.1 Scope

This report constitutes a summary of available information derived principally from the 1982 slim core drilling programme at Mt. Nicholas. It does not attempt to replace the previous report CEPR 11/81 "An Assessment of the Mount Nicholas Coal Deposit" Wollff et. al. (1981) but rather to complement it, providing updates of all the information contained therein, summaries of new investigations, and where necessary correcting assertions or conclusions subsequently found to be inaccurate. To this end it does not labour in areas where the 1982 programme has not significantly advanced the 1981 results, or contain appendices and figures relating to individual bores of the previous programmes which have already been promulgated. All of the maps and figures, however, represent new inceptions or substantial revisions of those contained in the previous report, and should be construed as representing the current state of knowledge where contradictions may occur.

The report attempts to present as much as possible of the available data in a concise and accessable format, to draw defensible conclusions, and to outline remaining deficiencies in the geological knowledge of the area.

2.2 Background

The Mt. Nicholas deposit is located some 16km from the coast in north-eastern Tasmania, some 9km north-west of the town of St. Marys. A location map is included as Figure 1.

The prospect forms part of the area covered by Exploration Licence 5/61, originally held by Industrial and Mining Investigations Pty. Limited (IMI) but in which The Shell Company of Australia Limited (SCOA) has now acquired a 60% interest.

This part of the EL is confined between Consolidated Mining Lease No. 34M/79 and EL 7/79, both held by the Cornwall Coal Company N.L. All of the area underlain by coal in the Mt. Nicholas area of EL 5/61 is Crown Land controlled by the Forestry Commission of Tasmania.

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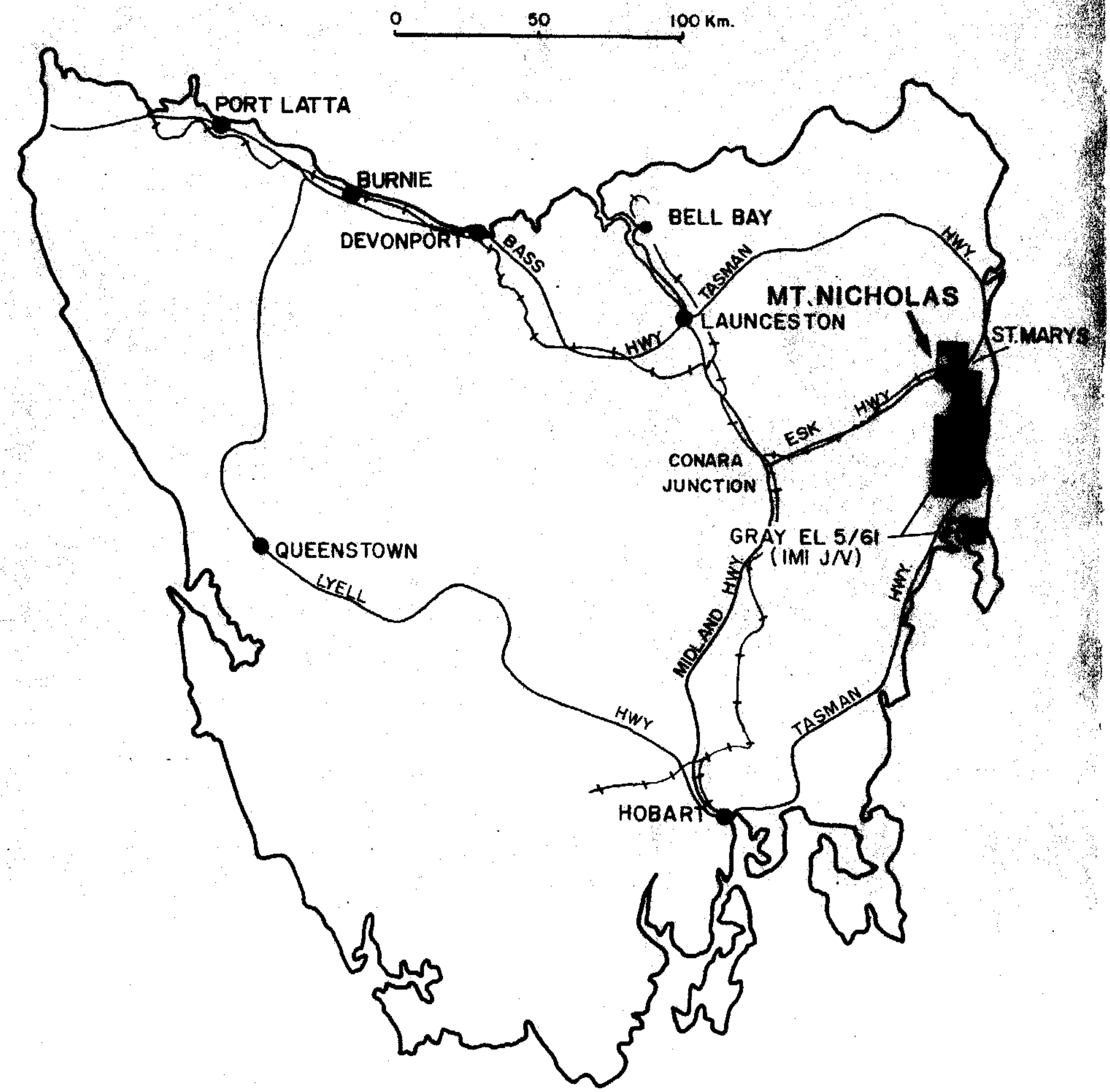
Mt Nicholas Location Map - Taesmania



Author : Coal Division	Date : November 1982	Fig. 1
Report No: CEPR 31/82	Drawing No: 1788	

2.3 Previous Exploration

At the end of 1981, exploration for and evaluation of coal in the area had proceeded to the stage where 14 NQ sized holes (47.6mm core) and four HQ sized holes (61.1mm core) had been drilled by the SCOA/IMI Joint Venture in addition to one smaller diameter hole drilled by the Tasmanian Department of Mines. Another Departmental borehole had been drilled slightly outside the western boundary of the E.L. Total meterage of drilling in these 16 holes was slightly over 3700m, all of which was fully cored and to which drilling by the Joint Venture contributed over 3200m.

At this stage a substantial proportion of the total reserve could be accorded Measured Status, there was a generally acceptable understanding of seam development and interseam stratigraphy within the area, and sufficient information had been obtained from sampled seam intersections to enable preliminary assessment of likely washability characteristics and utilization potential of the coals. Extensive geotechnical work carried out in association with the analytical sampling programme had laid the basis of an understanding of the mining conditions which could be encountered in the various mineable seams.

Raw data from this phase of exploration has been included in summary tables throughout this report.

The principle areas in which further information was needed concerned:

(a) The structure of the coal measures, which were evidently the subject of some significant faulting, flexuring or both;

(b) The definition of mineable sections in seams which were subject to banding and considerable variations in inherent ash;

(c) The location of potential mine portal sites adjacent to subcrops of mineable reserves in areas where highly variable dolerite colluvial deposits were thinnest;

(d) The extent and influence of structures such as dykes and washouts which had been encountered by several drillholes in different seams and which could be presumed to exist in other undrilled areas;

(e) Further information concerning probable washability characteristics of the coals, including testing over wider relative density ranges and the aquisition of data relating to sizing and other plant design criteria.

2.4 1982 Exploration Programme

2.4.1 Slim Hole Drilling

Work over the past year has been oriented primarily towards heightening understanding of the economic significance of the Mt. Nicholas deposit with particular reference to problem areas as outlined above. Further drilling was seen as the only method available to meet this requirement and accordingly a further programme of slim hole drilling was commenced. During the course of the year this has resulted in the drilling of an additional 28 boreholes, involving an additional metreage of 1945.5m, of which 1368m was cored. All of this drilling was contracted to the Tasmanian Department of Mines, with two drilling rigs deployed on Mt. Nicholas for the duration of the contract.

Table 2.1 summarises all of the Mt. Nicholas drilling undertaken to the end of this programme. Borehole locations are shown on Enclosure 1.

Six fully cored NQ boreholes were drilled to maximise Measured Reserves in the area and to further elucidate seam development and structural parameters. These bores were numbered GY106, 108, 119, 123, 132 and 151, and totalled 1056.0m. The only remaining area of Indicated Reserves corresponds to that underlying the dolerite capping of the Nicholas Range, which is regarded as inaccessible for drilling purposes.

Sixteen non-cored bores were drilled on the southern side of Mt. Nicholas to check colluvium thickness, detailed seam development, and structure in the subcrop region of the economic seams, so as to facilitate selection of possible mine entry sites. These bores were numbered GY109, 117, 120-122, 127, 128, 130, 135-138, 141-143 and 146. Total metreage was 560.2m.

A further six bores, cored at NQ and HQ diameter, were drilled in the immediate areas of possible mine entry development to acquire seam analytical and geotechnical information. These bores were numbered GY116, 157, 164 and 166-168 and totalled 329.3m.

Graphical logs and expanded seam sections from all bores and two measured sections comprising the 1982 field programme are included as Enclosures 37 to 66.

2.4.2 Subcrop Samples

It was recognised that slim core float/sink data could not be relied on to provide sufficient information for preparation plant design, and accordingly a decision was made to obtain larger samples.

A sample of the M1 seam was obtained from an old shallow shaft found in the Millstream Creek area (GY124), and a sample of the L2 seam was obtained by trenching from a weathered exposure of the L1 seam in the same area (GY173). These samples do not represent areas of ideal economic development of either seam, however, they were sufficiently large to provide useful float/sink data for the purpose of reserve definition in areas of marginal quality.

Due to poor outcrop, unexpectedly deep weathering, and colluvial coverage of the margins of the most attractive reserve areas, it was decided that it was not feasible to rely on further subcrop sampling for the acquisition of washery design data. Adit drillage was ruled out for similar reasons.

2.4.3 Large Diameter Drilling

A contract was let in August to Associated Diamond Drillers (contract drilling division of Boart Australia Pty. Limited) to drill large diameter bores at five sites. Desirably, seam samples would be of at least 50kg to enable adequate sample pretreatment and testing at sizes appropriate to washery design.

As a result two bores of 100mm core diameter will be drilled at each site and the two cores combined for each seam sample. This method is apparently cheaper and safer than attempting to core one hole at a commensurately larger diameter in potentially difficult ground conditions. It has the additional advantage of providing a means to check seam thickness variability and to regulate core losses.

Sites chosen for the large diameter bores corresponded with sites of existing slim holes GY123, 33, 36, 34 and 44. This was for a number of reasons:

(a) The selection of these sites optimises the number and distribution of intersections of each mineable seam in the area of its mineable reserve;

(b) Existing control would ensure that drilling of problematic colluvial material was minimised;

(c) A direct comparison would be provided between large sample washability testing and the slim core float/sink data which would serve to indicate the reliability and overall usefullness of the latter;

(d). Seam intersections could be accurately predicted to obviate the need for unnecessary coring runs and thus expedite the total programme.

All cores from the large diameter programme will be subjected to appropriate pretreatment and washability testing, plus some recrushing to determine ash liberation characteristics and to provide a basis of comparison with the slim core float/sink data. This should enable the projection of washery design data from samples which would otherwise be regarded as too small or too finely sized.

At the time of this report the large diameter drilling had been almost completed, however, only a few laboratory results were to hand. The results of this programme will therefore be reported separately.

2.4.4 Geophysics

Table 2.1 indicates geophysical logs which were run in boreholes drilled to date. These logs have been of prime importance in the definition of mineable seam sections particularly in non cored boreholes, the identification and correlation of seams in structurally ambiguous situations, and the interpretation of sedimentary structures of especial significance to mining, notably washouts. Some bores were sonic logged in anticipation that this information will eventually lead to wider interpretation and prediction of geotechnical parameters.

Earlier in the year several attempts were made to determine seismic velocities of the surface colluvial material and coal measure strata in the hope that any evident contrast between these could indicate the use of seismic refraction as an alternate tool for locating areas of minimal colluvium thickness, and thus defining possible portal sites. Surface velocities proved to be highly variable and the exercise was not persued.

2.4.5 Evaluation

Drill core was logged, photographed and sampled for both analytical and geotechnical purposes prior to being set aside in storage. The techniques of sampling and methods of analysis are detailed in later sections of this report.

2.4.6 Survey

All boreholes and both subcrop sample sites were accurately surveyed to AMG co-ordinates, and levelled to AHD datum by G.J. Walkem and Co. of Launceston. Results are contained in Table 2.1.

2.4.7 Environment Protection

At the conclusion of drilling operations at each site the area was cleared of rubbish and the surface ripped as an erosion preventative measure. This treatment was also applied to tracks no longer needed. A natural bark mulch was spread at each location to provide encouragement to natural regermination, and 200 seedlings of indigenous tree species were planted as an additional measure to supplement natural regrowth. Public access to the exploration tracks and drill sites has been restricted to increase the probability of their successful rehabilitation.

TABLE 2.1 SUMMARY OF DRILLING DATA (PAGE 1)

Bore	Shell Record No.	Collar RL (m AHD)	Easting (m AMG)	Northing (m AMG)	OH (m)	Core (m)	Total Depth (m)	Core Diam (mm)	Geophysical Logs					
									Cal.	LSD	BRD	γ	N-N	Sonic
DOM 8	5040	559.87	589 795	5 399 657	-	250.70	250.70	42.0						
DOM 13	5065	537.38	591 971	5 401 972	-	228.50	228.50	36.4						
GY 24	125	603.80	592 495	5 401 075	-	366.50	366.50	61.1						
26	135	610.60	591 246	5 400 770	-	340.86	340.86	61.1						
28	145	593.48	590 902	5 399 594	-	335.00	335.00	61.1						
31	160	417.57	590 322	5 402 186	-	119.96	119.96	61.1	*	*	*	*	*	
33	170	467.17	590 406	5 398 687	-	132.90	132.90	47.6	*	*	*	*	*	
34	175	480.51	591 234	5 402 273	-	114.75	114.75	47.6	*	*	*	*	*	
35	180	356.05	591 705	5 397 935	-	56.70	56.70	47.6						
36	185	486.23	590 318	5 401 347	-	117.82	117.82	47.6	*	*	*	*	*	
37	190	527.45	591 156	5 401 522	-	43.29	43.29	47.6						
38	195	391.36	591 191	5 398 123	-	75.00	75.00	47.6						
39	200	590.46	590 299	5 400 516	-	225.85	225.85	47.6	*	*	*	*	*	
40	205	583.78	590 299	5 399 561	-	229.50	229.50	47.6	*	*	*	*	*	
41	210	448.84	591 199	5 398 605	-	118.00	118.00	47.6	*	*	*	*	*	
42	215	579.68	591 764	5 401 381	-	236.10	236.10	47.6						
43	220	559.08	591 513	5 399 250	-	238.30	238.30	47.6	*	*	*	*	*	
44	225	506.38	592 773	5 401 648	-	166.86	166.86	47.6						
45	230	510.90	593 412	5 401 240	-	115.60	115.60	47.6	*	*	*	*	*	
46	235	527.41	591 160	5 401 524	-	199.57	199.57	47.6						
106	540	493.28	590 774	5 401 837	-	120.58	120.58	47.6						
108	550	456.46	592 545	5 402 314	-	109.14	109.14	47.6	*	*	*	*	*	
109	555	351.13	590 865	5 398 109	18.30	-	18.30							
116	590	355.59	592 265	5 398 276	-	25.00	25.00	47.6						
117	595	392.75	590 934	5 398 189	54.50	-	54.50		*	*	*	*		*

650020

TABLE 2.1 SUMMARY OF DRILLING DATA (PAGE 2)

Bore	Shell Record No.	Collar RL (m AHD)	Easting (m AMG)	Northing (m AMG)	OH (m)	Core (m)	Total Depth (m)	Core Diam (mm)	Geophysical Logs					
									Cal.	LSD	BRD	γ	N-N	Sonic
119	605	577.65	590 764	5 400 973	-	214.62	214.62	47.6	*	*	*	*		
120	610	394.54	590 805	5 398 278	54.00	-	54.00		*	*	*	*		*
121	615	349.87	590 750	5 398 199	18.30	-	18.30							
122	620	474.97	590 718	5 398 723	30.30	-	30.30		*	*	*	*	*	*
123	625	463.04	591 867	5 398 615	-	141.36	141.36	47.6	*	*	*	*	*	
127	645	472.97	591 653	5 398 664	48.50	-	48.50		*	*	*	*		*
128	650	473.53	591 345	5 398 754	64.00	-	64.00		*	*	*	*		*
130	660	457.24	591 037	5 398 769	42.00	-	42.00		*	*	*	*		
132	670	620.66	591 455	5 399 729	-	283.88	283.88	47.6	*	*	*	*		
135	685	458.14	590 967	5 398 801	18.00	-	18.00		*	*	*	*		
136	690	453.07	590 844	5 398 735	36.50	-	36.50		*	*	*	*		
137	695	357.09	590 630	5 398 271	16.00	-	16.00		*	*	*	*		
138	700	372.10	590 580	5 398 387	31.00	-	31.00		*	*	*	*		
141	715	458.82	590 163	5 398 592	42.50	-	42.50		*	*	*	*		
142	720	393.32	591 916	5 398 284	61.70	-	61.70		*	*	*	*		
143	725	355.24	590 395	5 398 243	24.50	-	24.50		*	*	*	*		
146	740	351.98	591 966	5 398 125	17.40	-	17.40							
151	765	524.08	590 837	5 399 054	-	186.40	186.40	47.6	*	*	*	*		
157	800	393.00	590 888	5 398 230	-	54.50	54.50	61.1						
164	840	355.76	590 845	5 398 162	-	18.23	18.23	61.1	*	*	*	*		
166	850	364.04	592 004	5 398 214	-	36.45	36.45	61.1	*	*	*	*		*
167	855	468.74	591 800	5 398 660	-	45.40	45.40	61.1	*	*	*	*		*
168	860	472.65	590 963	5 398 889	-	132.43	132.43	61.1	*	*	*	*		*

TABLE 2.1 SUMMARY OF DRILLING DATA (PAGE 3)

Bore	Shell Record No.	Collar RL (m AHD)	Easting (m AMG)	Northing (m AMG)	OH (m)	Core (m)	Total Depth (m)	Core Diam (mm)	Geophysical Logs					
									Cal.	LSD	BRD	γ	N-N	Sonic
TOTAL (GY 24-168)					577.50	4600.55	5178.05							
1982 TOTAL (GY106-168)					577.50	1367.99	1945.49							
124	630	453.60	590 913	5 398 804			4.30	Shaft						
173	885	357.91	590 706	5 398 253			10.86	Shaft						

Cal. = Caliper, LSD = Long Spaced Density, BRD = Bed Resolution Density, γ = Gamma, N-N = Neutron-Neutron

650022

3. GEOLOGY

3.1 General

This section comprises a broad outline of the geology of Mt. Nicholas as related to potential mining operations. For a more detailed treatise on historical geology and stratigraphy of the area the reader is referred to the previous geological report (Wollff et. al, 1981).

Figure 2 indicates the regional distribution of units described in the following paragraphs and also the location relative to the Mt. Nicholas area of mines which have operated or are operating in the same coal measure sequence.

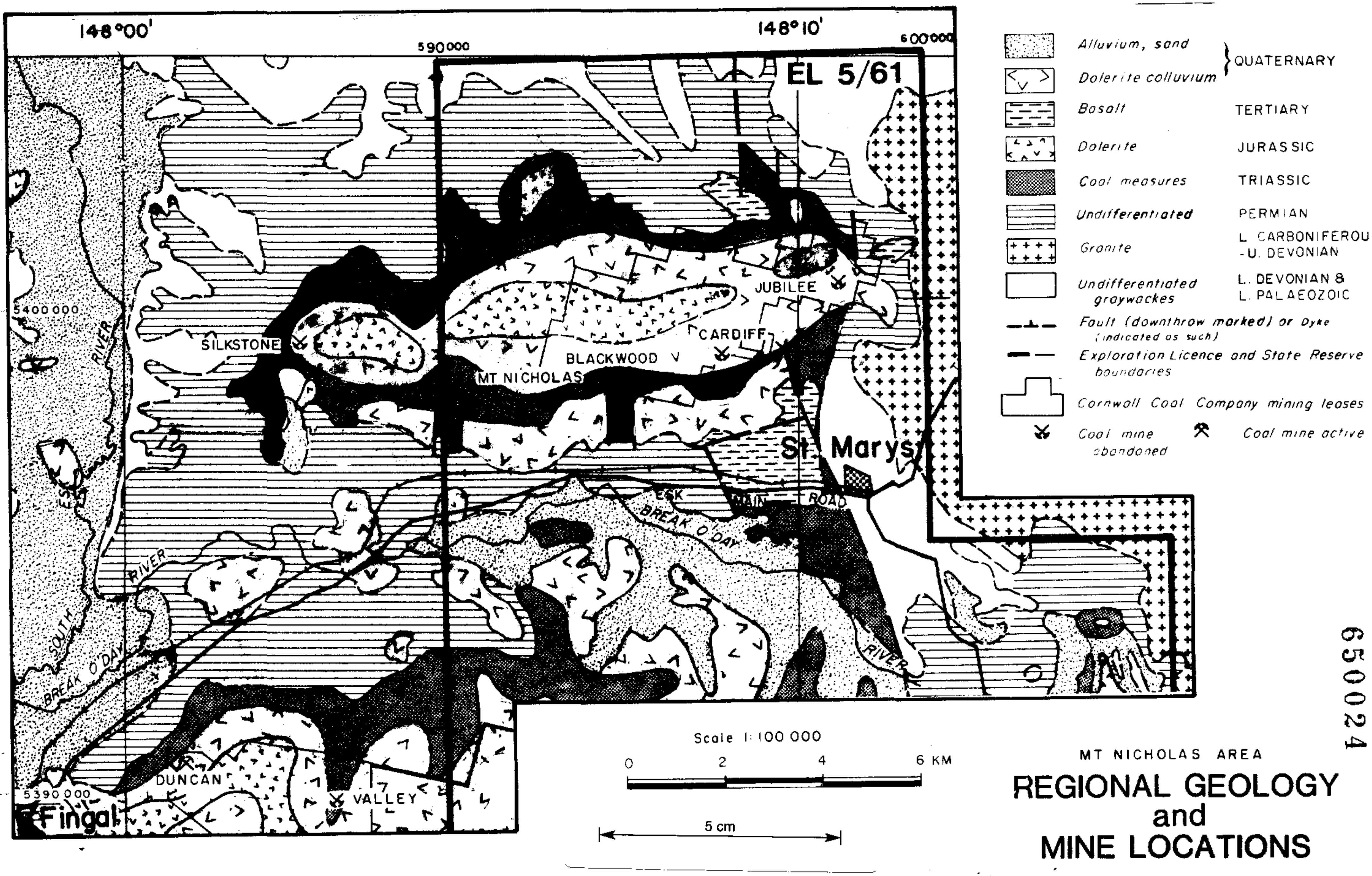
3.2 Stratigraphy

A simplified stratigraphic column is included as Figure 3.

Effective economic basement in the area is represented by the Mathinna Beds, which are tightly folded sedimentary rocks which, however, have suffered only low grade regional metamorphism. The top of this unit is marked by a pronounced unconformity of considerable relief corresponding to the Tabberabberan Orogeny at the conclusion of the Devonian period. Mathinna beds are exposed over most of the lower ground to the north of Mt. Nicholas.

Overlying the Mathinna Beds are Tasmanian Basin sediments of Permian age which in this area are represented by sandstones, mudstones and limestones of marine origin comprising the Lower Parmeener Super Group. Freshwater units containing minor coal measures in other areas of the basin are apparently not represented at Mt. Nicholas. The Lower Parmeener sediments are up to 100m thick, however the actual thickness in individual areas is a function of basement relief and in some areas they are apparently not represented.

A gradual transition from marine to freshwater sediments marks the base of the Upper Parmeener Super Group. The boundary is ill-defined as is the boundary between Permian and Triassic sedimentation which is

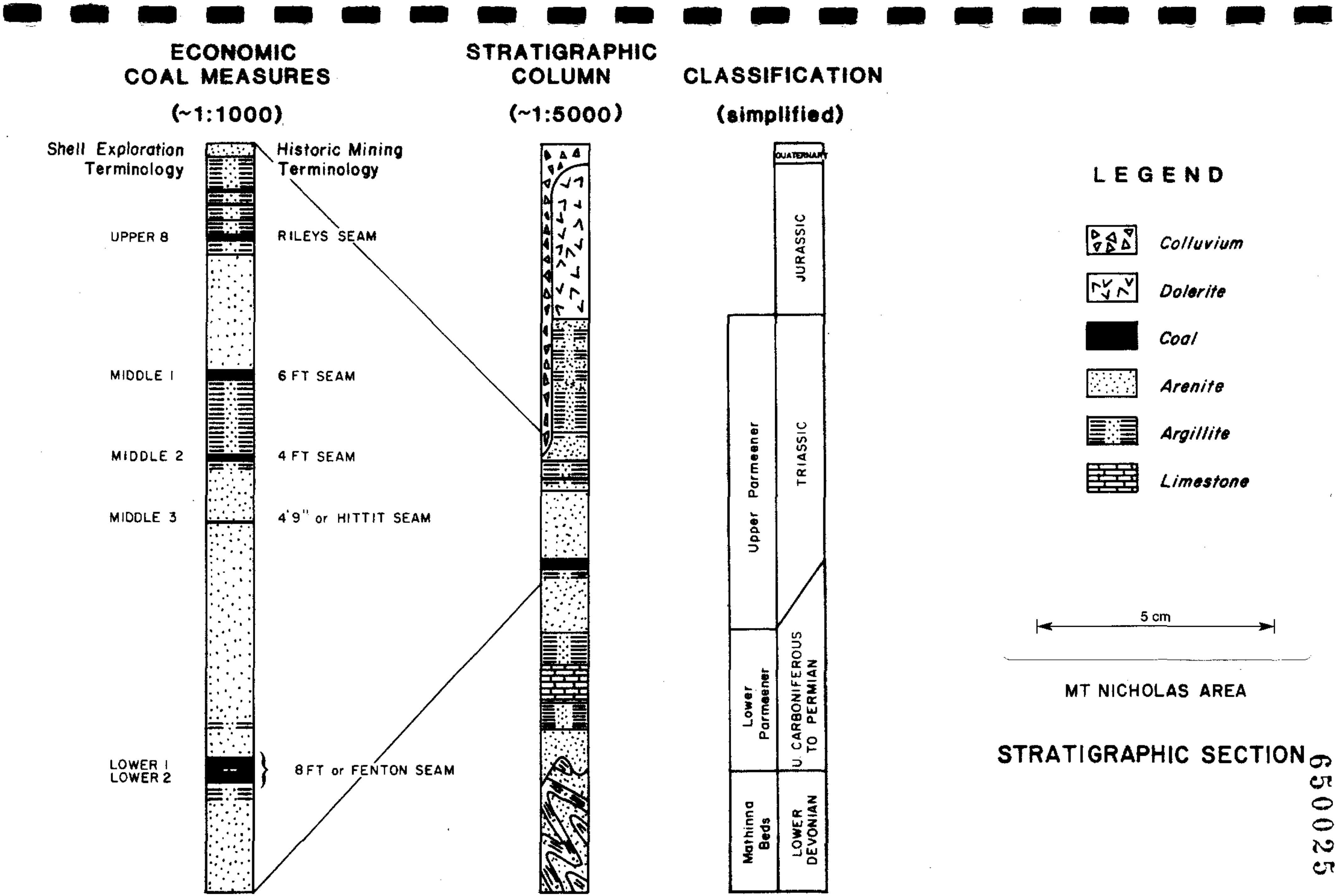


MT NICHOLAS AREA

REGIONAL GEOLOGY and MINE LOCATIONS

Author : Coal Division	Date November 1982	Fig. 2
Report No: CEPR 31/82	Drawing No: 2779	

650024



Author : Coal Division	Date : November 1982	Fig. 3
Report No: CEPR 31/82	Drawing No: 2717	

thought to be in the lower part of the freshwater sequence. At Mt. Nicholas the Upper Parmeener sediments are approximately 400m thick, of which the basal 100m are transitional lithologies, the central 100m are coal measures containing the principle economic seams, and the upper 200m are further freshwater sequences containing only thin and poorly defined coal seams.

The economic seams in ascending stratigraphic sequence are the Lower 2, Lower 1, Middle 2, and Middle 1, hereafter referred to respectively as the L2, L1, M2 and M1. The position of these seams in the sequence and the inferred relationship to previous terminology is indicated in Figure 3.

A massive dolerite sill was intruded at the top of this sequence during the Jurassic, and now comprises the uppermost unit of the total sequence represented.

3.3 Igneous Geology

All igneous intrusives mapped at Mt. Nicholas have been doleritic in character and are assumed to be contemporaneous with the massive Jurassic sill mentioned above, which although severely eroded still has a maximum thickness of over 200m in the Mt. Nicholas area. The base of the sill is obscured by talus deposits and has not been mapped, however, it appears to be reasonably regular and at approximately 650m in elevation. The absence of feeders underlying this material is inferred from the results of a major gravity survey of the area (Leahman, 1980).

By contrast, Huntsmans Cap to the north of the range and on the edge of reserve areas in two seams, is inferred to be a feeder plug from the elevation of its base (450m) and the verticality of its surface structures.

A major dolerite dyke radiates southwards from Huntsmans Cap into the northern sector of the seam reserve areas. The surface expression of this structure is discontinuous, and magnetic profiles across extensions of the observable strike have been recorded in order to interpret the extent of the structure at depth. Shallow concealment of a major igneous body between the surface exposure and the assumed source (Huntsmans Cap) is not indicated, however, some sub-surface continuation is evidently present to the south (i.e. into the main reserve areas). The extent of this was not ascertainable due to masking effects of dolerite talus.

A small dyke recorded in GY43 has not been traced elsewhere.

3.4 Structure

Structures of the three seams of principal economic significance (L2, M2 and M1) as interpreted from all of the data to hand, are shown respectively by Enclosures 7, 8 and 9. The L2-L1 interval is thin and regular, so that the structure of the L1 broadly parallels that of the L2.

Substantial revisions of the previous interpretations are indicated, largely as a result of intensive drilling on the southern side of the range, which has confirmed the existence of a considerable departure from the anticipated strike and thus obviated the requirement for a number of north-south trending faults which had been previously postulated.

Even allowing for variations in the strike however, there remain considerable variations in the dip of individual seams which could be interpreted as roughly east-west trending faults (See Enclosure 7, near GY119). These are, however, not generally reflected in the structures of other seams and it is therefore possible that they represent differential compaction effects arising from channel development both in and below the coal measures. In either event some fracturing of the seams could be anticipated on the margins of such zones.

The large basinal structure superimposed on the regional gradient in the area of GY34, 37 and DOM13 may have originally represented a swing back to the more northerly strike apparent on the southern side of the range. It is possible that it has been created by drag or displacement associated with the emplacement of the Huntsmans Cap plug or other major intrusives lower in the sequence. An apparently similar structure shown on the M seam structure maps (Enclosures 8 and 9) to the south and east of GY44 results from an inexplicably thin M2-L2 interseam thickness in GY44 (see Enclosure 11).

The interpretation of the major faults near DOM8 and GY44 remain, with the deposit still seen as a graben structure limited by these to the east and west, and by subcrop to the north and south.

Table 3.1 lists the reduced levels of all economic seam intersections, the elevation differences between these, and the reduced level of the base of colluvium in all bores drilled to date at Mt. Nicholas.

The cross-sections (Enclosures 2 to 5) give a graphical representation of the structural interpretation and an indication of the lateral interseam facies changes.

3.5 Surface Geology

The surface distribution of various stratigraphic units described under Section 3.2 is shown in Figure 2.

The most significant feature of the surface geology as related to mining and mine planning is the extensive blanketing of the subcrop by doleritic colluvial material, discussed in further detail under Section 4.1. Development of this can range from scattered surface boulders to valley infilling deposits over 100m in thickness. The thickest intersection so far recorded is 121.3m in GY132 (Table 3.1).

Outcrop of coal measure strata is generally easily recognisable in creek beds or road cuttings where a superficial soil cover has been removed. The coal, however, tends to weather in outcrop and is not generally exposed in representative section without considerable excavation.

TABLE 3.1 : SUMMARY OF STRUCTURAL DATA (PAGE 1)

Bore	Collar RL	Colluvium RL	M1 RL	M1-M2	M2 RL	M2-L1	L1 RL	L1-L2	L2 RL	T.D. RL
OM 8	559.9	559.9	536.3	22.2	514.1	80.1	434.0	3.3	430.7	309.2
OM 13	537.4	537.4	462.6	12.9	449.7	75.5	374.2	2.9	371.3	308.9
Y 24	603.8	497.5	442.0	10.3	431.7	74.6	357.1	2.6	354.5	237.3
26	610.6	501.5	448.8	15.9	432.9	73.8	359.1	3.5	355.6	269.7
28	593.5	527.9	452.8	23.9	428.9	73.0	355.9	3.3	352.6	258.5
31	417.6	408.5					N.P		393.2	297.6
33	467.2	467.2	448.1	27.4	420.7	72.9	347.8	3.2	344.6	334.3
34	480.5	462.9			449.0		N.P		375.7	365.8
35	356.1	< 299.4	Colluvium Only							299.4
36	486.2	475.2	473.4	15.4	458.0		W.O		379.1	368.4
37	527.5	< 484.2	Abandoned - See GY 46							484.2
38	391.4	< 316.4	Colluvium Only							316.4
39	590.5	583.6	464.8	14.2	450.6	75.7	374.9	2.6	372.3	364.6
40	583.8	552.8	463.9	26.3	437.6	73.2	364.4	3.3	361.1	354.3
41	448.8	420.8					347.0	4.8	342.2	330.8
42	579.7	558.0	454.9	11.2	443.7		W.O		363.8	343.6
43	559.1	515.8	436.4	20.8	415.5	70.6	344.9		F.O	320.8
44	506.4	500.4	443.4	12.1	431.3				362.2	339.5
45	510.9	506.1			478.8	74.9	403.9	2.6	401.3	395.3
46	527.4	459.4			449.4		W.O		W.O	327.8
106	493.3	472.8			456.6		W.O		382.3	372.7
108	456.5	456.5					388.6	2.9	385.7	347.3
109	351.1	344.5							344.1	332.8
116	355.6	339.6	No Seams Intersected							330.6
117	392.8	380.8					348.0	5.0	343.0	338.3

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TABLE 3.1 : SUMMARY OF STRUCTURAL DATA (PAGE 2)

Bore	Collar RL	Colluvium RL	M1 RL	M1-M2	M2 RL	M2-L1	L1 RL	L1-L2	L2 RL	T.D. RL
119	577.7	545.4	461.4	13.5	447.9	73.0	374.9	3.7	371.2	363.0
120	394.5	389.3					350.9	5.0	345.9	340.5
121	349.9	347.1	No Seams Intersected							331.6
122	475.0	474.2	457.0							444.7
123	463.0	458.0	427.3	21.6	405.7	69.7	336.0	4.6	331.4	321.7
124	453.6	453.6	449.6							449.3
127	473.0	469.0	432.8							424.5
128	473.5	465.7	441.8	25.3	416.5					409.5
130	457.2	457.2			421.0					415.2
132	620.7	499.5	442.3	22.0	420.3	71.9	348.4	3.7	344.7	336.8
135	458.1	458.1	448.7							440.1
136	453.1	453.1			425.6					416.6
137	357.1	357.1					352.3	5.1	347.2	341.1
138	372.1	372.1					354.8	4.9	349.9	341.1
141	458.8	456.6	452.3	22.7	429.6					416.3
142	393.3	388.3					335.5	4.1	331.4	331.6
143	355.2	351.2					340.2	5.3	334.9	330.7
146	352.0	<334.6	Colluvium Only							334.6
151	524.1	523.9	450.3	25.2	425.1	74.0	351.1	3.5	347.6	337.7
157	393.0	393.0					349.6	5.4	344.2	338.5
164	355.8	355.8					350.4	5.6	344.8	337.5
166	364.0	364.0					335.4	3.4	332.0	327.6
167	468.7	463.8	430.0							423.3
168	472.7	472.7	448.9	26.3	422.6	72.5	350.1	3.3	346.8	340.2
173	357.9	357.9					351.9	4.8	347.1	347.1

N.B. : Seam Separations are floor to floor
N.P. = Not Present; W.O. = Washed Out; F.O. = Faulted Out

650031

4. MINING CONSIDERATIONS

4.1 Colluvium

Extensive surface deposits of dolerite colluvial material blanket the southern side of Mt. Nicholas and parts of the northern side. These deposits conceal an older morphology which in many areas bears little resemblance to that seen today. Consequently the deposits are subject to rapid lateral changes in thickness even where apparently uniform on the surface.

Enclosure 6 represents an attempt to reconstruct the original surface from the accumulated bore data. From it in association with Enclosure 1 can be deduced an estimate of the likely thickness of this material at any location.

The material exhibits considerable variation, ranging from high angle uncemented talus deposits on upper slopes, to the more mature deposits of boulder clay consistency generally found at seam levels. The latter are prone to landsliding and there is recent evidence of this on both sides of Mt. Nicholas. The significance of this in relation to mine entry location is immediately evident.

4.2 Oxidation

Oxidation is unlikely to involve significant degradation of the coal, which being low in reactive macerals (see Section 7.7.1) is not particularly susceptible.

It may, however, be severely deleterious to roof and floor conditions due to the softening of argillaceous bands in the confining strata. Softening of seam stone plies will also occasion material handling and treatment problems.

Oxidation effects can be thus anticipated wherever there is movement of groundwater, and in this context the proximity to the base of colluvial material will probably be more significant than the depth of burial or distance to subcrop. The existing data is, unfortunately, inadequate to test the veracity of these assumptions.

4.3 Interseam

Isopachs of interseam material are represented in Enclosures 10, 11 and 12. The nature of this material and its likely influence on support requirements are fully dealt with in Section 6. The figures referred to indicate that in areas where mining operations are contemplated in separate seams, the interseam is of sufficient thickness for these operations to be generally regarded independently.

Rapid variation in interseam thicknesses indicated in some areas contributes to significant differences in the structure plans for each seam (Enclosures 7, 8 and 9), and may be attributable to differential compaction effects arising from the development of channel structures.

4.4 Intrusives

These have been mapped at the surface and intersected in one borehole, GY43. It is not known whether the L2 seam at this site has been faulted out or ingested, however, the general pattern of other dykes recorded in the area suggests the former as being the more likely alternative. Evidence that the intrusion penetrated higher in the sequence is shown by a bi-modal reflectance and unusually soft coal in the M1 seam, although there is no evidence of silling. The probability that the dyke is emplaced along a fault is the sole basis for its assumed direction as indicated in the reserve plans.

No anomalous seam intersections were associated with a large dyke outcropping between Mt. Nicholas and Huntsmans Cap in boreholes drilled nearby (DOM 13, GY42). The width and extent of this feature at seam level is unknown.

4.5 Faulting

Normal faulting with displacements of the order of five metres and upwards have been indicated by the results of drilling and are shown on the structure plans (Enclosures 7, 8 and 9).

Delineation of smaller faults along the southern flank of the mountain is substantially a function of the drilling density, and these faults must be assumed to exist in other areas where the drilling is more widely spaced.

Significant east-west faults/flexures shown in the areas of GY119 and GY44 on the L2 and M2 seam structure maps respectively, appear to result from rapid interseam thickness variations and are not reflected in the structure maps of other seams. It is, however, possible that faulting may be associated with these at seam level.

4.6 Washouts

The large washout shown on Enclosure 10 and other maps and resultant in the removal of the L seam sequence at GY46 is assumed to be related to large areas of sandstone roof to the L1 seam to the north of this area and in the south-western reserve area. In the former location this sandstone is mildly erosive and appears to work downwards through the L seam sequence southwards, suggesting a point bar type of deposit. The transition back to normal roof south of GY46 is relatively rapid, suggestive of a bend in the channel which would then be concave northwards at this point. Maximum incursion of the channel deposit into the coal horizon would represent the point of greatest stream velocity and thus probable maximum curvature on the bend. Whether the structure is actually a large channel curving to the north east as shown, or a meander plain of different orientation on which a single or several meandering channels may be located, could be indicated by further drilling but will only be ultimately resolved by mining.

A washout in the M1 seam at GY45 is outside the reserve area of the seam and of no apparent consequence to mining other than as an indication that similar undetected structures may exist elsewhere.

The interpretation of a washout referred to in the previous report (Wollff et. al., 1981) as having removed the L1 seam in GY43 is thought to have resulted from a mis-correlation of the L1 seam in that bore with the L2 elsewhere.

4.7 Water and Gas

Water is not expected to pose a serious problem in any future Mt. Nicholas workings except in proximity to the base of colluvial deposits as already discussed. Of particular significance in this aspect would be areas where the base of this material is flattish in proximity to a seam reserve or where it forms a natural channel for the migration of groundwater into lower parts of the deposit. The present investigation has not identified any problem areas in this respect. In most instances the dip of the seams will preclude water pondages in face areas which under current mine planning will generally be driven up dip, i.e. to the north and west.

No gas emissions have been noted from bores or coal cores in the Mt. Nicholas area.

4.8 Stress

Proximity of outcrop on both sides of the potential reserve should have resulted in considerable relief of lateral stress. An increased vertical loading in the area where this relief could be assumed to be minimal (i.e. remote from seam subcrop) should help to ensure a reasonably uniform stress field in the greater part of the reserve area, free of rapid changes which can cause problematic mining conditions. Vertical loading will naturally be severe in subcrop situations where surface influences may compromise roof and floor integrity. Maximum depth of cover at L2 seam level under the Nicholas Range is approximately 470m, corresponding to a probable vertical stress of 11800 kN/m^2.

650035

5. SEAM DEVELOPMENT

5.1 General

As mentioned in Section 2.3, one of the problems encountered in evaluating the Mt. Nicholas resource was in the definition of what would be regarded as a mineable section.

In numerous seam intersections, the roof and floor are not clearly defined, but represented by a series of transitional lithologies with diffuse boundaries frequently exhibiting lateral facies variations. This could result in the definition of stratigraphically non equivalent mining sections in adjacent holes, stratigraphically equivalent sections that did not represent the optimum mining section at both locations, or at worst, sections which were neither equivalent nor optimum.

As a result, seam intersections cored during the 1982 programme were sampled in smaller plies, with particular emphasis being given to the separate sampling of lithologies in proximity to the preferred mineable section boundary. The mining roof or floor was usually taken as the point where the relative density of the "seam" material exceeded 1.80, corresponding to an ash content of approximately 50%. Where this criteria failed to uniquely define a mineable seam section (for instance, in seam sections having heavy stone bands) the appropriate section was selected on the basis of:

(a) Mineability (usually indicated by the thickness of the band or the amount of coal between it and the roof or floor);

(b) The overall effect on seam quality and washability of the total seam which inclusion of the additional material would be likely to have;

(c) Stratigraphic, hence analytical equivalence to mineable sections as defined in surrounding bores.

As a result of this exercise, some minor redefinition of mineable sections in seams of the previous drilling programme took place, this being the basis of any discrepancies occurring between the tabulated mineable seam thicknesses and depths presented in Table 5.1, and those previously promulgated.

The seam isopach plans (Enclosures 13-16) are derived primarily from mineable sections in cored boreholes. As it was not possible to identify mineable sections in non cored boreholes any anomalously thick intersections recorded in these were assumed to represent more than the mineable section. Thinner than expected intersections were honoured unless considered attributable to oxidation.

All of the following discussion and the tabulated and graphical information elsewhere in this report relates to the mineable section as described above.

5.2 Seam Correlation

In the light of new information from all of the slim hole drilling completed in 1982, all of the seam correlations of the previous programme were rechecked. Two main changes emerged:

(a) The Lower seam intersected in GY43 was interpreted at the L1 seam rather than the L2 seam. This change was supported by the analysis of the coal and the overall structure in the area, although the seam graphic section bears similarities to both Lower seams in nearby boreholes. As a result of this change the need for a postulated washout in the L1 seam has been obviated and the L2 seam is presumed to have been faulted out or ingested by a fault or dyke near its projected horizon. The roof of the recovered seam bears little resemblance to that expected of either of the lower seams and does not apparently support either interpretation. The floors of the two seams are similar.

(b) The L1 to L2 seam split was traced northwards from GY26 as a rapidly thinning band which leads to the ultimate coalescence of the two seams in the vicinity of GY24. The roof of the L1 seam in this area is an erosive sandstone, and the remaining L1 coal is sufficiently thin to have been previously incorporated with the L2 seam. The L1 appears to eventually lense out towards its projected north western subcrop. Over much of the northern area it is sufficiently close to the L1 seam to be regarded as part of the mineable section, and this case has been assumed for reserve calculation.

5.3 Lower 2 Seam

5.3.1 Distribution and Thickness

The L2 is the basal coal unit of economic significance and thus defines the perimeter of the total reserves, which are contained within an area of approximately 10km². It occurs over the whole of this area with the exception of the washout occurring at GY46, which also appears to affect the intersections occurring in GY36, 42 and 106 also. The Seam Isopach is included as Enclosure 13.

The seam attains a maximum thickness of just over 2.75m near Huntsmans Cap and thins principally to the south, but to a lesser degree east and west. Areas of minimum seam thickness (approx. 1.3m) correspond with areas of inferior quality, being generally in the area of the southern subcrop but particularly in the south west.

5.3.2 Composition

The L2 seam is comprised essentially of dull coal, generally subdividable into an upper and lower ply by a light coloured marker bed which typically has a high gamma response. The lower ply is generally thinner and has a preponderance of mudstone and shaly coal bands. The coal itself tends to be generally brighter towards the base of the seam.

Graphic seam profiles are included as part of Appendix 3.

5.4 Lower 1 Seam

5.4.1 Distribution and Thickness

This seam develops a mineable thickness only in the southern part of the prospect, thinning steadily north towards the ultimate merger of its remains with the L2 seam in the north east, and its abrupt truncation by a major washout in the vicinity of GY46 to the north west. Its maximum thickness so far recorded was 3.5m in a non cored borehole, GY142. In a nearby cored hole (GY166) the mineable thickness was 2.35m. The maximum thickness recorded in a cored borehole was 2.64m in GY28.

Over much of the area of its thickest development, the L1 seam contains a lower section up to 0.75m thick comprised of inferior coal and numerous bands. The effect of mining above this would be to enhance yield without significantly lessening the tonnage of saleable reserve; the seam height would, however, be considerably lower than desirable for optimum production and too low for projected main development headings which under present plans (Fluor, 1982) are located in this area.

The two seam section alternatives are presented in the seam isopach plan, Enclosure 14. Reserves (Section 8) are calculated on the thicker seam section alternative.

5.4.2 Composition

The L1 seam is similar to the L2 seam in being comprised generally of dull coal. Some of the plies have surprisingly low inherent ash content, however ash levels are generally moderate to high and reflect a generally heavy degree of banding of the seam by shaly coal and mudstone plies.

Where the seam as a whole is of mineable quality, the inferior plies are generally concentrated towards the base, raising the possibility of mining section alternatives as discussed under 5.4.1.

5.5 Middle 2 Seam

5.5.1 Distribution and Thickness

A seam isopach plan for the M2 seam is included as Enclosure 15. The seam is of mineable thickness only in the north east of the area, where it attains a maximum recorded thickness of 2.82m in GY45. The thickening in this area is, however, largely attributable to band development, and is accompanied by a commensurate decline in quality. Recovery of an unexpectedly thin intersection of the seam from GY106 during the recent programme has resulted in a contraction of the apparently available reserve area to the north-east.

5.5.2 Composition

The M2 seam is usually comprised of dull coal with occasional brighter bands but a generally insignificant proportion of shaly coal. It contains one consistent silty marker band 0.4-0.5m below the top of the seam with a thickness of up to 60mm. Otherwise the seam is generally band free, the exceptions being GY45 as previously noted, and a silty band very close to the seam floor in the vicinity of GY36 and GY119.

5.6 Middle 1 Seam

5.6.1 Distribution and Thickness

This seam has a mineable thickness exceeding 3m on the eastern boundary of the area. There is a progressive thinning to the west accompanied by some splitting which renders the seam unmineable in the western and north western areas of the deposit. The area of thickest development on the eastern side corresponds to an area where first workings in the seam were developed as part of the Mt. Nicholas Mine in 1937.

5.6.2 Composition

The M1 seam is similar to the M2 seam in that it contains predominantly dull coal with moderate inherent ash levels and a generally freedom from shaly coal. It does, however, have a considerably heavier band content, particularly in the west of the area where this is related to the development of splits. The heaviest bands are generally in the upper portion of the seam, giving rise to problems associated with mineable seam definition and reserve extension into these areas.

TABLE 5.1: SEAM DEVELOPMENT DATA (PAGE 1)

BORE	M1 SEAM		M2 SEAM		L1 SEAM		L2 SEAM	
	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)
DOM 8	0.25	23.57	0.68	45.82	1.83	125.88	2.59	129.16
DOM 13	0.95	74.79	2.18	87.68	0.46	163.21	2.79	166.05
GY 24	1.69	161.84	1.03	172.13	0.40	246.66	2.58	249.28
26	1.45	161.83	0.91	177.74	1.22	251.51	2.48	255.02
28	1.76	140.68	0.75	164.62	2.64	237.57	2.04	240.87
31					Absent		1.96	24.41
33	1.06	19.05	0.56	46.52	2.49	119.35	1.71	122.53
34			2.14	31.50	Absent		2.05	104.81
35	Colluvium Only							
36	(0.5)	12.80	1.53	28.25	Washed Out		1.57	107.17
37	Bore Abandoned		(See GY 46)					
38	Colluvium Only							
39	0.63	125.65	1.20	139.88	1.72	215.54	1.90	218.12
40	0.49	119.89	0.96	146.14	2.20	219.42	2.11	222.65
41					2.45	101.86	1.55	106.66
42	0.69	124.81	1.14	136.01	Washed Out		2.06	215.87
43	3.29	122.71	0.72	143.54	1.78	214.19	Faulted Out (?)	
44	2.55	62.95	2.74	75.12	0.58	141.80	2.32	144.18
45			2.82	32.15	0.64	106.99	(2.20)	109.64
46			1.36	78.03	Washed Out		Washed Out	
106			0.17	36.72	Washed Out		1.61	110.99
108					0.43	67.88	2.86	70.80

650041

TABLE 5.1: SEAM DEVELOPMENT DATA (PAGE 2)

BORE	M1 SEAM		M2 SEAM		L1 SEAM		L2 SEAM	
	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)
109							OX.	(7.0)
116	No	Seams Insersected						
117					(2.6)	(44.8)	(1.7)	(49.8)
119	0.78	116.26	1.06	129.77	1.44	202.75	2.25	206.46
120					(2.6)	(43.6)	(1.5)	(48.6)
121	No	Seams Intersected						
122	(0.9)	(18.0)						
123	1.78	35.72	1.03	57.35	2.30	127.04	1.37	131.60
124	0.92	4.02						
GY 127	(1.7)	(40.2)						
128	(1.2)	(31.7)	(0.9)	(57.0)				
130			(1.4)	(36.2)				
132	1.95	178.39	(1.0)	200.32	1.62	272.29	1.67	276.01
135	(0.7)	(9.4)						
136			(0.5)	(27.5)				
137					(1.8)	(4.8)	(1.3)	(9.9)
138					(2.3)	(17.3)	(1.3)	(22.2)
141	(0.6)	(6.5)	(1.0)	(29.2)				
142					(3.5)	(57.9)	(1.4)	(61.9)
143					(2.1)	(15.0)	(2.1)	(20.3)
146	Colluvium Only							
151	2.00	73.79	1.05	98.97	2.19	172.97	1.77	176.46

TABLE 5.1: SEAM DEVELOPMENT DATA (PAGE 3)

BORE	M1 SEAM		M2 SEAM		L1 SEAM		L2 SEAM	
	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)	Thickness (m)	Floor Depth (m)
157					2.48	43.42	1.46	48.76
164					OX	5.37	1.40	10.92
166					2.35	28.60	1.77	32.00
167	1.61	38.77						
168	1.17	23.73	0.76	50.04	2.47	122.53	1.56	125.90
173							1.34	10.76

OX - Seam oxidised, no representative section

( )- Value inexact (non cored hole or insufficient core recovery)

6. GEOTECHNICAL ASSESSMENT

6.1 Introduction

The geotechnical aspects of the 1980 to 1981 exploratory drilling were analysed in the mining geology report by Wollff (1981) and were also included in the pre-feasibility study by Dames & Moore (1981). A separate study of underground mining conditions was produced by Barrett, Fuller & Partners (Fuller, 1981). Subsequently a review of roof support requirements was prepared by Barrett, Askew, Fuller & Partners (Fuller, 1982).

This section incorporates the results of the 1982 drilling programme and the previous mining geology report to give a general appraisal of the engineering geology with particular reference to roof and floor conditions of the mineable coal seams. A revised classification of roof support is also presented, derived from the initial concepts of the previous authors. Reference should be made to the geotechnical and mining engineers' reports (Fuller, 1981 & 1982) for a more detailed analysis of roof support design and costs and for a synopsis of underground mining conditions in adjacent mines.

6.2 Site Work

6.2.1 Core Logging

The rock core was logged on site to provide a qualitative assessment of geotechnical properties in addition to the routine lithological strata description. Information noted was an estimate of the rock strength, the rock quality designation (RQD), slaking potential, degree of weathering and the presence of joints.

This information is presented for the roof and floor strata of each mineable seam, defined as encompassing 5m above the roof of the seam and 2m below the floor respectively, in the borehole records in Appendix 1. The coal seam sections refer to the preferred mining sections, which have been selected with respect to coal quality and may not necessarily correlate exactly with the geological boundaries.

The rock strength classification follows the recommendations of the Geological Society of London Engineering Group (Anon, 1970) as follows:-

SCOA Code	Unconfined Compressive Strength MN/m²	Term
R1	<1.25	Very weak
R2	1.25 to 5	Weak
R3	5 to 12.5	Moderately weak
R4	12.5 to 50	Moderately strong
R5	50 to 100	Strong
R6	100 to 200	Very strong
R7	>200	Extremely strong

It should be noted that the rock strength field values given in the borehole records are entirely qualitative, being derived from visual assessment by a geologist, and have not been corrected to allow for field or laboratory test results. For this investigation in particular, comparison of the field assessment with point load test and laboratory unconfined compression test results suggests that the geologist's field value can be one order too low. In particular, a quoted value of R3 for strata below the M2 seam will generally indicate rock that is moderately strong rather than moderately weak.

It should also be noted that the core from boreholes GY24, GY26, GY38 and GY31 was re-logged to obtain the engineering parameters after the core had been stored in core boxes for at least six months. Although the effects of this storage period were taken into account it is possible that field estimates may not be immediately comparable with those of later boreholes logged contemporaneously. The estimated slaking potential in particular is liable to be most affected.

6.2.2 Point Load Testing

Point load tests were carried out on representative samples of the rock core from the full stratigraphic column in boreholes GY108, GY119 and GY123. The results of these tests, together with the results previously obtained from the earlier boreholes, are given in Appendix 2. All the tests were axial and the field values have been corrected to the equivalent 50mm size value, Is(50). (Broch & Franklin, 1972).

The point load strengths of the roof and floor strata for each coal seam are shown at the appropriate depth on the borehole records in Appendix 1.

6.2.3 Sampling

Representative core samples of lithological units were taken throughout the overlying strata with particular emphasis on roof and floor strata. These samples were wrapped in aluminium foil and sealed with wax into sections of PVC pipe to preserve moisture content and structural integrity. These samples were transported to Melbourne for storage and geotechnical testing.

The locations of roof and floor samples are indicated in the appropriate position on the borehole records in Appendix 1.

6.2.4 Piezometers

Standpipe piezometers were installed in boreholes GY157, GY166 and GY167 to allow piezometric water levels to be monitored. These comprised 30mm PVC pipe slotted over the coal interval with a sand filter and sealed with bentonite. The details of the installations are given in Table 6.5 The piezometers were installed at LII seam level in boreholes GY157 and GY166, and at M1 seam level in borehole GY167.

6.3 Laboratory Testing

Selected samples were sent to Melbourne University for geotechnical testing to provide additional information on roof and floor conditions.

Unconfined (uniaxial) compression tests, with determination of tensile strength by the Brazilian disc method were made on four samples. The results of these tests, together with moisture content, dry density, elastic modulus and Poissons ratio are given in Table 6.3A. The results of similar tests on the previous geotechnical samples are given in Table 6.3B.

Slake durability tests were made on 10 selected roof and floor samples, the slake durability indices (the percentage of intact material retained after two slaking cycles) being given in Table 6.4. Duncan Free-swelling coefficients were determined for three of these samples and these results, together with the results of the previous Duncan free-swelling tests are also incorporated in Tabel 6.4.

6.4 Ground Conditions for Lower 2 Seam

6.4.1 Lower 2 Seam Roof Conditions

The main distribution of lithotypes forming the roof strata is shown on Enclosure 22. The L1 seam, where present, overlies the L2 seam with a 'mudstone' separation varying from 0.04m to 4.15m in thickness, the isopachs for this separation being shown on Enclosure 22. Diagrammatic cross-sections showing the north-south variation in the separation are given on Enclosures 17-20. The characteristics of each roof lithotype zone are described below. All references to coal seam thickness in this and succeeding sub-sections mean the preferred mining section, not necessarily the geological thickness.

(a) Silty Mudstone Zone

It can be seen from Enclosure 22 that in general the mudstone separation thins northwards until interrupted by the sandstone washout facies, re-emerging to the north between the washout and the subcrop. It also appears to thin towards the south-east. The main axis of the thickest part follows a north-east-south-west trend through borehole GY157.

Examination of the lithological logs for the cored boreholes indicates that in detail, the bulk of the thickening of the separation is due to silts and fine sands. The sequence includes laterally gradational silty mudstones, siltstones and fine grained sandstones. At attempt has been made on Enclosures 17 to

19 to delineate the silty mudstone - fine grained sandstone type from the more clayey mudstone type within the seam separation. Correlation is, however, difficult as they tend to be superficially similar and lacking in distinguishing features and were not necessarily identified in the field as a separate engineering group.

In engineering terms silty mudstones differ from mudstones in having a tendency to be more massive, less prone to slickensiding and intraformational shearing and to have a higher overall strength. The mean point load strength for all strata within the separation is 1.23 MN/m^2 whereas the mean value for mudstone only is 0.69 MN/m^2. In addition, rockbolt holes in silty mudstones should be less liable to smearing of the sides and should give a more satisfactory bond with resin anchorages.

It is thus suggested that although the anchor zone for L2 seam roof bolts in the southern and south-eastern parts of the site could lie within a 'mudstone' sequence, an acceptable anchorage will nevertheless be found therein due to the presence of the silty mudstone facies. This zone is marked on Enclosure 22 as the silty mudstone zone.

Notwithstanding this, the immediate roof rock will still be largely mudstone, as can be seen on the cross-sections, with a maximum thickness of up to about 1.6m. The roof support design will therefore be required to support a relatively thin, probably thinly bedded, immediate mudstone roof with a suitable anchorage provided by the overlying silty mudstone type of inter-seam strata.

(b) <u>Coal L1 Over Mudstone Zone</u>

This zone constitutes the thinner part of the mudstone separation where the inter-seam parting varies in thickness from about 0.1m to 1.6m and occurs mainly over the central part of the site. There is a local thickening about an axis trending through boreholes GY119 and GY132.

As mentioned above, the mean point load strength for the mudstone fraction of the parting is 0.69 MN/m^2 which corresponds to moderately strong rock. The mean value for tests on sandstone within the first 3m of roof strata is 0.71 MN/m^2. This confirms the previously held view, (Fuller, 1981, page 24), that there is little significant variation in intact rock strength between mudstone and sandstone. The former, however, is laminated which will allow bedding partings to develop under stress release conditions. This in turn will lead to a reduction in the effective thickness of the rock 'beams' spanning the opening to the extent that they will cease to be self-supporting. In addition, there is likely to be other defects such as joints and shears which will add to roof instability.

It is known that the mudstones are sometimes liable to rapid slaking but this is considered unlikely to be a problem in the main mudstone roof zone, except possibly where significant groundwater inflows occur. Slake durability tests on mudstone roof samples from boreholes GY132 and GY151 showed indices of 98.8% and 95.2% respectively. Slaking could be of serious concern near the subcrop around borehole GY166 where weathered strata occur within the roof. Slake durability indices for roof strata from borehole GY166 showed indices of 93.0% and 65.7% respectively for siltstone and mudstone samples.

It is envisaged that, except for the subcrop area and areas of groundwater ingress, where increased facial support may be required, the general roof support requirement will be to create beams of at least one metre thickness in mudstone strata with the overlying L1 seam providing a suitable rock bolt anchorage.

For the coal L1 over mudstone area north of the 0.3m isopach, the general comments given above apply. It is assumed, however, that north of this isopach it is likely that both seams will be taken, in which case reference should be made to the L1 seam roof conditions in sub-section 6.5.1.

(c) <u>Sandstone Zone</u>

The sandstone represents a major washout the cuts through the L1 seam and into the L2 seam, reaching its maximum effect in the area of borehole GY46 where the L2 seam itself has been completely eroded. The sections on Enclosures 17 to 20 show diagrammatically the relationship between the strata and the transgressive sandstone.

In engineering terms the sandstone is moderately strong and massive with few or only partly developed bedding planes. Outcrop mapping carried out during the previous investigation, (Wollff 1981, page 27) revealed very widely spaced near vertical joints, with the major joint set striking north-south and a secondary orthogonal set striking east-west.

Previous studies by Fuller (1981, page 24) suggest that a 6m span sandstone beam would need to have a minimum thickness of 0.43m to avoid tensile cracking. As the proposed system would be for a shorter span of 4.5m to 5.0m, and as the sandstone is typically very thickly bedded, it is concluded that the sandstone roof should be largely self-supporting. There may, however, be instances where intersecting joints produce large unstable blocks in the roof. These will need to be pinned in place with dowels or bolts or propped. Rockbolts in this situation need not be tensioned but will probably have to be inclined to intersect the discontinuities.

Other potential mining hazards are small basal erosion gullies or channels within the washout, described in the Duncan Mine at Fingal (Kind, 1980). These could protrude into the coal by up to one metre and could have a width of 10m to 20m. They are generally oriented parallel to the long axis of the washout which in this case means an east-west alignment.

The sandstone has a sharp erosional contact with the underlying strata which is likely to facilitate strata separation. This could be particularly troublesome where a thin mudstone or coal is to be left in the roof immediately beneath the sandstone, as can be expected to occur around the margins or the washout. In this situation the mudstone is likely to peel away from the sandstone as roof deformation takes place. Extensive facial support such as bolted mesh will be required to prevent this or alternatively the unstable mudstone could be removed during mining to leave a clean sandstone roof.

Given a condition of sound sandstone roof, stresses will be transferred into the walls which act as buttresses. This should not present a problem for the coal which is considered to be stronger than the sandstone. If, however, there is a thin mudstone layer present immediately below the sandstone, these stresses are likely to induce squeezing and overbreak within the mudstone when mining in the peripheral areas of the washout. Additional support such as props may be required in these areas.

(d) Sandstone Over Coal L1 Zone

This zone may be academic in that all or part of the L1 seam will be taken with the L2 seam. In the event of total extraction the roof will be massive sandstone as described above. If the proposed mining horizon leaves a thin layer of coal or carbonaceous mudstone in the roof it could lead to a difficult support condition as the coaly layers will probably readily delaminate. As previously discussed it may be preferable to mine the whole of the coaly strata to leave a clean sandstone roof.

(e) Sandstone Over Mudstone Zone

This is the small area between the washout and the L2 seam northern subcrop. The base of the washout increases in elevation to the north as indicated by the mudstone isopachs with a maximum recorded mudstone thickness of 1.14m in borehole GY31. No information is available on the thickness beyond that or on whether the L1 seam re-appears, in part at least, in the subcrop area.

Roof conditions are likely to be worse in this zone than elsewhere due to the factors of bed separation at or below the base of the sandstone as described above and the higher degree of weathering nearer the subcrop.

The lithology log for borehole GY31 shows moderately strong to strong unweathered carbonaceous mudstone with a potential for rapid slaking in the immediate roof, followed by very weak to weak weathered mudstone. In borehole GY34 the strata is moderately weak unweathered mudstone, the single point load test result being 0.13 MN/m^2 (equivalent to weak to moderately weak rock). The Duncan free-swelling coefficient at 3.10% is higher than average which indicates the possibility of slaking and friable rock conditions.

The overlying sandstone should provide a suitable bearing stratum for resin-anchored rockbolts but the roof support design should allow for bolted mesh in places with mudstone as immediate roof. Where the cover is less and the sandstone itself weathered and susceptible to slaking, such as at borehole GY31, consideration may have to be given to the anchorage section of rockbolts to achieve the required carrying capacity.

6.4.2 Lower 2 Seam Floor Conditions

The lithological logs indicate variable floor strata including mudstone, silty mudstone and siltstone. In general the silty mudstone and siltstone will give better floor conditions as they are stronger, more competent and less prone to slaking than mudstone. East of a line through boreholes GY41, GY132, and GY42 reasonable floor conditions can thus be expected. Slake durability tests on floor strata from boreholes GY132 and GY166 gave results of 99.4% and 81.9% respectively.

On the west wide of the site the floor tends to be mudstone with a thickness varying up to 1.72m. Slake durability tests in this area range from 85.5% in borehole GY151 to 73.6% in borehole GY106. The Duncan free-swelling indices tend to be high, all results being greater than 4%.

In general it can be said that floors will tend to swell to a certain extent but, as the strata are moderately weak to moderately strong, and in the absence of any evidence to suggest adverse stress conditions, it is unlikely that heave will be a significant problem. This assumes that pillar design is adequate to safeguard against mining induced stress concentrations that could be detrimental to floor stability. Also the propensity to slake does not appear particularly high so that this factor can probably be discounted for typically dry run of mine conditions.

On the other hand, slaking and softening could be locally severe if water is allowed to stand on mudstone floors, which in turn, will result in unacceptable rutting in areas subject to heavy traffic. Should water be present in the mining areas, precuations should be taken to avoid ponding on roadways.

6.5 Ground Conditions For Lower 1 Seam

6.5.1 Lower 1 Seam Roof Conditions

The main distribution of lithotypes forming the roof strata is shown on Enclosure 23. Diagrammatic north-south sections showing the variation in roof strata are given in Enclosures 17 to 20. The characteristics of each roof lithotype zone are described below.

(a) Mudstone Zone

This zone covers the cental and eastern parts of the site. Tentative isopachs for the thickness of the mudstone layer forming the roof are shown on Enclosure 23. The mudstone appears to thicken about an east-west axis through borehole GY132 with a secondary axis of thickening running northwest-southeast through borehole GY119, directly superimposed on a similar feature noted in the mudstone parting above the L2 seam (Enclosure 22).

The mean value for the point load strength of the mudstone roof is 0.51 MN/m^2 indicating moderately strong rock. The intact rock strength is, however, of secondary importance to the rock defects; as discussed in subsection 6.4.1(b) above, the mudstone tends to be laminated and jointed which limits its capability to form competent roof beams.

The mudstone may also be suceptible to slaking although in the fairly constant climatic conditions of an underground mine and in the absence of groundwater inflows, roof slaking should not be a major problem. There is a suggestion from boreholes GY45 and GY132 that a significant part of the mudstone sequence is silty mudstone, which is less likely to slake than mudstone. A slake durability test on silty mudstone from borehole GY45 gave a value of 96.3% which is virtually non slaking.

It is concluded that regular roof support is needed to maintain structural integrity and prevent delamination of the roof in the mudstone zone with a provision for increased support such as mesh in areas of highly fractured rock or groundwater ingress. The mudstone is overlain by strong sandstone which will provide a suitable medium for anchoring rockbolts.

(b) Sandstone Zone

The sandstone zone is more extensive for the L1 seam than the L2 seam, being present not only over the whole of the northern part but also along the west side as far south as borehole GY168.

In general terms the sandstone is moderately strong, massive and essentially self-supporting as discussed in subsection 6.4.1(c) above. In boreholes GY24 and GY28, however, the immediate roof is a more laminated sandstone, overlain in the case of borehole GY24 by highly fractured siltstone. Additional support will be required in these areas.

The peripheral areas to the sandstone zone are also potentially troublesome where the sandstone transgresses or interleaves with mudstone to give a mudstone veneer in the roof. Extensive facial support or cleaning off is likely to be necessary for this condition.

(c) Mudstone Over Thin Sandstone Zone

At the southern end of the sandstone zone, there is a narrow zone where the massive sandstone interleaves with the mudstone to give a thin sandstone in the immediate roof overlain by mudstone. This zone extends from borehole GY33 through GY41 to GY123. Borehole GY41 is excluded from this zone on Enclosure 23 because the proposed mining horizon leaves 0.25m of carbonaceous mudstone beneath the sandstone.

The roof sandstone increases in thickness from west to east, from 0.16m in borehole GY33 to 1.03m in borehole GY123. It is generally too thin, allowing for defects, to be considered as a self-supporting beam and thus will require rockbolting or other support to prevent delamination and to maintain sufficient thickness of competent strata. The sandstone should, however, produce a clean roof which should eliminate the need for close facial support such as mesh, and possibly W straps, depending on the frequency of jointing.

The rockbolt anchor zone will be in varying rock types including mudstone or carbonaceous mudstone in the case of borehole GY33 and GY123; it would be prudent to check the soundness of this anchor zone by testing the capacity of rockbolts.

(d) Carbonaceous Mudstone Zone

This narrow zone along the subcrop has been differentiated from the main mudstone zone because of the variable, weak to moderately weak roof rocks which include mudstone, carbonaceous mudstone and coal.

Borehole GY41 has 0.25m of carbonaceous mudstone and coal below 0.49m of sandstone and siltstone, which presents the difficulty of supporting thin, laminated roof strata liable to peel away from the sandstone. A similar immediate roof condition occurs in borehole GY157 with 0.16m of fissile carbonaceous mudstone overlain by siltstones and fine grained sandstones, which although laminated, tend to have few bedding partings. In both cases the carbonaceous mudstone will probably require extensive facial support if not removed.

In the south-east corner at borehole GY166 the coal rider is 0.58m thick and is overlain by 1.10m of carbonaceous mudstone. Bolt anchorage tests should be carried out in this area to test the bonding and shear resistance of the carbonaceous mudstone. Consideration may have to be given to increased bond or anchor lengths. If the coal rider is mined there will still be a substantial support requirement for a carbonaceous mudstone roof but the anchor zone would be in massive sandstone albeit weathered.

6.5.2 Lower 1 Seam Floor Conditions

Apart from the area in the north-east where the L1 seam virtually rests directly on the L2 seam and can be discounted as a separate mining horizon, the floor to the L1 seam is typically a mudstone. This ranges up to 1.26m thick along the western side of the site where the total thickness of the inter-seam separation comprises mudstone. Elsewhere the mudstone grades downwards into silty mudstone as discussed in the L2 seam roof conditions in subsection 6.4.1(a).

The best floor conditions for the L1 seam are probably in the area encompassed by borehole GY123, GY168, GY151 and GY132. Within this area the clayey mudstone is less than 0.11m thick except for borehole GY43 where a thickness of 0.46m of mainly carbonaceous sheared mudstone was recorded. The potentially worse floor conditions in borehole GY43 may however, be a localised feature.

In the subcrop area around borehole GY166 the laboratory tests indicate the strata to be weaker and more susceptible to slaking. (The slake durability value was 65.7% with an unconfined compressive strength of 6.3 MN/m^2). The situation appears to improve northwards at boreholes GY41 and GY123 where the mudstone element decreases in thickness and becomes less susceptible to slaking.

The general comments on mudstone floors given for the L2 seam in subsection 6.4.2 are also applicable to the L1 seam, except that in the case of the latter the extent of mudstone floor is much greater, which increases the probability of localised areas of difficult conditions.

6.6 Ground Conditions For Middle 2 Seam

6.6.1 Middle 2 Seam Roof Conditions

In general terms the roof conditions for the M2 seam will be worse than for the L1 and L2 seams as the rock is weaker and more variable. The mean value of all point load strengths for the first 3m of roof is 0.54 MN/m^2 but the median value is about 0.35 MN/m^2, which is equivalent to moderately weak rock and is significantly less than the L1 and L2 seam values. Moreover, some 39% of the results were less than 0.2 MN/m^2 which indicates a greater likelihood of weak rock occurring in the roof.

In terms of lithologies, there are major variations over the total seam area, the most significant geological factor being the presence of massive medium grained sandstone in the southern half of the site. This reaches a thickness in excess of 20m in places where it makes up the bulk of the interburden between the M1 and M2 seams.

The northern limit of the massive sandstone facies is shown on Enclosure 24. It forms the immediate roof in two areas, west of a line through boreholes DOM 8 and GY33 and in a central area between boreholes GY26 and GY132. In the intervening area the massive sandstone is separated from the coal by mudstone. Isopachs for this mudstone have not been presented on Enclosure 24 since it is outside the zone of mineable thickness. It does, however, reach a maximum thickness of about 2.0m, local thickening being due to interleaved beds of fine grained sandstone and siltstone and, in the case of borehole GY40, a 0.53m thick coal seam 1.54m above the roof of the M2 seam.

The massive sandstone is rated R3, that is moderately weak, in the lithological logs and the mean point load strength from all tests in this stratum is 1.01 MN/m^2, about the middle of the moderately strong range. In detail, however, the point load strengths fall into two distinct sets; the mean of the tests in boreholes GY33 and GY123 is

2.15 MN/m² and the mean of the tests in boreholes GY40 and GY43 is 0.21 MN/m². The former reflects moderately strong to strong rock, the latter, moderately weak rock. In both cases a satisfactory anchorage for rockbolts should obtain, although the ultimate carrying capacity of individual bolts will vary widely.

The M2 seam is viable in the massive sandstone lithofacies area only in the eastern extremity, as indicated on Enclosure 24 in the sandstone over mudstone zone around borehole GY45. In this area the massive sandstone is separated from the M2 seam by mudstones which increase in thickness towards the east as shown by the isopachs. In borehole GY45 in particular, the immediate roof is 0.49m of moderately weak laminated carbonaceous mudstone, slickensided in places. Not only will substantial support be required to safeguard the immediate roof but increased rockbolt lengths up to 2.4m long may also have to be used to reach the massive sandstone unless satisfactory bonding and carrying capacity can be demonstrated for anchorage within mudstone.

North of the massive sandstone line there is a variety of roof strata including fine grained sandstone in borehole GY26 that probably represents the lensing out of the massive sandstone. The general sequence in the southern part of the siltstone over mudstone zone is a thin coal over siltstone beds of variable thickness, which in turn, overlie mudstones that form the immediate roof. The siltstone would provide the rockbolt anchorage and the isopachs give the thickness of mudstone between the base of the siltstone and the top of the coal. This represents a somewhat academic situation since the M2 seam is, for the most part, less than 1.5m thick.

In the localised area around borehole GY34, the thin coal has disappeared and the lithological log indicates 1.22m of silty fine grained sandstone over 2.03m of mudstone. Laboratory tests on a similar mudstone roof sample from borehole GY36, which is in an adjacent non viable part of the siltstone over mudstone zone, showed an unconfined compressive strength of 3.4 MN/m² with a Duncan free-swelling coefficient of 3.46%. Mining conditions could be difficult because of weak and potentially rapid slaking mudstone in the immediate roof and because the overlying siltstone, which is the obvious rockbolt anchorage, is 2.0m or more above the coal seam. The siltstone is, moreover, only rated as weak rock and may have a reduced carrying capacity on the standard rockbolt bond length, particularly near the subcrop where weathering will be more pronounced.

The remaining area in which the bulk of the mineable coal occurs is the thin coal over mudstone zone. The thin coal band varies from 0.36m to 0.92m in thickness and is overlain by mudstone. The strata between the thin coal and the M2 seam are typically mudstones, silty in places. The immediate roof strata appears to be invariably carbonaceous mudstone.

Roof support conditions in this zone are likely to prove difficult. In the first instance the immediate roof will probably be laminated and slickensided thus requiring extensive support. In the second instance the thin coal, although presumed to be an acceptable anchorage point, occurs at a varying distance above the roof, which means varying the rockbolt lengths accordingly. The isopachs on Enclosure 24 indicate the height of the base of the thin coal above the roof of the M2 seam. This suggests that, ideally, 1.8m rockbolts would be used in the north-east half of the 1.0m to 1.5m isopach plan interval and 1.5m rockbolts in the south-west half. Rockbolts in excess of 1.8m would be required to the north-east of the 1.5m isopach. Alternatively a standard length of say, 1.8m, could be used throughout at closer centres provided a satisfactory anchorage can be established.

6.6.2 Middle 2 Seam Floor Conditions

The floor is invariably a thin carbonaceous mudstone over mudstone, silty mudstone, siltstone or fine grained sandstone, except in occasional places near the southern subcrop where the coal rests directly on siltstone or sandstone. In the central part of the viable area around boreholes DOM 13 and GY44 the carbonaceous mudstone/mudstone element is about 0.8m thick, thinning to the south-west to less than 0.3m in boreholes GY42 and GY46.

In general, this mudstone floor stratum for the mineable coal area is rated R3 in strength (moderately weak), does not display slaking potential but does sometimes contain slickensided joints. It should not present any undue mining problems. Nevertheless, there will still be a certain amount of swelling and softening which will be exacerbated if water is allowed to stand on the floors. Areas of heavy traffic should therefore be kept free from ponding. The underlying silty mudstone, siltstone or sandstone type of rock is not considered to present any major problems of instability, swelling or slaking.

Floor conditions improve to the south-east in borehole GY45 where the mudstone floor, albeit sheared, is only 0.10m thick. However, there is a deterioration in conditions to the north-east around borehole GY34 where the mudstone sequence reaches 1.42m in thickness. The upper 0.55m of mudstone forming the immediate floor is potentially slaking and contains several slickensided 45° joints. The rock strength is R2 (weak), confirmed by point load tests in this case, which indicates generally weaker strata in this area than elsewhere. In addition there is a thin very weak mudstone band 0.55m below the floor which could induce heave.

6.7 Ground Conditions For Middle 1 Seam

6.7.1 Middle 1 Seam Roof Conditions

Enclosure 25 shows the conditions with respect to the roof strata lithologies. Massive medium grained sandstone swings across the area in an arc through boreholes GY44, GY24, GY132, GY28 and GY33 and also encompasses the whole of the south-east corner. It forms the immediate roof in the southern part centred around borehole GY43. To the west and north-west the sandstone is separated from the coal by a mudstone sequence, the isopachs for which are depicted on Enclosure 25. Diagrammatic cross sections showing the roof lithologies are shown on Enclosure 21.

The immediate roof sequence typically contains carbonaceous mudstone which is invariably laminated, weak and susceptible to slaking. Extensive support, including mesh, will be needed to maintain safe working conditions wherever mudstone is to be left in the roof.

For a rockbolt support system the massive sandstone is the obvious anchor medium and it is apparent from Enclosure 25 that it is not more than one metre above the roof over the area of mineable coal. The

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sandstone is rated as either weak or moderately weak in the borehole records and this is borne out by the point load test results. In particular, the median value of point load strength is about 0.16 MN/m^2 which falls roughly on the junction of the weak and moderately weak categories. This indicates the sandstone is significantly weaker than the other massive sandstones in the succession that form the anchoring medium for lower coal seams.

In terms of a standard rockbolt supported roof design a greater density of support will be required for the M1 seam as the load capacity of the bolts will be less and there is a possibility of an occasional failure to generate significant bond strength in individual rockbolts. It would be prudent, in any case, to carry out tests on rockbolt anchorages to prove the validity of the chosen system. Alternatively, fully grouted rockbolts could be used to eliminate individual anchorage failures although a greater number of rockbolts will be required to achieve the same supporting effect.

Close to the subcrop, roof conditions will deteriorate such that rockbolting may not provide adequate support. Borehole GY36, although outside the viable coal area, indicates what can be expected with shallow bedrock cover near the northern subcrop. The massive sandstone is highly weathered and very weak and the intervening 0.66m of carbonaceous mudstone is also highly weathered and reduced to the consistency of stiff clay. The mudstone will swell upon exposure and rapidly spall from the roof. Extensive support will obviously be required. Tensioned rockbolts would help to preserve the integrity of the mudstone with W straps to spread the load at the face. Several resin cartridges would probably be necessary to generate sufficient carrying capacity which may require rockbolt lengths in excess of 2m. Fully grouted rockbolts would have little effect in creating a beam effect in the mudstone and eventually the full dead load of the mudstone would be transferred via the straps and mesh to the section bonded in sandstone. In both cases it is doubtful whether the tensile strength of the highly weathered sandstone is high enough to allow the formation of a self-supporting beam within a practical thickness. Alternative methods of passive support such as props, bars and lagging may have to be considered for peripheral areas of the M1 seam.

6.7.2 Middle 1 Seam Floor Conditions

Mudstone, including carbonaceous varieties, forms the floor everywhere except for the area around borehole GY43 where the coal rests directly on siltstone. The mudstones are typically moderately weak but are weak in places, notably around borehole GY123 where there is 0.24m of very weak mudstone over weak siltstone and sandstone. There are also indications that the floor strata are occasionally potentially rapid slaking, for example in boreholes GY28, GY33 and GY132. In boreholes GY24 and GY42 the floor is made up of the deteriorated lower coal section of M1 seam comprising very thinly to thinly bedded coals, carbonaceous mudstones and mudstones.

In general the floor conditions will be similar to, but somewhat worse than for the M2 seam, as the mudstones appear weaker and will be more susceptible to swelling and softening. Areas of heavy traffic should be kept free of water to reduce the risk of softening and rutting. The underfloor strata are more variable and thick bands of more competent siltstone and sandstone are less common. Heave does not appear likely to be a significant problem but cannot be ruled out for local areas of very weak floor.

6.8 Groundwater

The previous series of exploration boreholes, described in the 1981 SCOA Mining Geology Report (Wollff, 1981, p.41) incurred no significant ingress of groundwater whilst being drilled. No additional information was gained from the deeper holes of the 1982 exploration programme. As it is known that the nearby Mount Nicholas and Cornwall Mines were relatively dry (Fuller, 1981), the previous conclusion that the proposed mine should also, for the main part, be an essentially dry operation, remains valid.

Some additional information has been obtained, however, from the areas of shallow coal beneath the colluvial cover at the southern outcrop. Table 6.6 gives the standing water levels recorded in open holes and piezometers in this area. It would appear that there is a water table attributable to the L2 seam in the area south of the M2 seam subcrop. The water level readings indicate a slight gradient in the same direction as the dip of the coal seam, boreholes GY157 and GY166 showing standing water levels approximately 7.5m and 16m respectively above the base of the L2 seam. As the open hole readings in nearby boreholes are similar to the piezometric levels, it is probable that this water arises from within the L1 and L2 seams.

Boreholes GY157 and GY166 are located on ridges of high rockhead separated by a deep buried valley with an approximately north-south axis through borehole GY41. This valley feature will undoubtedly be a locus of subterranean water flows through the colluvium and may thus provide a means of feeding groundwater into the coal subcrops in the valley sides. The overlying strata may also tend to be water bearing particularly where it is thin and weathered.

Further to the north, just beyond the M1 and M2 seam subcrops, water level readings in the open boreholes tended to show a water table at about the level of the M1 seam. Some of the boreholes were dry and borehole GY127 showed an anomalous level 28.46m above the base of the M1 seam, possibly associated with a fault; borehole GY168 was the only deep hole in the area and the standing water level therein was 50.87m below the M1 seam.

The colluvium in this area is relatively thin, being less than 2.5m thick from boreholes GY141 to GY168, increasing to 12.4m in thickness in borehole GY130. In the latter the standing water level coincided approximately with the base of the colluvium. The general indication is that the groundwater derives from the coal seams rather than the colluvium and that there is likely to be local, probably perched, water tables in the individual coal seams. However, the colluvium, although thin and typically of low mass permeability, is nevertheless likely to have high local groundwater flows through piping during and subsequent to heavy precipitation. This could in turn lead to recharge of the coal seam aquifers in the subcrop zone.

The general conclusion with respect to groundwater inflow is that the coal seams in the subcrop zone may act as aquifers of limited storage capacity but liable to seasonal fluctuation. The quantity of groundwater encountered is not likely to be significant, except possibly in fault zones. The main detrimental effect of even limited groundwater ingress, however, will be the softening and slaking of roof and floor strata. This, although not necessarily portentous of major instability, is likely to cause troublesome mining conditions requiring close roof support and drainage measures.

6.9 Roof Support Classification

An initial classification of roof conditions was made by Dames & More (1981) in their pre-feasibility study as follows:-

Roof Conditions	Lithology	Comment
Good	sandstone and/or thickly bedded siltstone	not likely to require extensive support
Moderate	mudstone with suitable sandstone or coal anchor above	controllable when employing adequate support
Poor	mudstone with no suitable anchor above	not easily controllable even when employing extensive support

Roof areas were delineated accordingly for each mineable seam; however areas of poor roof were apparently discounted as being unmineable, resulting in considerable reserve diminution.

Roof support systems were subsequently reviewed by Fuller (1982) who, on the basis of the geological information at the time, derived three different roof lithotypes, namely sandstone/siltstone, massive mudstone and laminated mudstone. A classification of four roof support methods, which included the aforementioned "poor roof condition", was also given. This classification comprised:-

1. No support required
2. Roof bolting
3. Roof bolting and timber props
4. Roof bolting, timber props and RSJ's

The roof lithotypes and support classes were not, however, integrated, and only support class 3 was quoted in the comprehensive table of roof support requirements for various heading types and widths in the mineable seams. Massive mudstone was not identified but thought to possibly occur in the roof of the L2 seam where it would require a similar support to that for sandstone. For 5.5m wide main headings, for example, the Fuller system comprised four variations on the two lithotypes.

Rock Type	Support
Sandstone (L2 seam)	3 bolts per W strap at 3.0m centres plus props
Laminated mudstone (L2 seam)	3 bolts per W strap at 2.0m centres plus props
Laminated mudstone (M1 seam)	4 bolts per W strap at 1.5m centres plus props
Laminated mudstone (M2 seam)	5 bolts per W strap at 1.5m centres plus props

With the availability of additional lithological and geotechnical information from the 1982 boreholes, a greater variation in roof conditions has been recognised for each mineable seam. These have been discussed in the preceding subsections in terms of lithotype zones. In order to provide practical guidelines for these zones a roof support classification has been evolved based on the traditional method of resin grouted vertical rockbolts with W straps.

This classification is presented in Table 6.1. It is based essentially on the lithology and engineering characteristics of the roof strata and does not take account of variation resulting from structural irregularities such as faults or localised joint concentrations. The state of stress in the ground, which is not in any case considered to be a significant problem, has likewise been excluded. A discussion of the pre-mining stress was given by Fuller (1981).

The roof support type has been included in the classification for comparative purposes to indicate the degree to which the amount of support is governed by the support class, and should not necessarily be taken literally as a recommendation. In particular it applies to main headings of about 5.0m width; support requirement will have to be increased at intersections and may possibly be relaxed in the panels and splits.

The application of the classification to each of the mineable seams is summarized in Table 6.2, assuming a standard bolt length of 1.8m and resin grouted anchorages. Bolt lengths could be reduced to 1.5m in places as may be deduced from examination of the mudstone isopachs on the roof plans, however, bolt lengths of less than 1.8m would not be suitable for Class 4 conditions.

In mudstone settings care will have to be taken to ensure that anchorages are carefully cleaned out, preferably with air, to achieve a satisfactory bond. All rockbolts should be stressed with a nominal load of 40 kN. As an alternative approach in zones of poor anchorage, consideration could be given to fully grouted bolts which do not require post tensioning, although this would require a greater number per unit area.

The roof support classification has been generated to highlight areas of potentially difficult conditions, and to assist in planning and costing by providing some idea of support requirements. It remains, however, an overall and generalized view and the details of support requirement will ultimately depend on conditions experienced during mining. Such experience will determine the need for any modification or refinement of the proposed support system to suit local conditions.

TABLE 6.1

CLASSIFICATION OF ROOF SUPPORT

	SUPPORT CLASS	ROCK TYPE	COMMENTS	SUPPORT TYPE*
1.	Minimal support	massive sandstone	routine support of roof not required but some treatment may be needed in discrete locations.	individual rockbolts as and when required
2.	Routine support	moderately strong bedded sandstone, siltstone and silty mudstone	material sufficiently competent to form bolted roof beams	3 bolts plus W straps at 1.5m centres
3.	Routine facial support	incompetent mudstone or carbonaceous mudstone liable to spalling in immediate roof; sound anchorage above	routine support to form bolted roof beams in upper part with provision for facial restraint of immediate, unsound rock.	3 bolts plus W straps at 1.2m centres plus mesh
4.	Extensive support	weak to moderately weak mudstone, no suitable anchorage.	higher support density required, necessary to test anchorage, may require increased anchor and bond lengths. Alternative is fully grouted bolts. In worst case may require passive support in conjunction with or in place of rockbolts.	5 bolts plus W straps at 1.2m centres plus mesh. Or, fully grouted bolts and W straps at 0.9m centres plus mesh.

* typical example for 5m heading

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TABLE 6.2

SUMMARY OF ROOF SUPPORT CONDITIONS

SEAM	CLASS*	AREA
L2 (Enc. 22)	1	sandstone zone
	2	silty mudstone zone
		coal L1 over mudstone zone - greater than 0.5m isopach
	3	sandstone over coal L1 zone
		sandstone over mudstone zone
		silty mudstone zone - 100m strip along subcrop
		coal L1 over mudstone zone - southeast corner around GY166, 100m strip along southern flank of sandstone zone, areas less than 0.5m isopach
L1 (Enc. 23)	1	sandstone zone - except Class 2 areas
	2	mudstone over thin sandstone zone
		sandstone zone - peripheral strip on eastern flank through GY28 and GY128, area around GY24
		mudstone zone - greater than 0.5m isopach
	3	carbonaceous mudstone zone
		mudstone zone - narrow strip between 0.5m isopach and sandstone zone
M2 (Encl. 24)	3	massive sandstone over mudstone zone - less than 1.5m isopach
		siltstone over mudstone zone - less than 1.5m isopach
		thin coal over mudstone zone - narrow strip between 1.3m and 1.5m isopachs
	4	massive sandstone over mudstone zone - greater than 1.5m isopach
		siltstone over mudstone zone - greater than 1.5m isopach
		thin coal over mudstone zone - except Class 3 areas
M1 (Enc. 25)	2	sandstone zone
	3	mudstone zone - less than 1.5m isopach
	4	mudstone zone - greater than 1.5m isopach, 200m strip along northern subcrop

* as per Table 6.1

TABLE 6.3A

ROCK STRENGTH TEST RESULTS

Borehole	Sample No.	Sample Depth	Uniaxial Compressive Strength (MN/m^2)	Indirect Tensile Strength (MN/m^2)	Moisture Content (%)	Dry Density (Mg/m^3)	Youngs Modulus Static E (GN/m^2)	Poissons Ratio
GY132	T54	273.84 - 274.02	29.2	2.03	4.0	2.44	8.01	0.22
GY151	T24	174.00 - 174.16	33.8	2.47	4.2	2.43	5.50	0.31
GY166	T19	28.97 - 29.19	6.3	0.78	5.8	2.31	0.39	0.41
	T20	29.42 - 29.60	19.9	1.58	4.4	2.39	1.48	0.53

TABLE 6.3B

ROCK STRENGTH TEST RESULTS

Borehole	Sample No.	Sample Depth	Uniaxial Compressive Strength (MN/m^2)	Indirect Tensile Strength (MN/m^2)	Bulk Density (Mg/m^3)	Youngs Modulus Static E (GN/m^2)	Poissons Ratio	Cohesion (MN/m^2)	Angle of Shearing Resistance (degrees)
GY33	T13	115.89 - 116.01	21.6		2.39	4.64	0.43		
	T19	120.88 - 121.01	29.0		1.28	2.59	0.32		
	T22	123.30 - 123.42		5.3					
	T23	123.45 - 123.56	14.2		2.51	3.07	0.25		
GY34	T03	102.22 - 102.39	20.5	2.6	2.45	1.68	0.42		
	T04	102.39 - 102.51		2.0					
	T06	103.17 - 103.30	41.0		1.39	3.63	0.32		
	T08	104.94 - 105.09						1.8	27
GY36	T07	26.47 - 26.59	3.4		2.32	0.09	0.55		
	T11	26.85 - 26.98	38.0		1.36	6.36	0.31		
	T08	28.25 - 28.39		0.14					
	T15	104.82 - 104.99	15.6	1.3	2.36	2.13	0.34		
	T19	105.44 - 105.60	17.3	3.2	2.47	2.79	0.35		
	T20	107.28 - 107.42			2.38			4.0	25
	T21	107.42 - 107.58		(2.1 (1.6					

TABLE 6.3B (Cont'd)

ROCK STRENGTH TEST RESULTS

Borehole	Sample No.	Sample Depth	Uniaxial Compressive Strength (MN/m^2)	Indirect Tensile Strength (MN/m^2)	Bulk Density (Mg/m^3)	Youngs Modulus Static E (GN/m^2)	Poissons Ratio	Cohesion (MN/m^2)	Angle of Shearing Resistance (degrees)
GY39	T13	215.54 - 215.57	29.8		2.40	5.88	0.47		
GY40	T18	219.83 - 219.90	33.2		2.37	3.95	0.29		
	T19	220.20 - 220.28	41.0		2.21	5.88	0.16		
GY41	T01	98.31 - 98.47	27.3		2.42	3.65	0.34		
	T02	98.47 - 98.57		2.7					
	T03	98.91 - 99.03	41.7		2.42	8.95	0.31		
	T04	99.03 - 99.16		2.6					
	T05	101.86 - 101.95		1.4					
	T06	101.95 - 102.07						2.7?	30
GY45	T12	105.99 - 106.16		2.03					

TABLE 6.4

ROCK DURABILITY TEST RESULTS

Borehole	Sample No.	Sample Depth	Slake Durability Index (%)	Duncan Free-swelling Coefficient (%)
GY33	T12	115.78 - 115.88		2.18
GY34	T04	102.39 - 102.51		3.10
	T07	104.81 - 104.85		4.20
GY36	T07	26.47 - 26.59		3.46
	T20	107.28 - 107.42		4.75
GY41	T02	98.47 - 98.57		0.61
	T04	99.03 - 99.16		1.77
	T05	101.86 - 101.95		4.22
GY45	T12	105.99 - 106.16	96.3	
GY106	T3/4*	110.98 - 111.07 111.24 - 111.35	73.6	
GY132	T54	273.84 - 274.02	98.8	
	T55	276.18 - 276.34	99.4	1.65
GY151	T24	174.00 - 174.16	95.2	
	T27	176.60 - 176.68	85.5	
GY166	T19	28.97 - 29.19	65.7	
	T20	29.42 - 29.60	93.0	
	T22	32.03 - 32.20	81.9	1.00
	T23	32.20 - 32.41	86.2	
GY167	T40	40.60 - 40.85	45.2	2.90

*combined sample

TABLE 6.5

DETAILS OF PIEZOMETER INSTALLATIONS

Borehole No.	Depths					
	Cement Grout	Bentonite Seal	Sand Filter	Slotted Section	Cement Grout	Sand Backfill
GY157	37.00 - 40.00	40.00 - 41.00	41.00 - 49.00	47.30 - 49.00	49.00 - 54.40	-
GY166	25.00 - 29.00	29.00 - 30.00	30.00 - 32.00	30.00 - 32.00	32.00 - 36.45	-
GY167	33.00 - 36.00	36.00 - 37.00	37.00 - 38.70	37.00 - 38.70	38.70 - 39.50	39.50 - 45.40

TCD:RP9:D:5

TABLE 6.6

STANDING WATER LEVELS

Borehole	Depth of Hole	Depth to Water Level: August 1982*	9/9/82	28/10/82	5/11/82	1/12/82	Remarks
109	18.30	6.00					Blocked at 5.60
116	25.00	11.60	10.45				Blocked at 12.00
117	54.50	40.82				41.35	
120	54.00	42.90				43.07	
121	18.30	4.40					Blocked at 4.90
122	30.30	22.15					
127	48.50	11.76					
130	42.00	12.50					
137	16.00	7.58				8.00	
138	31.00	20.40				20.60	
142	61.70	45.22	45.57	45.40			
146	17.40		Dry				Blocked at 5.50
157	49.00	41.23		41.45		41.47	Piezometer in L2
166	32.00	15.88	16.40	16.10			Piezometer in L2
167	38.70	35.60			35.29		Piezometer in M1

* values recorded during drilling period, no specific dates.

TCD:RP9:D:6

7. COAL QUALITY

7.1 Introduction

The assessment of quality parameters of Mt. Nicholas coal has proceeded from a rather tentative determination of raw ash and fundamental float/sink testing of the initial samples, to the stage where there is now considerable accumulated information derived from more comprehensive float/sink testing, the investigation of more detailed seam analytical profiles and alternate mining sections, and the comprehensive evaluation of the combustion characteristics of the likely washed product. This will shortly be supplemented by washability testing which will provide design criteria for the eventual preparation plant.

The rapidly increasing volume of this data makes a detailed treatise on all aspects of seam quality a considerable undertaking which is considered to be outside the scope of the present report. It is anticipated that the reader will gain a general understanding of the subject matter from the following summary and that the tables and maps will provide infill data as needed to fulfill specific requirements.

Wherever possible the published analyses of washed coal from the Duncan Colliery (JCB/QCB, 1978) are presented to provide a comparison with coal currently in use in Tasmania. The colliery is located on the southern side of the Fingal Valley (see Figure 2). Correlation of the coal with the seams at Mt. Nicholas is uncertain.

7.2 Sampling and Analytical Specification

7.2.1 1981 Analytical Programme

Analyses were carried out in 1981 on split core sample from the existing Department of Mines holes DOM 8 and DOM 13, and on whole core samples from the eleven Shell holes drilled in 1981 which intersected coal. A few additional analyses were made in 1981 on the whole core samples from the four Shell holes which were drilled and analysed in 1980. All Shell cores had a nominal diameter of 45.1mm, with the exception of one deflected redrill (GY45A) of nominal diameter 36.5mm. All of the split Department of Mines cores were of either 36.5mm or 34.4mm nominal diameter.

It was recognised that most, if not all of the coal would require washing to be acceptable in the market place, and analyses were consequently carried out in the following two stages:

(a) Raw Coal Analysis

- Size to -25mm
- Float/sink 25mm x 0 at Relative Density (RD) 1.60, 1.70 and 1.80
- Determine apparent RD of raw coal.

(b) Workable Section Composite Floats

- Prepare sample of cumulative floats at RD 1.70 from nominated plies.
- Determine:

  Proximate Analysis
  Specific Energy
  Total Sulphur
  Arsenic
  Chlorine
  Phosphorus
  Hardgrove Grindability Index
  Ash Fusion Temperatures (Reducing Atmosphere)
  Ash Analysis

7.2.2 1982 Analytical Programme

When the 1981 results were assessed it became evident that there were considerable ply variations in inherent ash within the seams, and that analyses of smaller plies than had previously been sampled could give greater control on the selection of appropriate mineable sections and allow more representative comparisons of equivalent sections.

Accordingly, there was some shift of emphasis towards ply sampling and the definition of raw coal quality criteria generally during 1982. The resultant reduction in overall sample quantities available did not permit detailed evaluation of washed coal quality criteria, however existing data of this nature exhibits a general consistency with no identifiable areas of concern. Further washed coal quality and petrographic information will be provided by the results of the large diameter drilling programme.

A primary sample sizing of -5.6mm was adopted for the slim core samples to enable the splitting of the small ply samples for proximate analysis and subsequent reconstitution into mineable sections as so defined for float/sink testing. This sizing is significantly larger than recommended by AS1676 (1975) for division of ply samples of the size anticipated, and slightly larger than recommended by AS1661 (1979) in respect of the anticipated size of the full seam sample reconstituted for float/sink testing. Some compromise was, however, necessary between these ideals and the necessity to obtain reproducible results which could be readily reduced to a basis of comparison with previous and later differently sized samples.

Seam intersections were sub-sampled over intervals corresponding to visibly distinguishable lithological units, particular attention being paid to accurate division in the area of the probable roof and floor of the mineable section.

Subsequent analysis was carried out in two stages as follows:-

(a) Raw Coal Analysis:

Determine Mass
Size to -5.6mm (minimum fines)
Divide

On Individual Plies
Determine True RD
Ash
Proximate Analysis
(if ash <35%)
Determine mineable section
(exclude roof and floor plies
having RD > 1.80) and
calculate composite.

Reconstitute plies comprising
mineable section in exact pro-
portions from given thickness
and determined RD.
Float/sink 5.6mm x 0 at
RD 1.40,1.60,1.70,1.80,2.00

(b) Washed Coal Analysis:

If cumulative yield of cumulative floats nearest 20% > 60%, prepare equivalent sample and determine

True RD
Proximate Analysis
Total Sulphur
Specific Energy

7.3 Raw Coal Quality

7.3.1 General

The coal seams of the Mt. Nicholas deposit all consist of predominantly dull coal with varying proportions of dull shaly coal and stone bands. A pronounced lateral variation in the relative proportions of these basic components is evident in all four seams for which reserves have been calculated (Lower 2, Lower 1, Middle 2 and Middle 1). Seams of clean dull coal deteriorate laterally as a result of the progressive admixture of high ash coal or extraneous stone bands. The boundaries of the reserves of each of the four seams are partly defined by the quality variation with respect to ash which accompanies these coal facies changes.

In addition to the lateral variation in coal seam characteristics, there is a stratigraphic differentiation apparent, at least within the areas of defined reserves. The Lower 2 seam consists of dull coal with a relatively high proportion of dull shaly coal and a modest proportion of stone bands. The Lower 1 seam is essentially similar except that it contains a higher proportion of stone bands. Unlike the Lower seams, the Middle seams contain a relatively low proportion of dull shaly coal. The Middle 2 seam owes its attractive ash levels to the relative absence of both dull shaly coal and stone bands. The Middle 1 seam is also relatively, although not so markedly, low in dull shaly coal, but it does contain a high proportion of stone bands.

Raw coal analyses of Mt. Nicholas coals have generally been restricted to ash or proximate analyses and Relative Density determination. These parameters are tabulated for all sampled seam intersections in Tables 7.10 to 7.13.

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Individual ply analyses for seams sampled during the 1982 drilling programme are represented graphically in Appendix 3.

Enclosure and Table numbers adjacent to further headings under Section 7.3 refer to Raw Coal Ash Maps and Raw Coal Quality Tables respectively.

7.3.2 Lower 2 Seam - Enclosure 26; Table 7.10

The main feature of the Raw Ash plan is a noticeable deterioration in seam quality towards the south of the deposit, where the seam is thinnest. There is apparently random variation throughout the rest of the area, generally within the 28-32% a.d. ash range.

7.3.3 Lower 1 Seam - Enclosure 27; Table 7.11

This is a generally heavily banded and very high ash seam, as shown by the raw ash levels represented in Enclosure 27. The only areas offering mineable quality coal appear to be in the south and south west, and an isolated pocket of undefined extent indicated by the analysis of GY119. The seam is, however, only 1.44m thick at the latter location.

7.3.4 Middle 2 Seam - Enclosure 28; Table 7.12

The M2 seam is distinguished among Mt. Nicholas coals by its low raw ash content in the area of mineable thickness. Raw ash contents are less than 25% a.d. over the greater part of this area, the only exception being represented by the development of an unusually thick, heavily banded seam at GY45.

7.3.5 Middle 1 Seam - Enclosure 29; Table 7.13

The M1 seam isoash plan is drawn on the basis of fairly widely scattered data points in relation to the position and extent of the reserve. There is, however, an evident and expected deterioration of the raw coal to the north west, commensurate with the thinning and splitting in this seam already referred to (Section 5.6).

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7.4 Physical Coal Characteristics

7.4.1 Relative Density

The relationship between the relative density (RD) and the air dried ash content of full mineable seam samples of raw coal is indicated by Figure 4.

Prior to the 1982 programme, RD's were determined on an apparent basis (i.e. liquid displacement), resulting in a reasonably wide distribution of data points and consequently poor definition of the relationships. Linear regression of the 28 data pairs with ash less than 40% gives the relationship:

$$\text{Apparent RD} = (0.012 \times \text{Ash}) + 1.18$$

The correlation coefficient is 0.87. The apparent RD, whilst obviously being the most appropriate RD in respect of the calculation of reserve tonnages, is obviously sensitive to variations in sample condition and not particularly predictable.

For the duration of the 1982 programme, RD's were determined on a true basis (i.e. gas displacement) so that only the matter content of the sample is subject to determination, with the influence of all but the smaller pore volumes removed. This method on linear regression of the 23 data pairs with less than 40% ash gave the relationship:

$$\text{True RD} = (0.010 \times \text{Ash}) + 1.30$$

The fit of the line to the data was much improved, with a correlation coefficient of 0.97.

From consideration of the two relationships given the apparent RD is some 96-97% of the true RD in the raw ash range containing the bulk of the reserves. For the purpose of reserve calculation, a flat difference of 0.04 was assumed.

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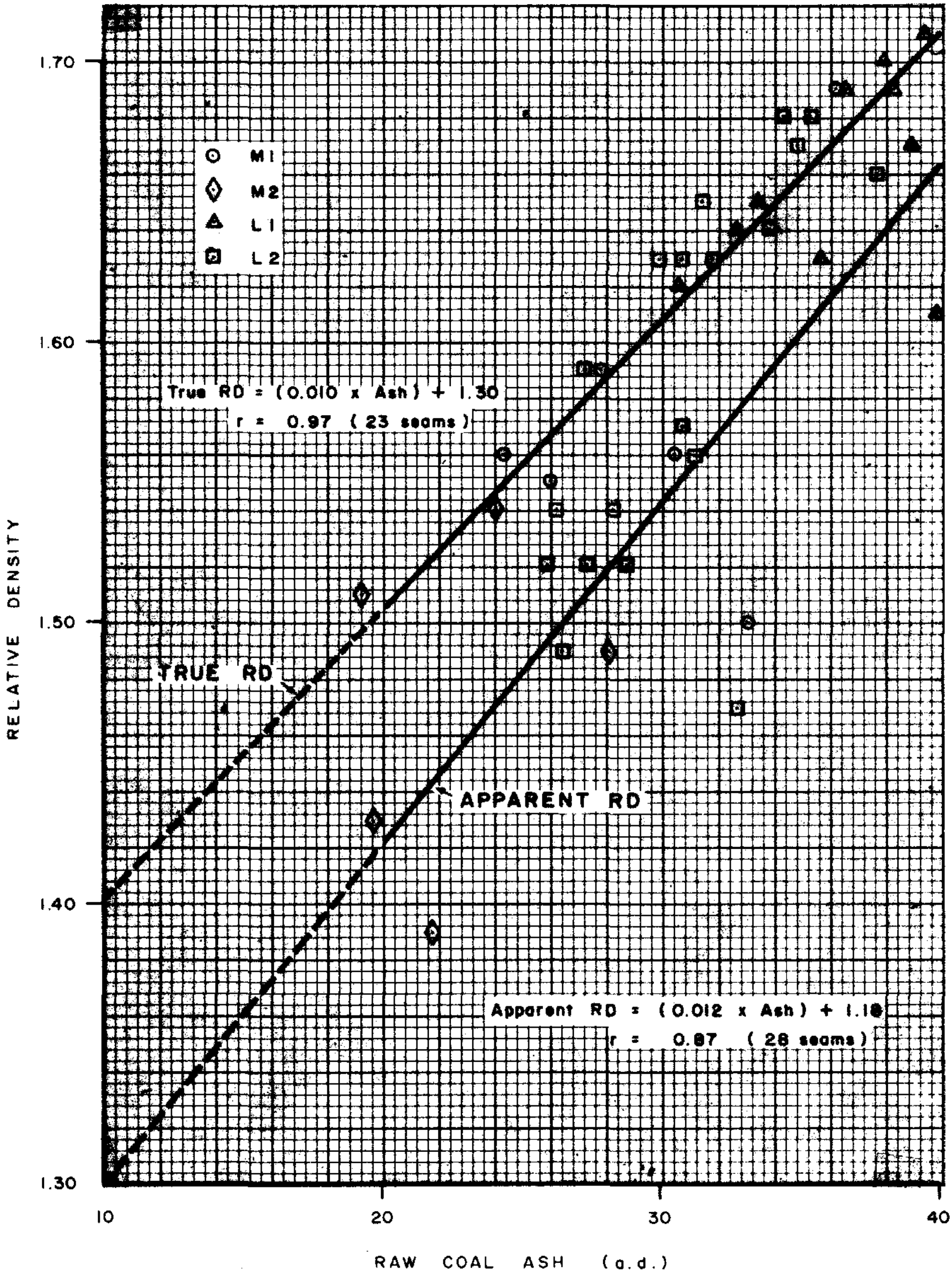


RELATIVE DENSITY/ASH RELATIONSHIP

5 cm

Author: Coal Division	Date: November 1982	Fig. 4
Report No: CEPR 31/82	Drawing No: 2719	

7.4.2 Hardness and Abrasion

No Hardgrove Grindability Indices (HGI) for raw Mt. Nicholas coal core have been obtained due to the difficulty of extracting a sufficient sized sample from a slim core. This shortcoming will be overcome by the current large diameter drilling programme. Two have been derived from subcrop samples which are, however, unrepresentative of the general seam quality (GY124 and GY173).

The HGI's for washed coal tabulated below (Table 7.1) show, with one exception, a very limited variation, and a consistency with Duncan Colliery coal. The one anomalous value is from the Middle 1 intersection in GY43 which is almost certainly heat affected. Disregarding this one high value, the Mt. Nicholas coals all have Hardgrove Grindabilities around the mid 50's. Due to the low proportion of friable macerals, these values are relatively low for the rank of the coal. They are, however, within the usual design range of most grinding equipment.

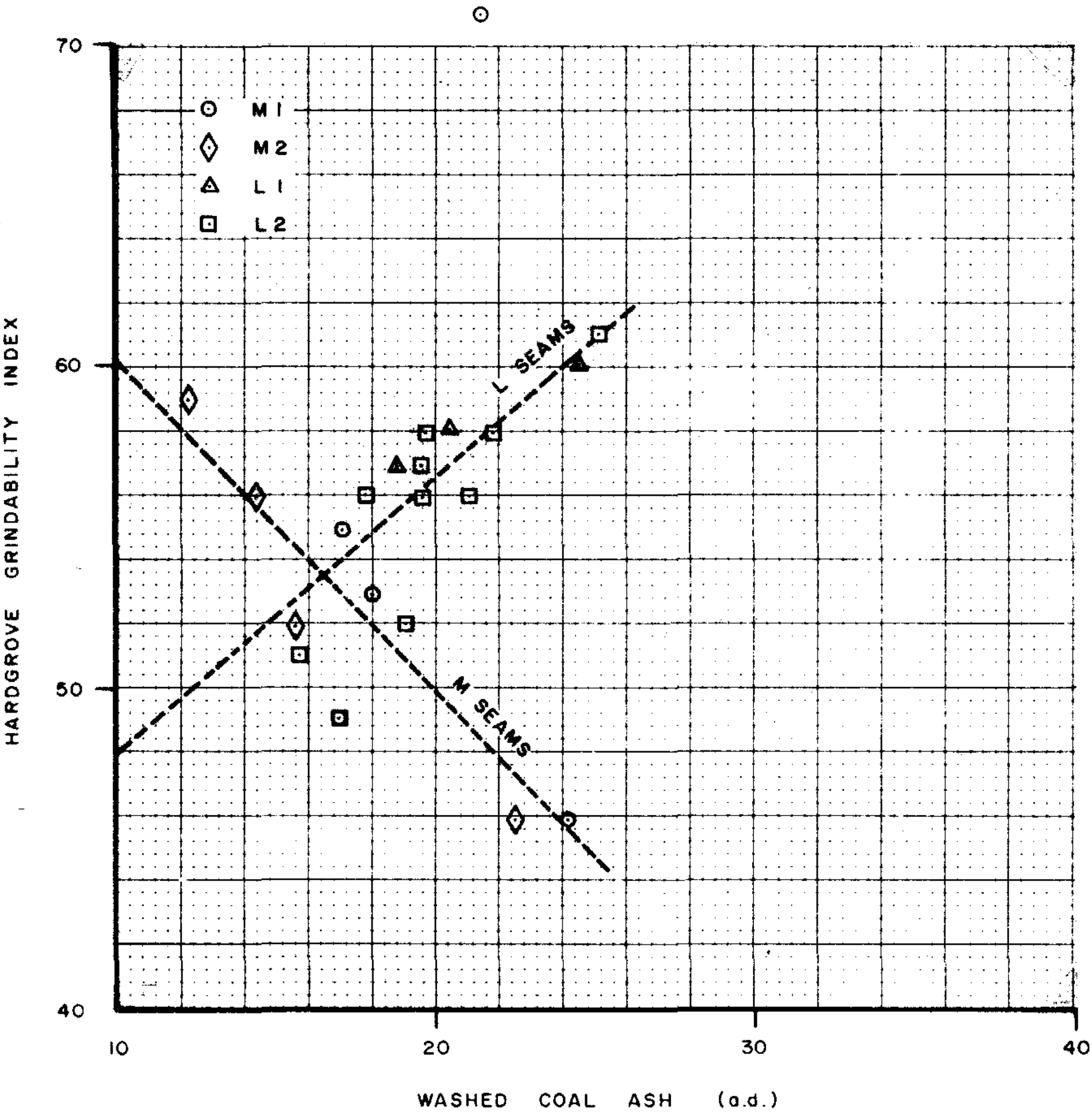
TABLE 7.1
HARDGROVE GRINDABILITY
WASHED COAL

SEAM	MEAN	RANGE
MIDDLE 1	54.75	46 - 71
MIDDLE 2	55.67	52 - 59
LOWER 1	57.50	57 - 58
LOWER 2	56.00	51 - 61
DUNCAN	56.00	

Attempted correlation of HGI with coal ash met with curious results. Figure 5 shows two distinctly different relationships, viz:

(a) The anticipated relationship of decreasing HGI with increasing ash content, principally relating to the Middle seam samples, and

(b) A reverse relationship of increasing HGI with increasing ash content, principally relating to the Lower seam samples.



HARDGROVE GRINDABILITY/ASH RELATIONSHIP

5 cm

Author: Coal Division	Date: November 1982	Fig. 5
Report No: CEPR 31/82	Drawing No: 2727	

It may be concluded that the observed relationship under (a) is caused by a predominantly carbonate ash mineralogy which reinforces the coal structure, whereas that under (b) represents an ash mineralogy based on clays which reduce the strength of the coal. This hypothesis is reinforced to some extent by the ash analyses of the various seams (Table 7.6) which show emphasis on aluminium-silicate mineralogy (clays) in the Lower seams and iron, calcium and magnesium (carbonate) mineralogy in the Middle seams. A very high HGI resulted from a very high ash sample of the L2 seam containing clay weathering products in GY173. Regression does not produce a significantly good fit to either set of data to suggest that the relationships may be predictable.

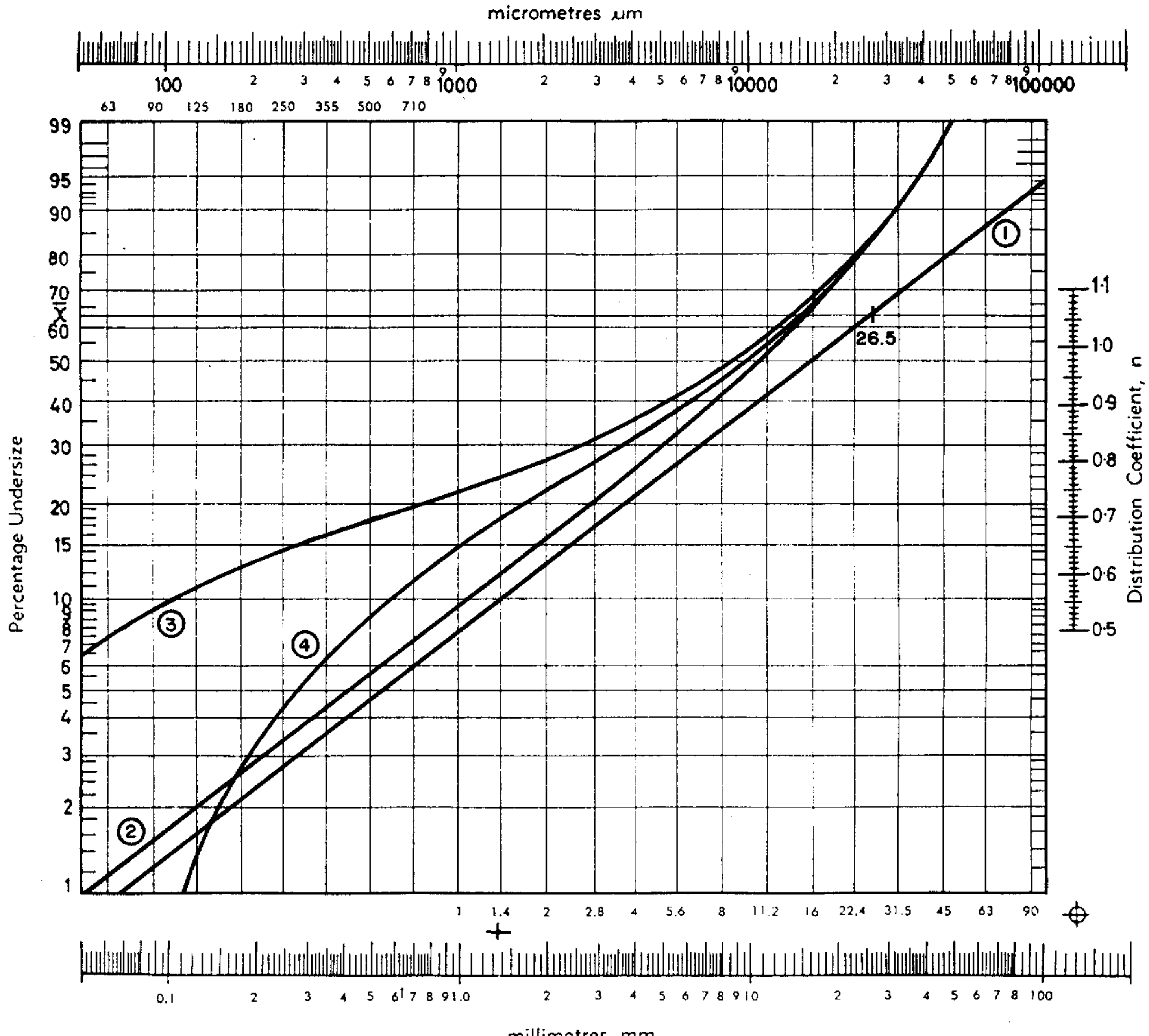
Only one Abrasion Index has so far been determined, for a sample of the M1 seam at the site of GY123. The determined value of 17.5 represents a Y.G.P. Index of 70 and thus a coal of low abrasiveness.

7.4.3 Sizing

A number of assumptions have had to be made in relation to the anticipated sizing of Mt. Nicholas coal at various stages of its mining, preparation and beneficiation.

The Rosin-Rammler distribution indicated for run of mine coal by Figure 6 curve (1) is based on a coal with Hardgrove Grindability Index of 55 with a nominal top sizing of 200mm, resulting in a distribution coefficient n of 0.75 and absolute size constant $\bar{x}$ of 26.5mm. The distribution shown closely resembles that of a steaming coal of similar rank and hardness from the western coalfield of New South Wales.

Some reduction of the run of mine coal prior to plant input will be necessary. If the material is first screened at the anticipated breaker or crusher sizing, a substantial proportion of the coal will bypass this step and the reduction will not involve significant comminution in the lower size ranges. Figure 6 curve (2) indicates the anticipated sizing of the coal after dry screening at 50mm and crushing of the oversize to -50mm. At this partition the oversize subject to crushing comprises some 20% of the run of mine material.



① Anticipated ROM Sizing
(99% - 200 mm)

② Anticipated Plant Feed Sizing
(99% - 50 mm)

③ Anticipated Process Sizing

④ Anticipated Total Product Sizing

HGI = 55, n = 0.75

ROSIN - RAMMLER SIZING

5 cm

Author : Coal Division	Date : November 1982	Fig. 6
Report No: CEPR 31/82	Drawing No: 2730	

Prediction of the behaviour of the coal when subjected to wet processes within the washery is more hazardous, and will constitute the main source of errors arising from the prediction of proportions of material in various size streams within the washery, or the ultimate sizing of the product coal.

Wet pretreatment of larger subcrop and bore samples from Mt. Nicholas has indicated an apparent degree of dependence of slimes liberation on the ash content of the coal, suggesting that the level of dilution will have a pronounced influence on slimes generation within the washery. The increase in -125μm material between the dry tumbled and wet tumbled stages of pretreatment (assuming 2% of -125μm after dry tumbling) has ranged from 5.5% for the L seams at the site of GY123 (which are of inferior coal but are relatively free of bands) up to 30% for a heavily banded and inferior L2 seam at GY173. It is envisaged that the results of the larger diameter drilling will clarify this relationship, however, it is presently assumed that material derived from the mineable seam will contribute an additional 8% of -125μm material at the washery.

Further assumptions have been made in order to derive the size distribution of the water degraded material within the washery, and to predict the quantities of material reporting to particular treatment circuits:

(a) Treatment sizes will be:

-125μm	=	Slimes
125μm - 1mm	=	Fines
1mm - 50mm	=	Smalls and coarse coal/reject

(b) Dilution material and coal will have similar dry size distributions.

(c) Slimes (-125μm) will be derived as follows:-

2.0% from feed size distribution (see Fig. 6 curve (2)).

1.0% from dilution (6% of ROM - see Reserves Section)

This assumes that 80% of dilution is water degradable and that 20% of this component is actually degraded.

7.5% from mineable seam (94% of ROM) as indicated by the wet pretreatment results.

10.5% Total Slimes.

(d) Fines (125μm - 1mm) will be derived as follows:-

7.0% from feed size distribution (see Figure 6 curve (2)).

4.0% from comminution of larger size fractions as indicated by the wet pretreatment results.

-0.5% lost through comminution to slimes.
10.5% Total Fines

(e) Smalls and coarse coal/reject are derived by difference to represent 79% of the total plant throughput.

The resultant size distribution of all material within the plant is indicated by Figure 6 curve (3).

The ultimate product sizing is arrived at by adjusting the previous distribution to remove the -125μm component and reducing the influence of the +1mm fraction by a factor derived from its plant yield (80% overall assumed). This presupposes that that all slimes will be reject and all fines will be product. In fact this is not the case as all classification processes are not 100% efficient, and some further comminution will occur during drying, stockpiling and loading. The effects of these, however, are not anticipated to be severe, and a likely size distribution of the <u>total</u> product is indicated by Figure 6 curve (4), which assumes that 10% of the product is halved in size during these stages. Note that curve (4) is presented to indicate the likely proportions of marketable material in designated size ranges, rather than the overall size distribution of any particular product.

Table 7.2 summarises the size distributions of the coal at various stages as predicted on the basis of the foregoing assumptions, and is the basis of the curves shown in Figure 6.

TABLE 7.2

ANTICIPATED SIZE DISTRIBUTIONS

Size Range	Fractional Percentages					
	Run of Mine	Feed	Process	Run of Plant Product	Run of Plant Reject	End Product
-125 m	1.6	2.0	10.5	-	39.9	1.4
125 - 1mm	6.2	7.0	10.5	14.2	-	13.4
1 - 2	5.2	6.5	6.1	6.6	4.6	6.8
2 - 4	8.0	9.5	7.8	8.5	5.9	9.2
4 - 8	12.0	16.0	13.9	15.1	10.6	15.8
8 - 16	17.0	24.0	20.8	22.6	15.8	22.7
16 - 32	19.0	25.0	21.7	23.6	16.5	22.2
32 - 50	11.0	10.0	8.7	9.4	6.7	8.5
50 +	20.0	-	-	-	-	-

7.5 Washability

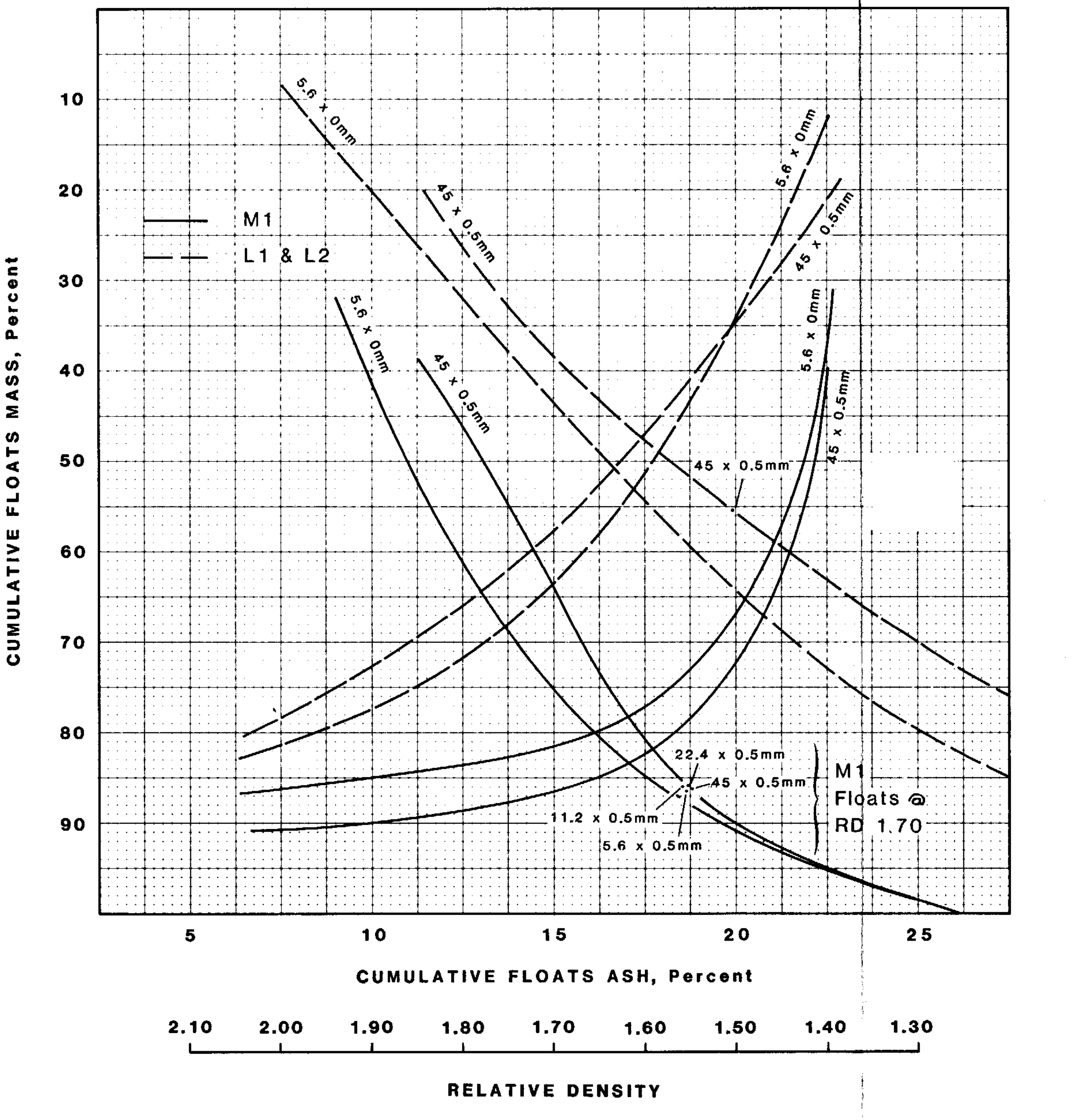
7.5.1 General

Washability characteristics at this stage are largely inferred data derived from simple float/sink testing carried out on samples which would normally be regarded as being too small or too finely sized for this purpose. They are, however, complemented by a few results of more realistically sized samples which indicate a reasonably close relationship between the two. The approximation approaches equivalence at high yield levels corresponding to RD's of separation in the 1.80 to 2.00 range, where most efficient washing of the coals appears to be feasible. (Refer Figure 7).

650089

EFFECT OF SIZING ON WASHABILITY

(GY 123)



Author: Coal Division	Date November 1982	Fig. 7
Report No: CEPR 31/82	Drawing No: 2801	

For the purpose of this evaluation it has therefore been assumed that theoretical yield of ROM material may be directly equated to determined laboratory yields of the slim core samples. This has been assumed only in respect of those size fractions which it is anticipated will be ultimately washed (See Reserves Section 8).

As the bulk of the mineable reserves are contained within the L2 seam, basic product criteria have been adopted which are most relevant to this seam. A target washed product ash of 22½% has been adopted, as this equates to the limit to which the seam is apparently readily washable. The derivation and adoption of this criteria is discussed under Section 8.7, as are the sensitivities of yield and hence reserve estimates to variations from this ash level. The theoretical yield corresponding to a 22½% ash washed product were obtained by plotting cumulative floats curves for all of the available mineable seam data and deducing the applicable yield by interpolation. In some cases float/sink testing had been carried out on sections other than the adopted mineable section and in these instances a yield for the omitted or erroneously included seam section was estimated. The yield for the desired section was then calculated by adding or subtracting as appropriate the mass-weighted calculated yield to or from the mass-weighted determined yield. This was accomplished by reference to the sample thickness and RD for the arithmetic weights, and by determining a relationship between the raw ash and the theoretical yield for 22½% ash, to enable an estimate of the yield to be made when only the ash was available.

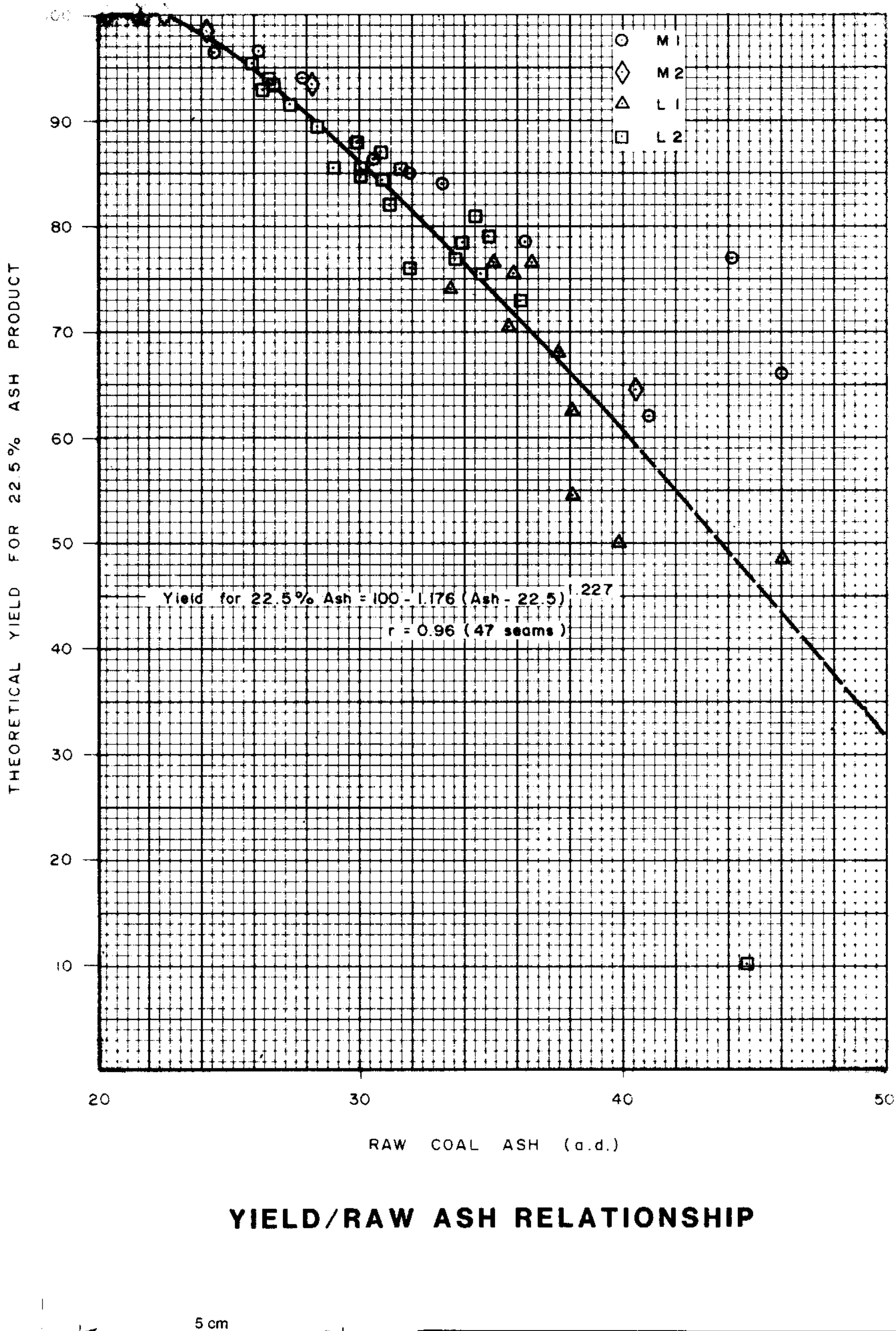
This relationship is shown in Figure 8 and may be expressed as:

$$\text{Yield for 22.5\% Ash} = 100 - 1.176\ (\text{Raw Ash} - 22.5)^{1.227}$$

The determined accuracy of the relationship appears acceptable for raw ash levels not exceeding 36-37%. Generally, yields for the M1 seam are slightly higher than would be estimated from the equation given.

In general terms the difference in composition between the Middle and Lower seams as recorded in Section 5 is predictably reflected in their washability characteristics.

650091



YIELD/RAW ASH RELATIONSHIP

Author: Coal Division	Date: November 1982	Fig. 8
Report No: CEPR 31/82	Drawing No: 2802	

The relatively continuous density gradation of material within the lower seams is manifested in the large proportions of near gravity material at desirable RD cut points corresponding to the preferred ash level of the product. This will result in significant proportions of misplaced material if beneficiation is by a relatively inefficient process such as jigging. Any bias towards misplacing of floats or sinks will result in a departure from the indicated ash level.

The Middle seams are comprised of generally cleaner coal with shalier bands, creating sufficient RD contrast to facilitate higher efficiency separation with considerably less near gravity material at the chosen RD cut point, and thus reducing the opportunity for material to be misplaced.

Theoretical washability as discussed below and presented in Figures 9 to 12 does not include provision for anticipated dilution of run of mine coal by roof and floor material.

7.5.2 Lower 2 Seam

Washability curves representative of a typical sample of L2 seam from within the reserve area are indicated in Figure 9.

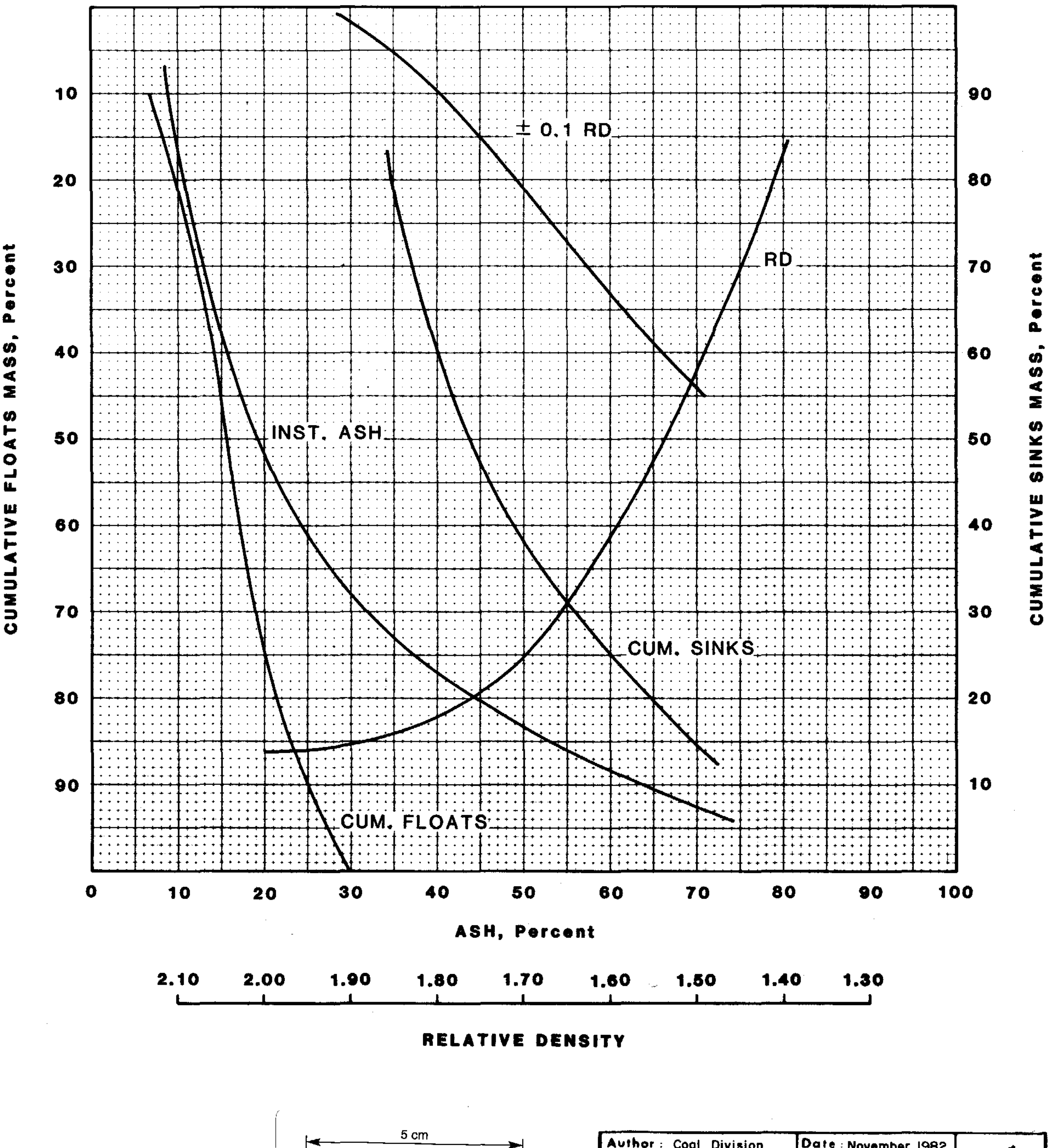
All of the curves shown are indicative of a seam containing significant proportions of material over a wide range of RD's which may therefore be difficult to efficiently separate, particularly at RD's corresponding to ash levels below 20%.

The ±0.1 RD material exceeds 10% of the total sample for RD's less than 1.80 and product ash levels less than 22%. There is no plateauing of the ±0.1 RD curve and only moderate levelling of the RD curve above RD 1.70.

At a separation RD of 1.80 the product yield is 82% and product ash is 22%. The ash content of a particle in equilibrium with the solution is 48%, which is in close agreement with the relationship derived in Section 7.4.1 between ash and RD. The sinks ash content is 66.5%.

L2 SEAM TYPICAL WASHABILITY

(GY 132)



Author: Coal Division	Date: November 1982	Fig. 9
Report No: CEPR 31/82	Drawing No: 2713	

650094

Indicated yield distribution for a 22½% ash washed coal is illustrated by Enclosure 30.

7.5.3 Lower 1 Seam

Figure 10 indicates the washability characteristic of an L1 seam sample located in the south of the reserve area.

All indications point to a coal of problematic washability. Although a 22½% ash product can ostensibly be obtained at a separation RD of 2.00, the indicated yield is only 76% and the amount of near gravity material is still near 10%. At the indicated RD the inherent ash in the float fraction may be as high as 60% yet the cumulative sinks ash is only 76%. The coal would be categorised as one of excessively difficult washability under the criteria of Whitmore (1979).

This particular sample is of significantly better coal than some on the proposed route of the main development headings, which on current proposals are to be driven in this seam. An adequate assessment of washery performance may not therefore be appropriate in the first 18 months of the operation of the mine.

Indicated yield distribution for a 22½% ash washed coal is illustrated by Enclosure 31.

7.5.4 Middle 2 Seam

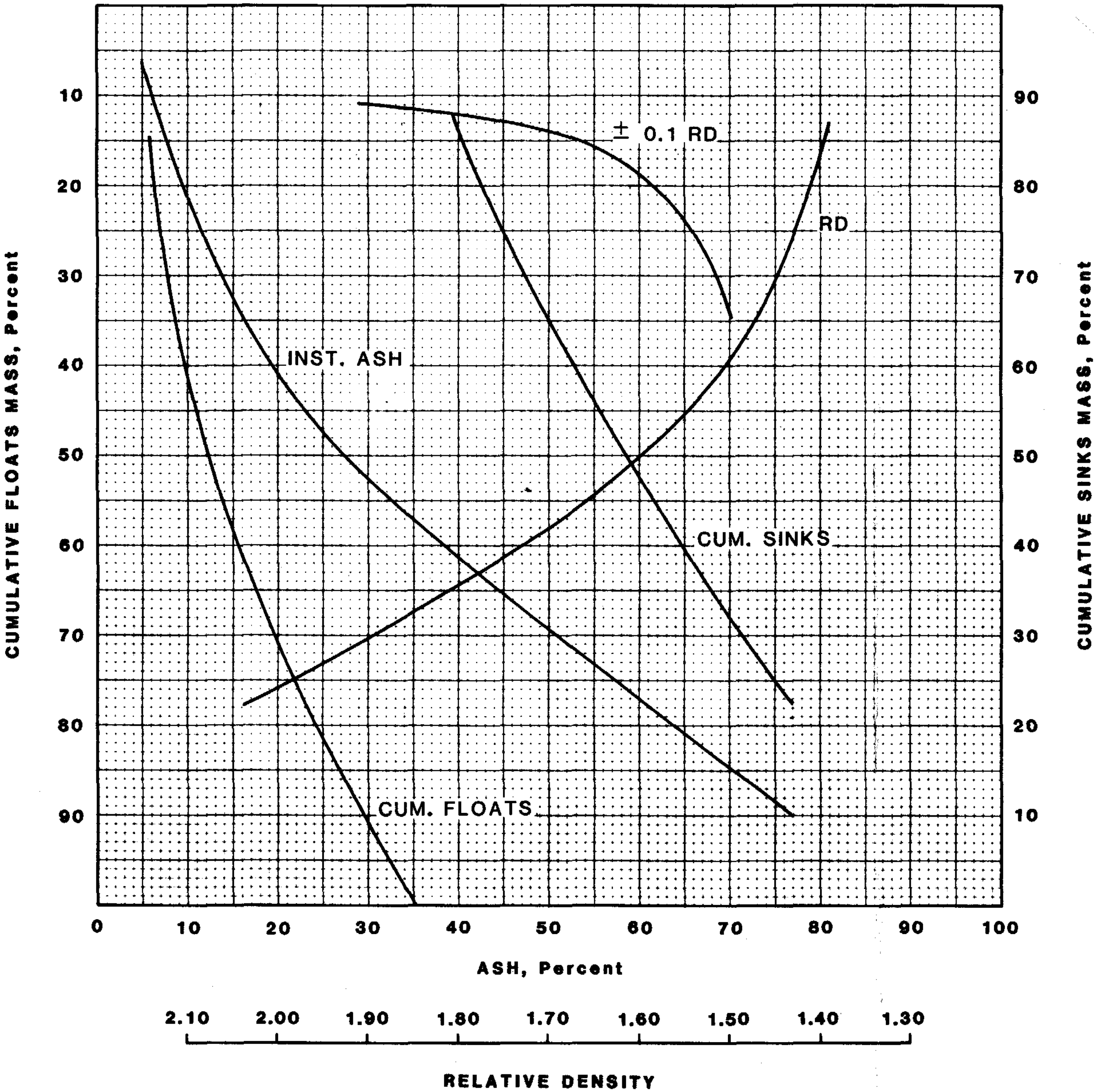
The M2 seam generally contains the cleanest raw coal in the Mt. Nicholas area and has in consequence the best washability characteristic, as indicated by Figure 11.

The cumulative floats curve is noticeably concave, indicating a rapid increase in sinks ash at higher RD's of separation as evidenced by the instantaneous ash curve. There is only minimal near gravity material at RDs above 1.80, at which point yields in excess of 80% can be anticipated for a washed coal product with only 12% ash. This could thus be used as a blending coal with one of higher washed ash (i.e. the L1) but as the reserve is geographically isolated and unlikely to

L1 SEAM TYPICAL WASHABILITY

(GY 157 - FULL MINEABLE SEAM)

650095



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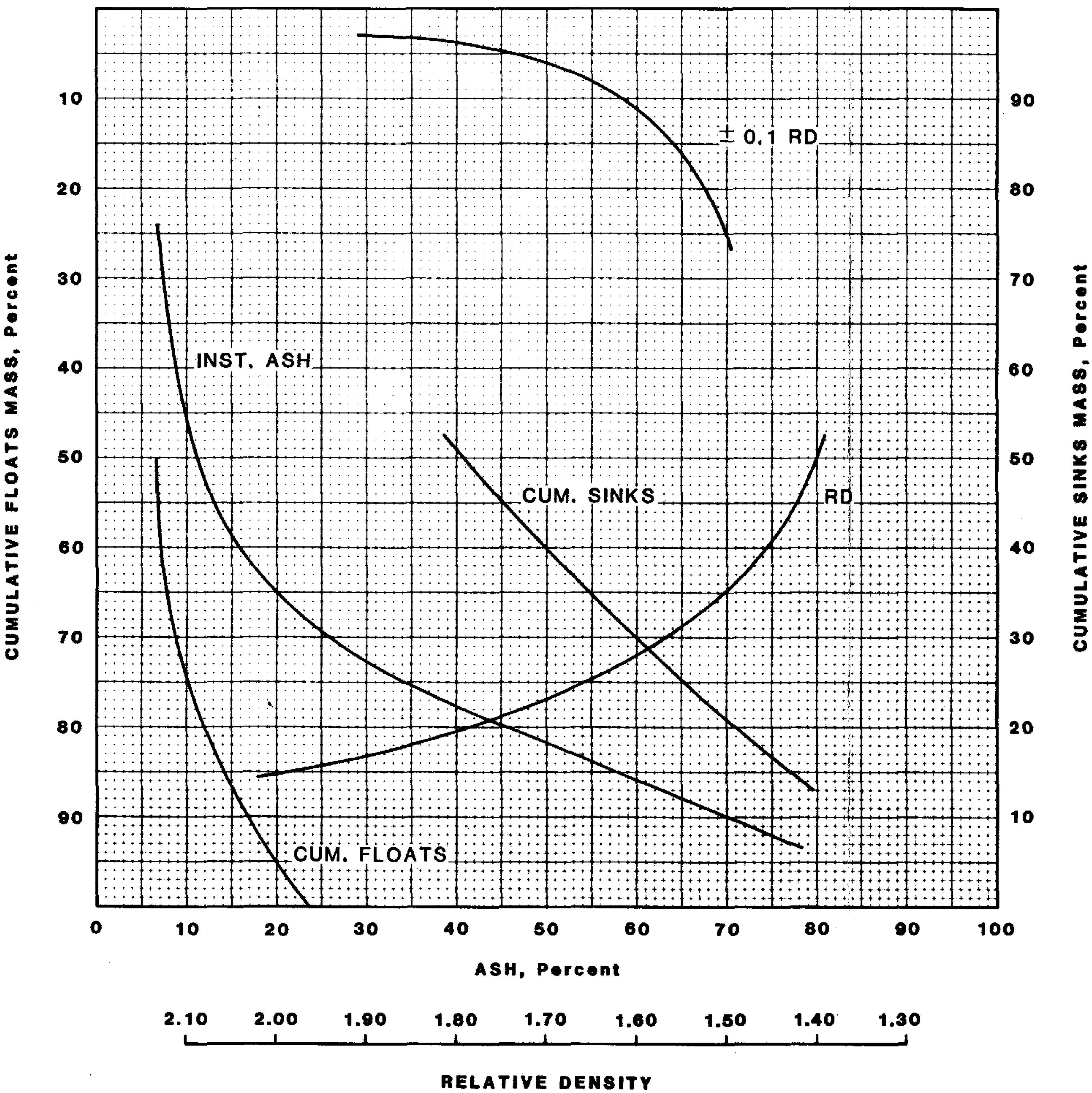
Author : Coal Division	Date : November 1982	Fig. 10
Report No · CEPR 31/82	Drawing No · 2714	

M2 SEAM TYPICAL WASHABILITY

(GY 119)



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Author : Coal Division	Date : November 1982	Fig. II
Report No: CEPR 31/82	Drawing No: 2715	

be developed at the same time, it is more likely that yield will be maximised.

Enclosure 32 indicates the theoretical yield distribution of an M2 coal washed to 22½% ash.

7.5.5 Middle 1 Seam

The M1 seam is intermediate in its washability between the M2 and the L2, as shown by Figure 12.

It is apparently readily washable at RD's of separation above 1.70, at which point in GY132 the yield was 82% for a 17% ash product. The instantaneous ash curve appears to level out at about the 95% yield level, implying an effective upper limit to washability corresponding to a 22% ash product.

Enclosure 33 indicates the variation of theoretical yield for a 22½% washed coal ash.

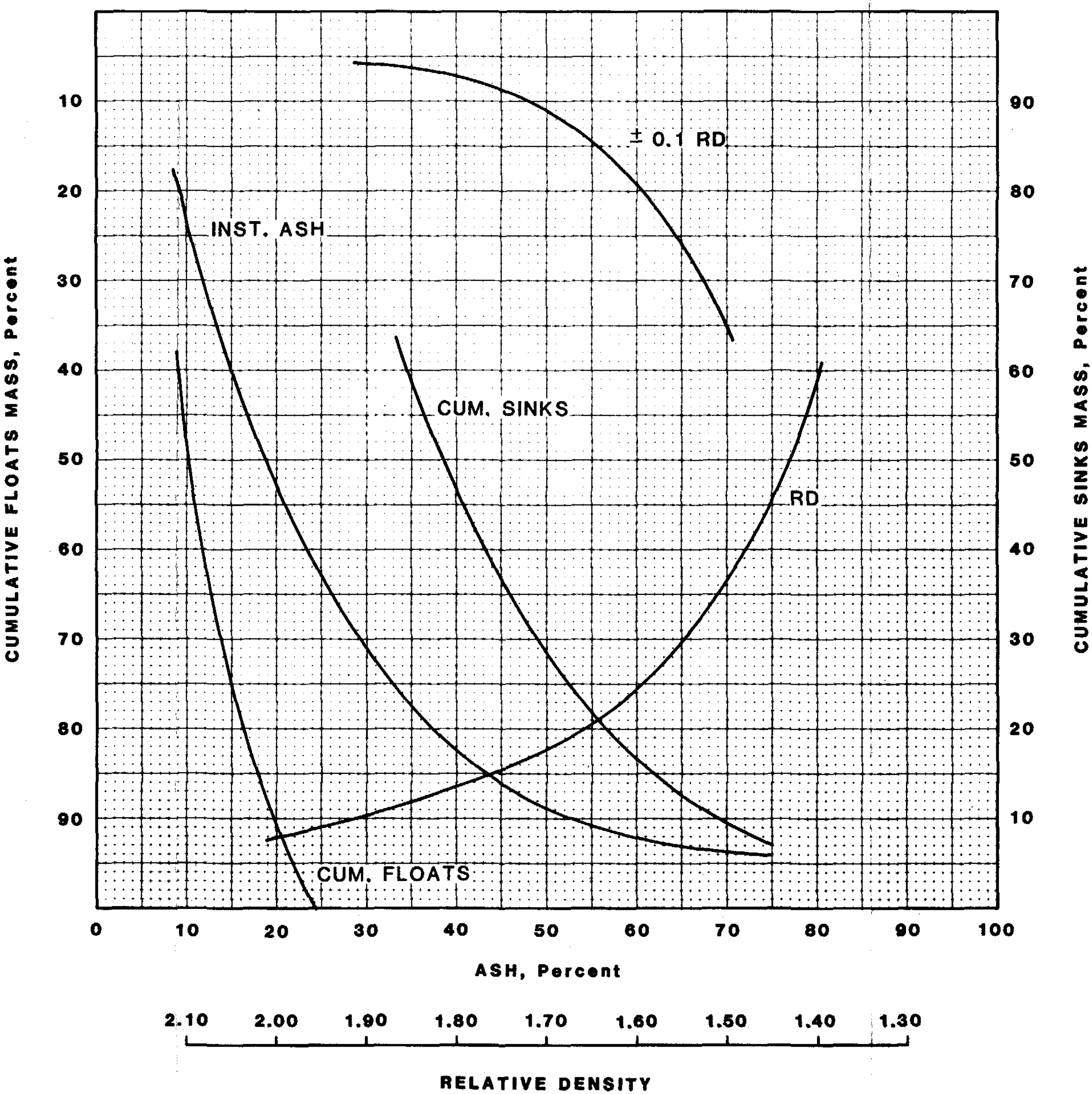
7.6 Washed Coal Quality

7.6.1 General

Analyses quoted in this section are derived from whole seam cumulative floats at RD 1.70 of seams sampled during or prior to 1981, and from mineable section cumulative floats corresponding to approximately 20% ash of seams sampled during 1982. The general specification of washed analyses at a specific RD had resulted in the analysis of some samples having unrealistically low yields and ash levels, particularly from the M2 seam.

All coals ultimately mined from Mt. Nicholas will presumably be washed to a reasonably constant ash level, thus removing the principal factor of contrast between the coals from different seams. It is therefore appropriate to discuss washed coal quality under an analytical classification rather than on a seam by seam basis, drawing attention to peculiarities attributable to individual seam coals as the relevant parameters are discussed.

M1 SEAM TYPICAL WASHABILITY
(GY 132)



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Author : Coal Division	Date : November 1982	Fig. 12
Report No: CEPR 31/82	Drawing No: 2716	

Summary tables of mean analytical values are included in the appropriate part of this text. For a summary of the base washed coal data, the reader is referred to Tables 7.14 to 7.17 at the end of this Section.

7.6.2 Proximate Analysis

As the ash content of a washed coal is largely a function of its preparation, it is not an intrinsic virtue and tends to obscure, rather than highlight other details of the coals proximate composition. For the purposes of this sub section, it has therefore been assumed that the ash content of the washed coal is 20%, and other percentages have been corrected to this base. Table 7.3 summarises the results on this basis.

TABLE 7.3
MEAN PROXIMATE ANALYSES OF WASHED COAL
(CORRECTED TO 20% ASH)

	M1	M2	L1	L2	DUNCAN
Moisture a.d.	6.9	6.3	5.8	5.9	5.9
Ash a.d.	20.0	20.0	20.0	20.0	20.0
Volatile Matter a.d.	27.7	25.4	25.3	25.2	23.5
Fixed Carbon a.d.	45.4	48.3	48.9	48.9	50.6
Volatile Matter d.a.f.	37.9	34.4	34.1	34.0	31.7
Volatile Matter d.m.m.f.	35.3	32.3	31.1	31.5	29.9
Number of Samples	(11)	(6)	(10)	(20)	(1)

The d.m.m.f. volatiles as tabulated in Tables 7.14 to 7.17 were calculated from the proximate and ultimate analyses of the washed coals according to the formulae:

$$V_{d.m.m.f.} = \frac{100(V - X)}{100-M-MM}$$

where $X = 0.13A + 0.2S + 0.7CO_2 - 0.13$
and $MM = 1.10A + 0.53S + 0.74CO_2 - 0.32$
V = Volatile Matter (a.d.)
M = Moisture (a.d.)
MM = Mineral Matter
A = Ash (a.d.)
S = Total Sulphur
CO_2 = Carbon Dioxide

Reference: CPC (1980)

The M1 seam is immediately distinguished from the other seams by its higher volatiles; this is not an indication of comparatively lower rank, but results from its being rich in the reactive maceral vitrinite (see Section 7.7.1). This effect is the result of a slightly different depositional environment. The vitrinite reflectance of the M1 seam is actually higher than the other seams on present data.

The M1 seam is also distinguished in having a higher and more variable moisture content which varied from 5.3% to 8.5% on an uncorrected basis. A lower moisture of 4.2% was recorded in GY43, where the seam appears to be heat affected.

7.6.3 Ultimate Analysis

The ultimate analyses set out in Table 7.4 show slight differences between Mt. Nicholas and Duncan Colliery coal which are probably attributable to the slightly higher rank of the latter (see Section 7.7.2). The differences between Mt. Nicholas coals are very slight; a perceptible increase down section in carbon/hydrogen ratios of from 16.2 (M1) to 16.7 (L2) may reflect a rank effect.

The coals are relatively low in hydrogen, a consequence of their low reactives content, and a principal reason for their relatively low specific energies. Nitrogen content is normal and should not constitute a problem in achieving acceptable oxide emissions during combustion.

The mean carbonate content quoted excludes an anomalous value for GY43 where the seam is heat affected. The seam is however, known to contain "coal balls" (which are probably sideritic) in other areas.

The sulphur contents, bearing in mind that they are on a dry ash free basis, are extremely low, enhancing the value of the coal as a fuel.

TABLE 7.4

MEAN ULTIMATE ANALYSES OF WASHED COAL

	M1	M2	L1	L2	DUNCAN
Carbon d.a.f.	80.25	81.31	81.67	81.57	83.30
Hydrogen d.a.f.	4.91	4.94	4.98	4.88	4.79
Nitrogen d.a.f.	1.45	1.42	1.39	1.43	1.50
Sulphur d.a.f.	0.54	0.41	0.47	0.47	0.45
Oxygen d.a.f.	12.85	11.94	11.52	11.66	10.00
Carbonates A.A	0.24	0.51	0.19	0.55	N.A.
Number of Samples	(4)	(4)	(3)	(9)	(1)

7.6.4 Minor Constituents

The total sulphur content of washed coal was determined for most seam intersections, and phosphorus has been recalculated from ash analyses where available. Two or three arsenic and chlorine determinations were carried out on samples from each of the four seams. Results are summarised in Table 7.5

Sulphur contents of the Mt. Nicholas coals are uniformly low, and very much in line with these of other Tasmanian coals. Although no determinations of the forms of sulphur has been made in view of the low levels of total sulphur, it can be assumed that most of the sulphur is present as organic sulphur.

Phosphorus contents are generally very low. Only two determinations yielded values that were not less than 0.01. Combustion of Mt. Nicholas coal should therefore be free of boiler deposits which can occur with coals of greater than 0.03% phosphorus.

Chlorine determinations have all been made on coal washed in chlorine compounds. The resultant values should therefore be regarded as maxima. The coal has a chlorine content substantially lower than the 0.3% level beyond which utilization problems can occur.

Arsenic content of the Mt. Nicholas coals is extremely low with values of around 1ppm. These values are consistent with the low total sulphur content of the coal, and in particular, with the almost complete absence of sulphide minerals.

TABLE 7.5

MEAN MINOR CONSTITUENT ANALYSES OF WASHED COAL

	M1	M2	L1	L2	DUNCAN
Sulphur %	0.42	0.34	0.34	0.35	0.38
Phosphorus %	0.001	0.001	0.002	0.01	0.03
Chlorine %	0.04	0.06	0.07	0.05	Trace
Arsenic ppm As_2O_2	1.3	0.8	1.0	0.8	N.A.

7.6.5 Ash Analysis

From the analyses tabulated in Table 7.6 the following trends are evident:

1. The silica alumina ratio increases up section from the Lower 2 to the Middle 1.

2. The aggregate of silica and alumina decreases up section.

3. Fe_2O_3, CaO and MgO all increase up section.

It is not clear whether the changing silica alumina ratio reflects a decreasing proportion of kaolinite up section relative to other clay minerals, or whether the coal contains a progressively higher proportion of quartz. High levels of CaO and Fe_2O_3 in the M1 seam ash from GY43 may be associated with the high level of carbonates in the ultimate analysis. The intersection (which was heat affected) also recorded a high level of SO_3. High levels of Fe_2O_3 in the M2 seam ash of GY34 also corresponded with an unusually high carbonate content. There is apparently no general relationship, however, between the level of basic oxides in ash and the amount of carbonates shown in the ultimate analysis.

650103

TABLE 7.6
MEAN ASH ANALYSES OF WASHED COAL

	M1	M2	L1	L2	DUNCAN
SiO_2	51.00	61.60	64.03	60.96	62.88
Al_2O_3	23.27	27.70	29.30	30.68	28.20
Fe_2O_3	5.58	4.57	2.68	3.89	5.48
CaO	2.66	0.96	0.35	0.69	0.17
MgO	1.06	0.95	0.37	0.69	1.02
TiO_2	1.13	1.10	1.64	1.22	0.78
Na_2O	0.30	0.15	0.20	0.23	0.60
K_2O	0.65	0.57	0.33	0.42	0.67
P_2O_5	0.01	0.02	0.02	0.09	0.02
Mn_3O_4	0.09	0.05	0.03	0.03	0.08
SO_3	1.31	0.38	0.27	0.15	0.10

7.6.6 Slagging and Fouling Factors

All of the coals produce a bituminous type ash with attractively low slagging and fouling propensities. Slagging and fouling factors have been calculated from ash and coal analyses using the following formulae:

Slagging factor R_s = B/A x % sulphur in dry coal

$$\text{where } B/A = \frac{Fe_2O_3 + CaO + MgO + Na_2O + K_2O}{SiO_2 + Al_2O_3 + TiO_2}$$

Fouling factor R_f = B/A x % Na_2O in ash

Evaluation of slagging and fouling factors is based on the following criteria.

If R_s is less than 0.6 - Slagging propensity LOW
If R_s is between 0.6 and 2.0 - Slagging propensity MEDIUM
If R_s is between 2.0 and 2.6 - Slagging propensity HIGH
If R_s is greater than 2.6 - Slagging propensity SEVERE

If R_f is less than 0.2 - Fouling propensity LOW
If R_f is between 0.2 and 0.5 - Fouling propensity MEDIUM
If R_f is between 0.5 and 1.0 - Fouling propensity HIGH
If R_f is more than 1.0 - Fouling propensity SEVERE

The fouling and slagging propensities of all the Mt. Nicholas coals as well as the Duncan coal are all well within the LOW range. (Reference CPC, 1980).

TABLE 7.7

SLAGGING AND FOULING FACTORS

	M2	M2	L1	L2	DUNCAN
Slagging Factor R_s	0.03-0.09	0.01-0.04	0.01-0.02	0.01-0.04	0.03
Fouling Factor R_f	0.01-0.07	0.01-0.02	0.01	0.01-0.05	0.05

7.6.7 Ash Fusion Characteristics

Of all the samples analysed from Mt. Nicholas only one, the Middle 1 seam in GY43, shows indications of ash fusion temperatures low enough to cause boiler problems. This sample is obviously affected by heat from an igneous intrusion and is therefore regarded as unrepresentative. The coal intrusion interaction is probably the cause of the very high carbonate content of the coal which is in turn responsible for the low ash fusion temperature. Apart from this one anomaly the ash fusion temperatures of the Mt. Nicholas coals are all well above the minimum requirements for conventional thermal coal.

TABLE 7.8

ASH FUSION TEMPERATURES

(° Celcius - Reducing Atmosphere)

	M1*	M2	L1	L2	DUNCAN
Deformation	1360-1410	1340->1600	1560->1600	1330->1600	1520
Spherical	1470-1500	1410->1600	>1600	1480->1600	N.D.
Hemisphere	1490-1560	1420->1600	>1600	1500->1600	1560
Flow	1500-1560	1440->1600	>1600	1520->1600	1560

* Excludes GY43.

7.6.8 Specific Energy

The variation in specific energies observed is largely due to ash and moisture content variation. A linear regression of all Mt. Nicholas specific energy and ash:moisture data (Figure 13) gives the following air dried specific energy to air dried ash:moisture relationship:-

$$\text{Specific Energy (MJ/kg)} = 31.49 - 0.33\ (\text{Ash} + \text{Moisture})$$

The relationship appears to hold well for both washed and raw coals, with an overall correlation coefficient of 0.96. In general Triassic Tasmanian coals have a moderately low specific energy relative to their rank and ash. This characteristic results from the very high proportion of inertinite which the coals contain, inertinite having a lower specific energy than virtinite or exinite.

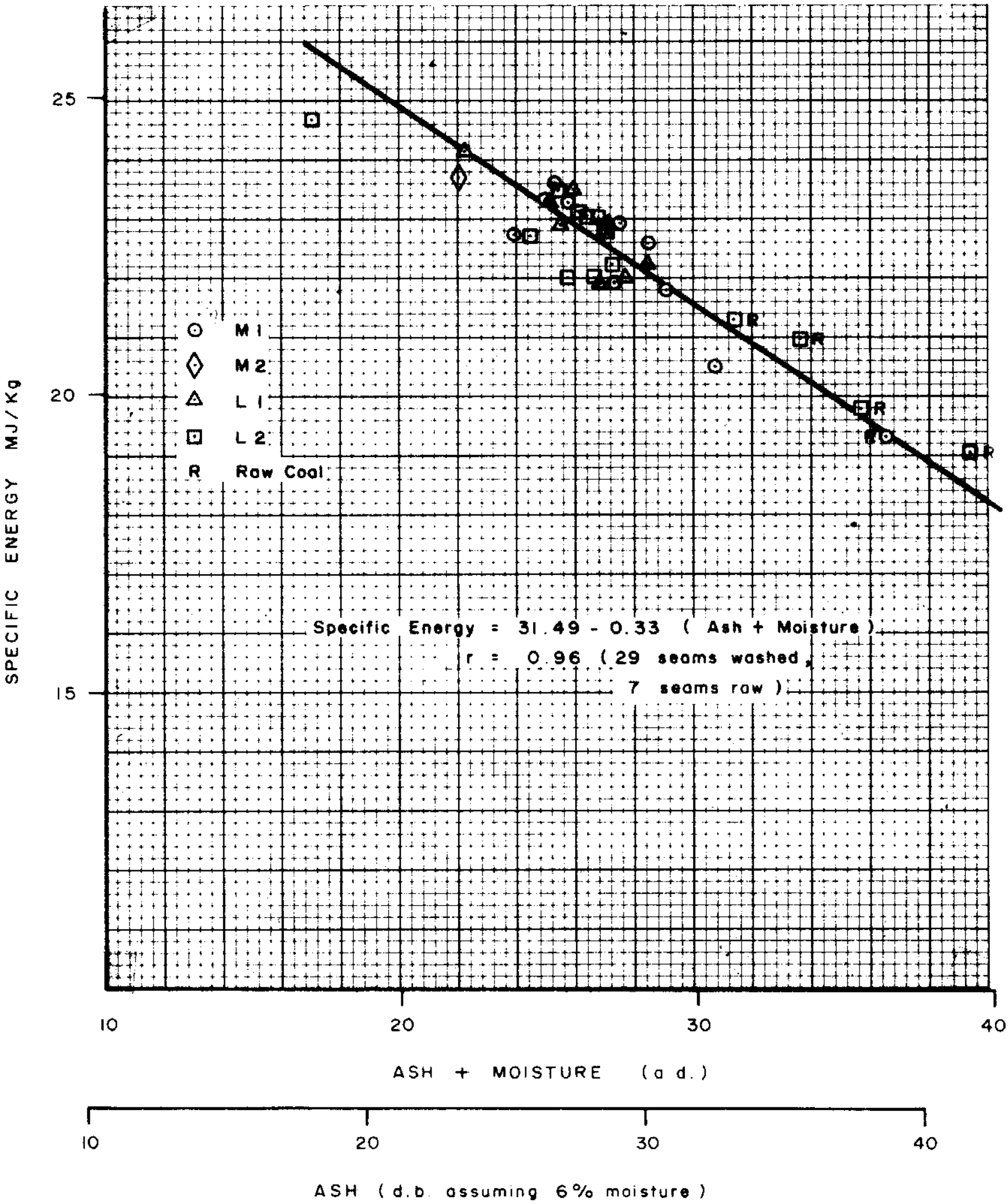
7.7 Coal Type and Composition

7.7.1 Petrology

Maceral counts and mean maximum vitrinite reflectance ($\bar{R}_o$max %) have been determined on whole seam washed coal samples from each of the Middle 1, Middle 2 and Lower 2 seams. For comparison, petrological data from two sources (JCB/QCB, 1978; Smyth, 1980) for the Duncan Colliery coal are listed in Table 7.9.

Petrology of the Mount Nicholas coals is very nearly identical to that of the Duncan seam except in the slightly higher vitrinite reflectance of the latter seam. The coals have very low percentages of vitrinite and exinite, and a high percentage of the remainder is semifusinite. This characteristic, together with their high inherent ash, supports the concept that the coals accumulated in an environment subject to frequent periods of oxidation. From a utilization point of view it is the basis of the relatively low volatility and specific energy of the coals in comparison with others of similar rank.

The M1 seam is distinguished from the others by a considerably higher vitrinite content, which appears to be solely at the expense of its semifusinite content.



SPECIFIC ENERGY/ASH-MOISTURE RELATIONSHIP

5 cm

Author : Coal Division	Date : November 1982	Fig. 13
Report No: CEPR 31/82	Drawing No: 2723	

650107

TABLE 7.9

PETROLOGY OF MT. NICHOLAS COALS

SEAM LOCATION	LOWER 2 GY34	MIDDLE 2 GY34	(Blue) MIDDLE 1 GY123	 GY43	DUNCAN (a)	 (b)
VITRINITE	18.3	14.0	31.8	32.9	14.4	9.4
EXINITE	(3.3)	(4.4)	(7.8)	(3.9)	6.7	5.9
Resinite	1.1	2.2	-	2.6		
Sporinite	2.2	2.2	3.6	1.3		
Cutinite	Tr	Tr	3.8	-		
Alginite	-	-	0.4	-		
INERTINITE	(78.4)	(81.6)	(60.4)	(63.2)		84.7
Fusinite	3.2	2.2	6.1	1.3	1.1	
Semifusinite	65.5	69.7	33.9	35.6	65.6	
Macrinite	1.1	-	2.9	6.6	-	
Sclerotinite	-	-	-	-	-	
Micrinite	1.1	1.1	2.7	1.3	12.2	
Inertodetrinite	7.5	8.6	14.8	18.4	-	
$\overline{R}_o$ max	0.55	0.55	0.61	0.67	0.67	0.61

7.7.2 Rank

As indicated by the mean maximum reflectance of its total vitrinite recorded in Table 7.9, the rank of the coal is low. The M1 sample from GY43 had an additional reflectance mode at 1.18 which is probably indicative of the influence of an igneous intrusion intersected at L2 seam level in this bore. A general ascending increase in reflectance may represent the effect of the massive Jurassic dolerite sill intruded higher in the section.

Volatile matter content is not a reliable indicator of comparative rank in the Mt. Nicholas area, the observable contrasts between seams being generally related to petrological differences.

7.7.3 Classification

Coal from all seams in the Mt. Nicholas area could be regarded as a high volatile bituminous steaming coal with medium to high inherent ash and low sulphur.

In classifying the coal it is assumed that it characteristically has a crucible swelling number of 0 and that the specific energy on a moist ash free basis is approximately 29.5 MJ/kg.

The coal may then be classified as follows:-

International	800
A.S.T.M.	Bituminous High Volatile B
Australian	800(5) (washed)

Ref: ASK184(1969)

650109

TABLE 7.10 : RAW COAL QUALITY & BASIC WASHABILITY - L2 SEAM (PAGE 1)

BORE	MINEABLE THICKNESS (m)	R.D.	ASH	20% ASH PRODUCT		22.5% ASH PRODUCT		25% ASH PRODUCT	
				YIELD	SEP. RD	YIELD	SEP. RD	YIELD	SEP. RD
DOM 8	2.59	1.43 A	26.7	88.0	2.00	93.5	>2.10	98.0	>2.10
DOM 13	3.31 *	1.51 A	34.6	69.0	1.75	75.5	>2.00	82.0	>2.10
GY 24	3.02 *	1.56 A	31.2	75.0	1.73	82.0	1.82	88.0	1.95
26	2.48	1.55 A	30.0	79.0	>2.00	85.5	>2.10	91.0	>2.10
28	2.04	1.52 A	28.8	79.0	>2.00	85.5	>2.10	91.5	>2.10
31	1.96	1.47 A	32.8					76.5	1.68
33	1.71	1.63 A	31.9	64.0	1.59	76.0	1.71	85.0	1.83
34	2.05	1.59 A	27.3	84.0	1.71	91.5	>2.00	97.0	>2.10
36	1.57	1.54 A	28.3	83.5	1.77	89.5	>2.00	94.5	>2.10
39	1.90	1.52 A	25.9	90.5	>2.10	95.5	>2.10	99.0	>2.10
40	2.11	1.57 A	30.8	80.0	1.75	87.0	>2.00	93.5	>2.10
41	1.55	1.72 A	44.8	NIL	-	10.0	<1.55	20.0	<1.55
42	2.06	1.49 A	26.5	88.5	>2.00	94.0	>2.10	98.0	>2.10
44	2.96 *	1.52 A	26.3	87.0	1.95	93.0	>2.00	98.0	>2.10
45	2.20	1.69 A	36.1	85.0	1.71	73.0	1.86	79.5	>2.10
106	1.61	1.68 T	34.4	74.0	1.78	81.0	>2.10	87.0	>2.10
108	2.86	1.63 T	30.8	79.5	2.05	84.5	>2.10	88.5	>2.10
119	2.25	1.63 T	29.9	82.5	1.91	88.0	>2.00	93.5	>2.10
123	1.37	1.64 T	33.9	71.0	1.70	78.5	1.81	85.0	>2.10
132	1.67	1.63 T	30.0	75.5	1.70	84.5	1.86	91.0	>2.10
151	1.77	1.65 T	31.5	79.0	1.82	85.5	>2.00	91.0	>2.10
157	1.46	1.95 T	55.6	Not tested					
166	1.77	1.67 T	34.9	73.0	1.81	79.0	1.94	85.0	>2.10

TABLE 7.10 : RAW COAL QUALITY & BASIC WASHABILITY - L2 SEAM (PAGE 2)

650110

BORE	MINEABLE THICKNESS (m)	R.D.	ASH	20% ASH PRODUCT		22.5% ASH PRODUCT		25% ASH PRODUCT	
				YIELD	SEP. RD	YIELD	SEP. RD	YIELD	SEP. RD
168	1.56	1.66 T	33.6	*69.0	1.71	77.0	1.80	84.5	2.00
173	1.34	1.74 T	43.0	Alternate Section Tested					

A - Apparent

T - True

* Includes Upper ply and band representing L1 seam and split

650111

TABLE 7.11 : RAW COAL QUALITY & BASIC WASHABILITY - L1 SEAM

BORE	MINEABLE THICKNESS (m)	R.D.	ASH	20% ASH PRODUCT		22.5% ASH PRODUCT		25% ASH PRODUCT	
				YIELD	SEP. RD	YIELD	SEP. RD	YIELD	SEP. RD
DOM 8	1.83	1.55 A	38.1	47.0	1.55	54.5	1.61	64.5	1.68
GY 26	1.22	1.75 A	46.0	Not Tested					
28	2.64	1.67 A	39.0					60.0	1.72
33	2.49	1.70 A	38.1	56.0	1.71	62.5	1.77	69.0	1.85
39	1.72	1.75 A	46.1	41.5	1.60	48.5	1.68	53.5	1.75
40	2.20	1.63 A	35.7	65.5	1.69	70.5	1.75	77.5	1.81
41	2.45	1.61 A	39.9	42.0	1.60	50.0	1.65	57.0	1.70
43	1.78	1.92 A	51.9	NIL	-	NIL	-	2.0	1.59
119	1.44	1.65 T	33.5	67.0	1.76	74.0	1.84	81.5	1.95
123	2.30	1.70 T	39.6	Alternate Section Tested - Cf GY 166					
132	1.62	1.76 T	42.6	Not Tested					
151	2.19	1.69 T	36.6	70.5	2.00	76.5	> 2.10	82.5	> 2.10
157	2.48	1.68 T	35.9	70.5	1.90	75.5	1.98	81.0	> 2.10
166	2.35	1.70 T	37.6	61.0	1.76	68.0	1.84	74.5	1.92
168	2.47	1.68 T	35.1	70.0	1.84	76.5	1.94	82.5	> 2.00

A - Apparent
T - True

650112

TABLE 7.12 : RAW COAL QUALITY & BASIC WASHABILITY - M2 SEAM

BORE	MINEABLE THICKNESS (m)	R.D.	ASH	20% ASH PRODUCT		22.5% ASH PRODUCT		25% ASH PRODUCT	
				YIELD	SEP. RD	YIELD	SEP. RD	YIELD	SEP. RD
DOM 13	2.18	1.42 A	20.4	99.5	-	100	-	100	-
GY 34	2.14	1.51 A	19.3	100	-	100	-	100	-
36	1.53	1.43 A	19.7	100	-	100	-	100	-
42	1.14	1.49 A	28.2	89.5	>2.10	93.5	>2.10	97.0	>2.10
44	2.74	1.39 A	21.8	97.0	>2.00	100	-	100	-
45	2.82	1.60 A	40.5	57.0	1.60	64.5	1.70	71.5	1.95
46	1.36	1.45 A	21.5	97.5	>2.10	100	-	100	-
119	1.06	1.54 T	24.1	96.5	>2.10	98.5	>2.10	100	-

A - Apparent

T - True

TABLE 7.13 : RAW COAL QUALITY & BASIC WASHABILITY - M1 SEAM

BORE	MINEABLE THICKNESS (m)	R.D.	ASH	20% ASH PRODUCT		22.5% ASH PRODUCT		25% ASH PRODUCT	
				YIELD	SEP. RD	YIELD	SEP. RD	YIELD	SEP. RD
GY 24	1.69	1.56 A	30.5	80.0	1.81	86.5	2.00	91.5	>2.10
28	1.76	1.76 A	46.1	61.0	>2.10	66.0	>2.10	71.0	>2.10
43	3.29	1.50 A	33.1	74.0	1.67	84.0	1.91	88.5	>2.10
44	2.55	1.54 A	41.0	50.0	1.56	62.0	1.64	71.0	1.80
119	0.78	1.69 T	36.3	72.5	1.88	78.5	>2.10	84.5	>2.10
123	1.78	1.55 T	26.1	92.0	>2.10	96.5	>2.10	99.0	>2.10
124	0.92	1.59 T	31.3	Alternate section tested - Cf. GY 168					
132	1.95	1.56 T	24.4	90.5	1.95	96.5	>2.10	100.0	-
151	2.00	1.78 T	44.2	62.0	2.00	67.0	>2.10	71.0	>2.10
167	1.61	1.59 T	27.8	89.0	>2.10	94.0	>2.10	97.5	>2.10
168	1.17	1.63 T	31.9	78.0	1.80	85.0	>2.00	91.0	>2.10

A - Apparent

T - True

TABLE 7.14: WASHED COAL QUALITY - L2 SEAM (PAGE 1)

Bore No.	DOM 8	DOM 13	GY 24	26	28	31	33	34	36	39	40	41	42	44	45	106	108	119	123	132	151	166	168
Seam Thickness (m)	2.59	3.31	3.02	2.48	2.04	1.96	1.71	2.05	1.57	1.90	2.11	1.55	2.06	2.96	2.20	1.61	2.86	2.25	1.37	1.67	1.77	1.77	1.56
Sample (Cum. Fl. RD)	1.80	1.80	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.80	2.00	2.00	1.70	1.70	1.80	1.80	1.70
Yield %	84.1	71.1	72.1	67.6	81.8	79.1	74.4	82.7	79.8	83.5	80.1	56.8	81.9	78.1	58.9	74.8	79.4	84.6	72.4	75.4	76.4	69.5	68.3
Relative Density																1.51	1.52	1.54	1.52	1.53	1.48	1.49	1.48
Proximate Analysis																							
Moisture % a.d.			4.8	4.3	5.0	6.5	5.2	6.5	6.9	6.2	5.9	5.8	5.0	7.1		6.6	6.0	6.2	5.8	5.9	5.5	6.3	6.1
Ash % a.d.	18.5	20.7	19.1	15.8	21.1	25.2	21.9	19.7	19.8	17.9	19.7	31.6	17.8	16.9	20.9	20.2	19.6	20.9	20.4	20.1	18.8	19.0	20.5
Volatile Matter % a.d.			26.0	28.3	25.5	21.6	22.9	23.6	25.9	24.9	24.2	19.8	25.8	24.5		26.6	27.8	26.4	24.0	25.5	27.8	26.2	25.4
Fixed Carbon % a.d.			50.1	51.6	48.4	46.7	50.0	50.2	47.4	51.0	50.2	42.8	51.4	51.5		46.6	46.6	46.5	49.8	48.5	47.9	48.5	48.0
Ultimate Analysis																							
Carbon %d.a.f.							82.4	82.1	79.9	81.3	80.9	79.2	81.8	82.6	76.6								
Hydrogen %d.a.f.							5.52	5.32	4.95	4.66	4.44	4.63	4.68	4.56	4.59								
Nitrogen %d.a.f.							1.55	1.38	1.33	1.41	1.39	1.49	1.51	1.42	1.37								
Sulphur %d.a.f.							0.41	0.31	0.58	0.48	0.45	0.65	0.62	0.44	0.33								
Oxygen %d.a.f.							10.12	10.89	13.24	12.15	12.82	14.03	11.39	10.98	17.11								
(Carbonates) % A.A.							0.43	0.20	0.09	0.05	0.08	0.10	0.18	0.04	0.44								
Sulphur %a.d.			0.43	0.26	0.30	0.23	0.30	0.23	0.44	0.37	0.34	0.42	0.48	0.34	0.19	0.35	0.37	0.32	0.41	0.42	0.33	0.40	0.38
Chlorine %a.d.									0.03	0.07	0.06	0.02	0.02	0.07	0.10								
Phosphorus %a.d.					0.048	0.014	0.003	0.005	0.001	<0.001	<0.001												
Arsenic P.P.M. As_2O_3									0.1	1.0	0.5	1.4	0.9										
Specific Energy MJ/kg			24.40	25.95	23.89	22.19	23.65	24.17	24.12	25.02	24.25	20.16	25.67	25.27		22.84	22.00	22.22	23.14	23.18	22.72	23.50	23.00
Hardgrove Grindability			52	51	56	61	58	57	58	56	56			55									
Ash Analysis																							
SiO_2					58.2	64.3	61.4	60.0	60.0	54.0	56.7	64.2	68.7	65.3	58.5								
Al_2O_3					34.2	31.3	31.0	31.6	31.2	31.5	31.4	25.0	25.3	28.6	33.4								
Fe_2O_3					3.94	1.80	3.81	3.65	4.20	7.41	5.10	7.20	2.32	2.80	3.26								
CaO					0.59	0.76	0.23	1.20	1.30	0.82	0.80	0.03	0.01	0.49	0.45								
MgO					0.62	0.71	0.42	0.30	0.91	1.48	1.15	<0.01	<0.01	0.70	0.41								
TiO_2					1.12	0.95	1.08	0.90	0.94	2.08	2.20	0.75	0.75	1.00	1.07								
Na_2O					0.39	0.28	0.10	0.15	0.21	0.24	0.24	0.54	0.28	0.17	0.06								
K_2O					0.38	0.77	0.30	0.31	0.55	0.52	0.50	0.10	0.20	0.27	0.26								

TABLE 7.14: WASHED COAL QUALITY - L2 SEAM (PAGE 2)

Bore No.	DOM 8	DOM 13	GY 24	26	28	31	33	34	36	39	40	41	42	44	45	106	108	119	123	132	151	166	168
P_2O_5					0.52	0.13	0.03	0.06	0.01	<0.01	<0.01	0.02	0.01	0.04	0.05								
Mn_3O_4					0.04	0.01	0.06	0.01	0.02	0.06	0.05	0.03	0.02	0.01	0.29								
SO_3					0.03	0.05	0.56	0.15	0.06	0.06	0.01	0.35	0.43	0.02	0.38								
Ash Fusion																							
Deformation °C			>1600	1430	1500	1560	>1600	>1600	1580	>1600	1570	1330	>1600	1540	>1600								
Spherical °C			>1600	1550	>1600	>1600	>1600	>1600	>1600	>1600	>1600	1480	>1600	>1600	>1600								
Hemisphere °C			>1600	1560	>1600	>1600	>1600	>1600	>1600	>1600	>1600	1500	>1600	>1600	>1600								
Flow °C			>1600	1570	>1600	>1600	>1600	>1600	>1600	>1600	>1600	1520	>1600	>1600	>1600								
Volatile Matter d.m.m.f			31.6	33.4	31.6	27.8	28.1	29.2	32.7	30.5	29.9	26.3	31.0	30.0		33.6	34.7	33.3	29.6	31.7	34.2	32.5	31.8
Base/Acid Ratio					0.06	0.05	0.05	0.06	0.08	0.12	0.09	0.09	0.03	0.05	0.05								
Slagging Factor Rs					0.02	0.01	0.02	0.01	0.03	0.04	0.03	0.04	0.01	0.02	0.01								
Fouling Factor Rf					0.03	0.01	0.01	0.01	0.02	0.03	0.02	0.05	0.01	0.01	<0.01								

650116

TABLE 7.15 : WASHED COAL QUALITY – L1 SEAM (PAGE 1)

Bore No.	DOM 8	GY 28	33	39	40	41	43	119	123	151	157	166	168
Seam Thickness (m)	1.83	2.64	2.49	1.72	2.20	2.45	1.78	1.44	2.30	2.19	2.48	2.35	2.47
Sample (Cum. Fl. RD)	1.60	1.70	1.70	1.70	1.70	1.70	1.60	1.80	1.70	2.00	1.80	1.80	1.80
Yield %	52.7	58.9	54.0	48.7	66.0	56.5	6.7	71.2	(54.8)	70.5	64.6	63.9	66.1
Relative Density								1.52		1.50	1.49	1.52	1.49
Proximate Analysis													
Moisture % a.d.		4.9	5.3	6.6	6.2	4.7		6.1		6.5	4.7	5.9	6.3
Ash % a.d.	21.8	24.6	18.9	22.6	20.5	25.3	26.2	21.4	(19.0)	20.2	17.4	21.1	18.7
Volatile Matter % a.d.		23.9	24.2	24.7	23.1	23.7		25.3		26.1	25.8	25.2	27.3
Fixed Carbon % a.d.		46.6	51.6	46.1	50.2	46.3		47.2		47.2	52.1	47.8	47.7
Ultimate Analysis													
Carbon % d.a.f.			83.2		81.1	80.7							
Hydrogen % d.a.f.			5.42		4.60	4.85							
Nitrogen % d.a.f.			1.48		1.32	1.38							
Sulphur % d.a.f.			0.45		0.41	0.54							
Oxygen % d.a.f.			9.45		12.57	12.53							
(Carbonates) % A.A.			0.28		0.14	0.16							
Sulphur % a.d.		0.30	0.34	0.35	0.31	0.39		0.35		0.34	0.36	0.31	0.36
Chlorine % a.d.					0.09	0.05							
Phosphorus % a.d.			0.002		0.001	0.003							
Arsenic P.P.M. As_2O_3					1.0	1.1							
Specific Energy MJ/kg		22.53	24.73	23.37	24.03	22.97		22.00		21.88	24.12	22.86	23.32
Hardgrove Grindability		60	57		58								
Ash Analysis													
SiO_2			61.8		65.8	64.5							
Al_2O_3			32.0		27.2	28.7							
Fe_2O_3			2.60		2.63	2.80							
CaO			0.13		0.82	<0.01							
MgO			0.35		0.67	<0.01							
TiO_2			1.34		2.10	1.48							
Na_2O			0.11		0.23	0.27							
K_2O			0.26		0.52	0.20							
P_2O_5			0.03		<0.01	0.03							
Mn_3O_4			0.04		0.03	0.02							
SO_3			0.23		0.01	0.58							

650117

TABLE 7.15 : <u>WASHED COAL QUALITY - L1 SEAM (PAGE 2)</u>

Bore No.	DOM 8	GY 28	33	39	40	41	43	119	123	151	157	166	168
Ash Fusion													
Deformation °C		1560	>1600	1580	1580	>1600							
Spherical °C		>1600	>1600	>1600	>1600	>1600							
Hemisphere °C		>1600	>1600	>1600	>1600	>1600							
Flow °C		>1600	>1600	>1600	>1600	>1600							
Volatile Matter d.m.m.f.		30.3	29.3	31.6	28.6	30.2		31.9		32.8	30.8	31.6	33.9
Base/Acid Ratio			0.04		0.05	0.04							
Slagging Factor Rs			0.01		0.02	0.02							
Fouling Factor Rf			<0.01		0.01	0.01							

650118

TABLE 7.16 : WASHED COAL QUALITY - M2 SEAM (PAGE 1)

Bore No.	DOM 13	GY 34	36	42	44	45	46	119				
Seam Thickness (m)	2.18	2.14	1.53	1.14	2.74	2.82	1.36	1.06				
Sample (Cum. Fl.RD)	1.80	1.70	1.70	1.80	1.70	1.70	1.70	2.00				
Yield %	90.2	90.3	86.4	79.2	86.2	64.2	80.7	84.9				
Relative Density								1.49				
Proximate Analysis												
Moisture % a.d.		6.8	7.9		5.7	5.4	6.9	7.4				
Ash % a.d.	14.6	14.5	12.4	14.8	15.7	22.6	13.1	14.5				
Volatile Matter % a.d.		25.2	28.1		26.1	26.2	25.6	29.2				
Fixed Carbon % a.d.		53.5	51.6		52.5	45.8	54.4	48.9				
Ultimate Analysis												
Carbon % d.a.f.		82.8	80.0		81.1	80.3						
Hydrogen % d.a.f.		5.31	4.89		4.61	4.86						
Nitorgen % d.a.f.		1.39	1.40		1.46	1.48						
Sulphur % d.a.f.		0.27	0.46		0.50	0.54						
Oxygen % d.a.f.		10.23	13.25		12.33	12.82						
(Carbonates) % A.A.		0.70	0.70		0.14	0.19						
Sulphur % a.d.		0.21	0.38		0.40	0.40		0.32				
Chlorine % a.d.			0.09		0.04	0.04						
Phosphorus % a.d.		0.002	0.001		0.001	0.001						
Arsenic P.P.M. As_2O_3			0.3		1.1	1.0						
Specific Energy MJ/kg		25.65	26.36		25.74	23.55	26.71	23.66				
Hardgrove Grindability		56	59		52	46						
Ash Analysis												
SiO_2		60.7	64.0		59.0	67.5						
Al_2O_3		22.8	28.3		32.0	19.7						
Fe_2O_3		7.00	3.30		3.40	8.04						
CaO		0.81	1.26		0.80	0.83						
MgO		1.00	0.96		0.90	0.10						
TiO_2		1.10	0.83		1.46	0.94						
Na_2O		0.08	0.07		0.30	0.10						
K_2O		0.23	1.01		0.46	0.25						
P_2O_5		0.03	0.01		0.02	0.01						
Mn_3O_4		0.08	0.01		0.06	0.12						
SO_3		0.70	0.07		0.38	0.35						

650119

TABLE 7.16 : WASHED COAL QUALITY - M2 SEAM (PAGE 2)

Bore No.	DOM 13	GY 34	36	42	44	45	46	119				
Ash Fusion												
Deformation °C		1380	1540		>1600	1340						
Spherical °C		1490	>1600		>1600	1410						
Hemisphere °C		1510	>1600		>1600	1420						
Flow °C		1520	>1600		>1600	1440						
Volatile Matter d.m.m.f.		29.8	33.7		31.2	33.3	30.3	35.5				
Base/Acid Ratio		0.11	0.07		0.06	0.11						
Slagging Factor Rs.		0.02	0.03		0.03	0.04						
Fouling Factor Rf.		0.01	<0.01		0.02	0.01						

650120

TABLE 7.17 : WASHED COAL QUALITY - M1 SEAM (PAGE 1)

Bore No.	GY 24	28	42	44	119	123	124	132	151	167	168
Seam Thickness (m)	1.69	1.76	3.29	2.55	0.78	1.78	1.09	1.95	2.00	1.61	1.17
Sample (Cum. Fl. RD)	1.70	1.70	1.70	1.70	2.00	2.00	2.00	2.00	2.00	2.00	1.80
Yield %	71.2	56.5	76.0	67.0	74.6	86.0	(86)	92.0	63.8	82.4	78.4
Relative Density					1.53	1.49	1.49	1.50	1.54	1.48	1.49
Proximate Analysis											
Moisture % a.d.	5.5	7.9	4.2	5.8	7.4	7.3	8.0	8.0	8.5	5.3	7.6
Ash % a.d.	17.0	18.1	21.5	24.2	21.5	18.3	17.2	20.3	22.1	18.5	19.8
Volatile Matter % a.d.	30.3	28.3	24.4	25.9	29.5	28.9	27.2	27.7	27.8	28.6	28.4
Fixed Carbon % a.d.	47.2	45.7	49.9	44.1	41.6	45.5	47.6	44.0	41.6	44.9	44.2
Ultimate Analysis											
Carbon % d.a.f		81.8	79.9	79.7			79.6				
Hydrogen % d.a.f		5.41	4.66	4.88			4.68				
Nitrogen % d.a.f.		1.41	1.48	1.45			1.46				
Sulphur % d.a.f.		0.36	0.64	0.69			0.46				
Oxygen % d.a.f.		11.02	13.32	13.28			13.77				
(Carbonates) % A.A.		0.27	2.02	0.17			0.28				
Sulphur % a.d.	0.36	0.26	0.49	0.50	0.45	0.44	0.40	0.41	0.34	0.53	0.40
Chlorine % a.d.			0.03	0.04							
Phosphorus % a.d.		0.002	0.001	0.001							
Arsenic P.P.M. As_2O_3			1.1	0.7			2.0				
Specific Energy MJ/kg	24.47	23.87	24.29	22.91	21.80	23.26	23.62	22.60	20.52	22.72	22.90
Hardgrove Grindability	49	53	71	46			55				
Ash Analysis											
SiO_2		64.0	57.9	61.0							
Al_2O_3		22.8	21.0	26.0							
Fe_2O_3		2.83	6.81	7.10							
CaO		0.74	6.08	1.16							
MgO		0.40	0.67	2.10							
TiO_2		1.00	0.82	1.58							
Na_2O		0.23	0.40	0.26							
K_2O		0.61	0.58	0.75							
P_2O_5		0.02	0.01	0.01							
Mn_3O_4		0.01	0.21	0.05							
SO_3		0.10	3.48	0.35							

TABLE 7.17 : WASHED COAL QUALITY - M1 SEAM (PAGE 2)

Bore No.		GY 24	28	43	44	119	123	124	132	151	167	168	
Ash Fusion													
Deformation	^oC	1390	1410	1190	1360			1340					
Spherical	^oC	1550	1470	1230	1470			1410					
Hemisphere	^oC	1560	1480	1250	1490			1430					
Flow	^oC	1560	1500	1270	1500			1460					
Volatile Matter d.m.m.f.		37.0	35.8	28.6	33.6	38.6	36.4	34.0	35.9	37.0	35.1	36.5	
Base/Acid Ratio			0.11	0.18	0.13								
Slagging Factor R_s			0.03	0.09	0.07								
Fouling Factor R_f			0.01	0.07	0.03								

8. RESERVES

8.1 General

A statement of reserves must ultimately attempt some assessment of the total saleable product which a mining lease can reasonably be expected to yield at an acceptable level of profitability. In the present situation, the absence of an immediate market for the coal makes such an undertaking a daunting task which cannot be accomplished with precision. The following section therefore represents a "best estimate" within the framework of limiting variables which are known, understood or assumed with varying degrees of confidence.

The immediate difference between the present estimate and the 1981 estimate is that the reserves have been considerably increased. This has not resulted from any significant change in the assessment of the overall geological reserve present, but from the inclusion of some reserves previously considered unmineable because of the probability of increased support requirements (see Section 6.9). Because the reserves are demonstrably flexible according to the application of inclusion or exclusion criteria the basis of the present assessment is presented in some detail so that minor changes in these can be accommodated.

8.2 Criteria for Reserve Areas

The following general exclusion criteria were applied rigorously unless otherwise noted in the definition of reserve areas:

Barriers : 20m to lease boundary
20m to major faults
80m to subcrop
90m to igneous intrusions
100m to old workings

Minimum seam height : 1.50m
Minimum acceptable theoretical yield : 70%
(for 22.5% ash product)

An area of less than 70% yield in the L1 seam was included due to the apparent unavailability of any better location for the proposed development headings.

8.3 Classification of Reserves

Reserves are calculated and categorised as per the "Code For Calculating and Reporting Coal Reserves" published by the Standing Committee on Coalfield Geology of New South Wales, and reprinted as Appendix A1 in AS2519 (1982). All of the reserves fall into Measured and Indicated categories by this classification. Areas of Indicated Reserves represent areas of inaccessibility due to rough dolerite topography on the crest of the Nicholas Range.

A total estimate of the geological In Situ reserve has not been attempted due to the existence of considerable quantities of coal in thin, shaly or otherwise unmineable seams and the attendant likelihood that any such statement may therefore be very misleading. Instead, the In Situ reserve has been calculated on the basis of the criteria outlined above, and therefore represents the total reserve which is currently considered accessible to mining. It is directly comparable with the "Available" category adopted by Fluor (1982).

Recoverable reserves represent that proportion of the mineable In Situ reserves which are considered extractable.

Run of Mine reserves are an introduced category derived from the Recoverable reserves by the addition of an estimated tonnage for unavoidable dilution of the seam material by roof and floor material.

An absolute statement of Marketable reserves is not possible because overall recovery of product coal from the ROM material is very dependant on treatment methods and market specifications. Instead it has been assumed that the size partition points of 125 μm and 1mm as adopted in Section 7.4.3 will be adopted in the ultimate washery design, and the probable quantities of material in corresponding size ranges are therefore presented individually. The Marketable reserve could therefore range from the "Washed 1mm - 50mm" as tabulated, to the sum of this plus the "Fines 125 μm - 1mm", depending on ultimate market requirements.

8.4 Reserve Areas

8.4.1 Lower Seams

These seams are in all areas too close together to be regarded independently for mining purposes, and accordingly only one seam has a reserve figure quoted in any given area. The exception to this is in the north of the area where the two seams coalesce; here the limited quantities of L1 seam and intervening split material have been included with the L2 reserve where the split is less than 0.3m in thickness.

Fortunately, areas where the two seams are of mineable thickness and quality do not generally coincide, and this restriction has not resulted in the sterilisation of significant quantities of otherwise mineable coal.

For practical considerations the cut-off between L1 and L2 reserve areas adopted corresponds to the northern fender of the main headings shown on the current conceptual mining plan (Fluor, 1982). As presently proposed, these headings will be driven in the L1 seam between GY43 and GY151 before turning northwards and descending to the L2 seam.

Discontinuities in the lower seams are known but poorly defined. The L2 seam is absent in GY43 due to the presence of a minor fault along which a dyke has evidently been emplaced. The direction or extent of this feature is unknown and it is shown on the reserve plan (Enclosure 34) as a probable reflection of the regional faulting pattern. Also unknown is the extent of in seam silling which may be assumed to affect seam penetrated by the dyke.

A major dyke on the northern flank of Mt. Nicholas is indicated on the reserve plans in terms of its surface outcrop only, which is some 200m stratigraphically above the L2 seam. The dyke is up to 30m thick and 250m long at the surface, however, the possibility that this and other dykes are more extensive than indicated at seam level cannot be ruled out.

A complete washout of the L1 and L2 seams in GY46 is associated with a sandstone channel infilling which apparently relates to a persistently erosive sandstone recurring in the lower seam interval in other bores to the north.

The direction of the channel has been the subject of discussion in Section 4.6, however, the actual length and width of its incursion into the L2 seam remains a matter for speculation.

8.4.2 Middle Seams

Enclosure 35 indicates that reserve areas in the Middle Seams as defined by the criteria of Section 8.2 form two largely independent areas which overlap in a small area near GY44 where the seam separation is approximately 9m (refer Enclosures 12 and 15). The overlap provides a means of access from one reserve to the other and the separation is probably sufficient to enable mining in both seams.

The M1 seam reserve has a boundary with the old Mt. Nicholas Colliery workings to the south east, against which a 100m barrier has been assumed. The adoption of a wide barrier represents a degree of uncertainty as to the actual perimeter of the old workings, and it may be possible to adopt a narrower barrier in practice on the assumption that there will be negligible accumulated water in this part of the old workings and that pillars are still standing. The last workings in this part of the colliery appear to have been in 1937 and it is possible that workings intersected a fault which has been postulated between GY166 and GY116.

8.5 Reserve Calculation

Reserve areas as delineated by the criteria of Section 8.2 were sub-divided according to the variation in seam thickness and theoretical yield to give a number of irregularly shaped blocks, and an average value for each parameter then assigned to each. The numbered blocks are indicated on the reserve plans (Enclosures 34 and 35), and planimetered areas and assigned thickness and theoretical yields are indicated in the detailed reserves (Tables 8.4 to 8.7). A maximum mineable thickness of 3.0m was applied, representing a practical limitation of probable mining equipment.

Calculation of the In Situ Reserve in each block utilised the planimetered area, the assigned average thickness, and an apparent relative density related to the theoretical yield for a 22.5% ash product, which was derived as follows:

Apparent RD = True RD - 0.04

True RD = (0.01 x Ash %) + 1.30 (refer Figure 4)

Yield % = $100-1.76\,(\text{Ash \%} - 22.5)^{1.227}$ (refer Figure 8)

The cumulative effect of these calculations are as tabulated below:

TABLE 8.1 Relationship Between Yield, Ash and Relative Density

Indicated Yield for 22.5% Ash product	Equivalent Raw Ash	True RD	Apparent RD
45	44.0	1.74	1.70
55	41.0	1.71	1.67
65	38.3	1.68	1.64
75	34.5	1.65	1.61
85	30.5	1.61	1.57
95	25.8	1.56	1.52
100	~ 20.0	1.50	1.46

Recoverable Reserves were calculated as 70% of the In Situ Reserve. It is considered that this figure should be attainable using the proposed Wongawilli System of bord and pillar extraction in areas which are regarded as mineable. Geological factors resulting from dykes and faults have been taken into account in the provision of barriers to these features where known.

Dilution was calculated on the basis of a constant 0.1m of non mineable seam material over the entire Recoverable Reserve irrespective of seam thickness. An RD of 2.1 was adopted on the assumption that this material would include significant proportions of inferior coal and carbonaceous mudstone in addition to geological roof and floor lithologies. This is equivalent to 1470 tonnes per hectare of each reserve block and amounts to approximately 6% of the total anticipated Run of Mine.

The Run of Mine (ROM) Reserve includes Recoverable Reserves plus Dilution.

The ROM Reserve was partitioned into size fractions by proportions as derived in Section 7.4.3 (Table 7.2) and shown by Figure 6, curve (3), i.e.:

- 125µm	10.5%
125 - 1mm	10.5%
+ 1mm	79.0%

It was assumed that the proportion of Dilution material in each size fraction was the same as in the ROM Reserve for each block.

The Slimes (- 125µm) and Fines (125µm - 1mm) are quoted as direct proportions as above of the ROM Reserve.

The assumption was made that no dilution would report to the washed coal product, and accordingly this fraction was derived from the Recoverable Reserve by application of the product of three factors, i.e.:

0.79	-	Percentage on size basis to be washed
0.xx	-	Theoretical yield for 22.5% Ash in reserve block
0.95	-	Washery inefficiency factor

The actual yield of washed coal from the Recoverable Reserve is therefore 0.7505 of the theoretical yield.

The Coarse Reject was derived by difference between the sum of the slimes, fines and washed coal and the ROM Reserve in each block.

The statement of these tonnages to the accuracies implied by Tables 8.3 - 8.6 is a function of the need to preserve three significant figures in some of the smaller tonnages calculated on a block basis, to ensure the accurate application of percentage factors and to facilitate totalling or subsequent modification. It therefore reflects the accuracy of the calculation rather than that of the final result.

Measured Reserves were derived by estimating the proportion of each reserve block shown on Enclosures 34 and 35 to be within the Measured Reserve areas as designated. In view of the relatively small number of blocks which are not 100% Measured, the overall accuracy is greater than this apparent imprecision implies. The balance of the reserves are Indicated.

8.6 Reserve Tonnages

Reserves are summarised in Table 8.2. For a detailed tabulation of Reserves on a block-by-block basis refer to Tables 8.4 - 8.7 at the end of this section.

TABLE 8.2 Reserve Summary, Mt. Nicholas

	Measured (% of In Situ)	In Situ (Mineable)	Recoverable	ROM	Marketable Washed	Marketable Fines
		Millions of tonnes, air dried				
Middle 1 Seam	62.5	9.5	6.7	7.1	4.4	0.7
Middle 2 Seam	100.0	3.9	2.7	2.9	2.0	0.3
Lower 1 Seam	100.0	5.0	3.5	3.7	1.8	0.4
Lower 2 Seam	84.7	30.4	21.3	22.5	13.9	2.4
TOTAL	83.2	48.8	34.2	36.2	22.1	3.8

Note that all reserve tonnages are quoted on an air dried basis, i.e. approx. 6% inherent moisture. The free moisture content of the product coal will probably amount to an additional 5-6% dependent on the degree of crushing and treatment. On this basis the Marketable Reserve tonnages could be increased by approximately this amount to represent an "as sold" product.

8.7 Product Ash

Throughout this report it has been assumed that sized coal would be washed to an ash specification of 22.5% a.d. This is not entirely an arbitrary figure; it is considered to represent the mid-point of the likely market, and also corresponds to the level of acceptable washability of the L2 seam in which 62% of the total reserves are concentrated. This level has been derived from Figure 9, which shows that 22.5% represents the ash cut-off point of a typical L2 coal corresponding to the RD where the amount of near gravity material begins to exceed 10%, i.e. the accepted limit of moderately difficult washability for a jig-type plant (Le Page, 1982).

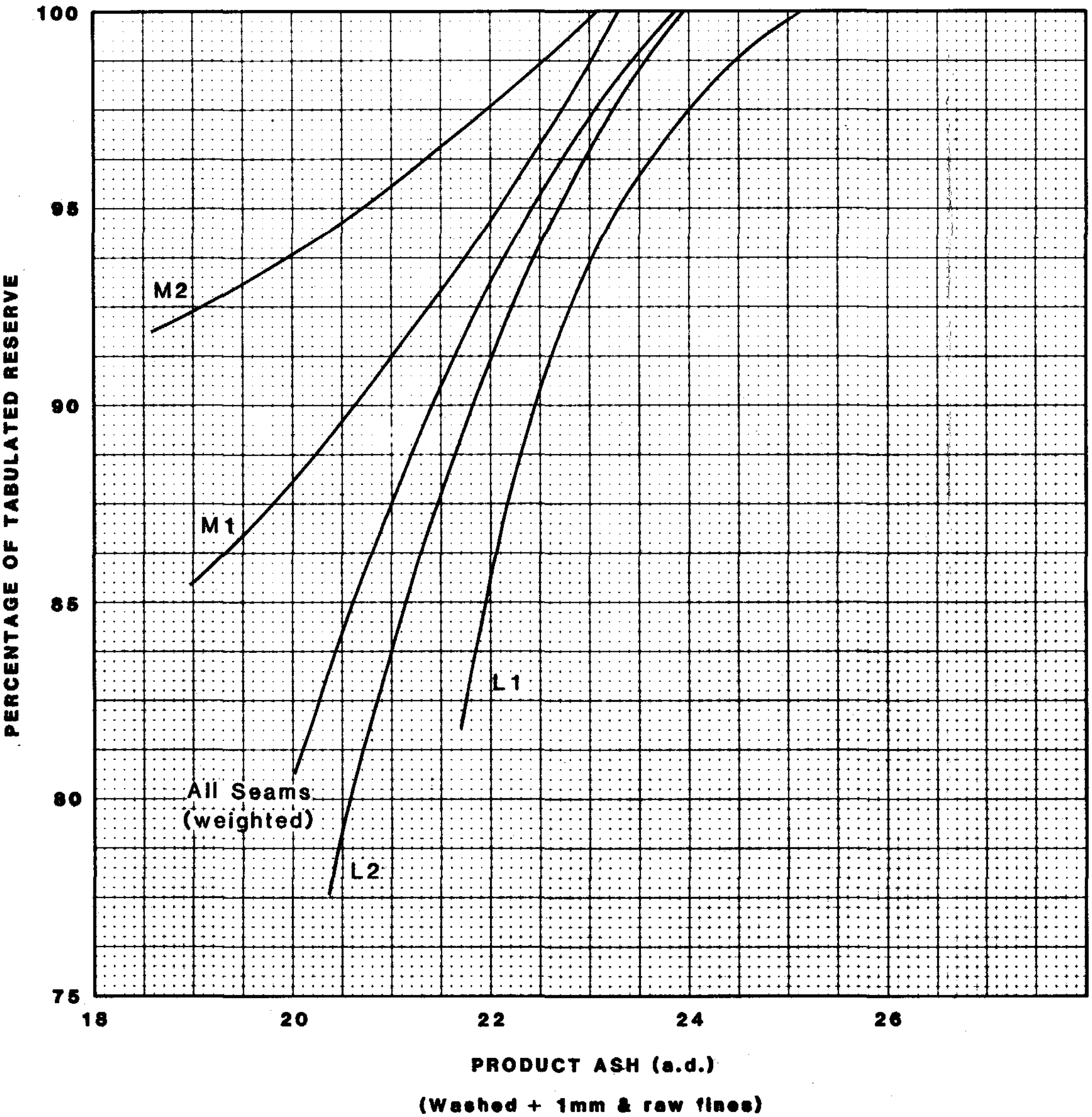
In view of the probability that unwashed fines material may be required to comprise a significant proportion of the total product, and that this material (including dilution at the assumed rate) will have ash contents ranging from approximately 27% (M2 seam) to 38% (L1 seam), it is prudent to consider the effect of this on the ash specification of the total product, and the effect of reducing plant yield and thus, Marketable Reserves, to improve this if unacceptable.

Table 8.3 examines the effects and sensitivities of such manipulations and is complemented in graphical form by Figure 14. Figures 9-12 have been used as the basis of calculation.

TABLE 8.3 Marketable Reserve Sensitivity to Product Ash

		Washed Product Ash					
		17.5%		20.0%		22.5%	
	Fines Ash %	Total Product Ash	Reserve %	Total Product Ash	Reserve %	Total Product Ash	Reserve %
M1 Seam	28	19.3	86.3	21.3	92.3	23.3	100.0
M2 Seam	27	18.9	92.2	21.0	95.6	23.1	100.0
L1 Seam	38	21.8	83.6	23.3	94.9	25.2	100.0
L2 Seam	33	20.4	78.4	22.1	91.7	24.0	100.0
Weighted Mean	32	20.1	81.6	21.9	92.5	23.9	100.0

RESERVE SENSITIVITY TO PRODUCT ASH SPECIFICATION



5 cm

Author : Coal Division	Date : November 1982	Fig. 14
Report No · CEPR 31/82	Drawing No: 2803	

TABLE 8.4: L2 SEAM RESERVES (PAGE 1)

Area No.	Area (Ha)	Thickness (m)	R.D.	Th. Yield (%)	Reserves - Thousands of Tonnes (a.d.)							
					In Situ (Mineable)	Recoverable	Dilution	Run of Mine	Washed 1mm-50mm	Fines 125µm-1mm	Slimes -125µm	Reject 1mm-50mm
1	69.95	1.625	1.61	75	1830.07	1281.05	102.83	1383.88	721.07	145.31		372.19
2	55.52	"	1.57	85	1416.45	991.52	81.61	1073.13	632.52	112.68		215.25
3	55.89	1.875	1.57	85	1645.26	1151.68	82.16	1233.84	734.69	129.55		240.05
4	13.57	"	1.61	75	409.64	286.75	19.95	306.70	161.40	32.20		80.90
5	77.22	"	1.57	85	2273.16	1591.21	113.51	1704.72	1015.07	179.00		331.65
6	4.64	"	1.51	95	131.37	91.96	6.82	98.78	65.57	10.37		12.47
7	41.41	"	1.51	95	1172.42	820.69	60.87	881.56	585.13	92.56		111.31
8	59.64	2.125	1.57	85	1989.74	1392.82	87.67	1480.49	888.51	155.45		281.08
9	3.74	"	1.57	85	124.78	87.35	5.50	92.85	55.72	9.75		17.63
10	21.24	"	1.57	85	708.62	496.03	31.22	527.25	316.43	55.36		100.10
11	24.26	"	1.57	85	809.37	566.56	35.66	602.22	361.42	63.23		114.34
12	26.00	"	1.51	95	834.28	584.00	38.22	622.22	416.38	65.33		75.18
13	69.22	"	1.51	95	2221.10	1554.77	101.75	1656.52	1108.51	173.93		200.15
14	2.09	"	1.57	85	69.73	48.81	3.07	51.88	31.14	5.45		9.84
15	46.29	2.375	1.57	85	1726.04	1208.23	68.05	1276.28	770.76	134.01		237.50
16	20.87	"	1.57	85	778.19	544.73	30.68	575.41	347.50	60.42		107.07
17	6.23	"	1.57	85	232.30	162.61	9.16	171.77	103.73	18.04		31.96
18	2.72	"	1.57	85	101.42	70.99	4.00	74.99	45.29	7.87		13.96
19	9.35	"	1.51	95	335.31	234.72	13.74	248.46	167.35	26.09		28.93
20	53.72	"	1.51	95	1926.53	1348.57	78.97	1427.54	961.50	149.89		166.26
21	9.95	2.625	1.57	85	410.06	287.04	14.63	301.67	183.11	31.68		55.20
22	4.32	"	1.57	85	178.04	124.63	6.35	130.98	79.50	13.75		23.98
23	31.99	"	1.57	85	1318.39	922.87	47.03	969.90	588.72	101.84		177.50
24	41.83	"	1.51	95	1658.04	1160.63	61.49	1222.12	827.50	128.32		137.98
25	2.38	2.875	1.61	75	110.16	77.11	3.50	80.61	43.40	8.46		20.29
26	13.32	"	1.57	85	601.23	420.86	19.58	440.44	268.48	46.25		79.46
27	31.07	"	1.57	85	1402.42	981.69	45.67	1027.36	626.24	107.87		185.38
28	18.89	"	1.51	95	820.06	574.04	27.77	601.81	409.28	63.19		66.15
29	11.15	3.125	1.61	75	547.52	383.26	8.20	391.46	215.73	41.10		93.53
30	19.52	"	1.57	85	934.72	654.30	14.35	668.65	417.39	70.21		110.84

TABLE 8.4: L2 SEAM RESERVES (PAGE 2)

Area No.	Area (Ha)	Thickness (m)	R.D.	Th. Yield (%)	Reserves - Thousands of Tonnes (a.d.)							
					In Situ (Mineable)	Recoverable	Dilution	Run of Mine	Washed 1mm-50mm	Fines 125μm-1mm	Slimes -125μm	Reject 1mm-50mm
31	11.55	3.125	1.57	85	553.07	387.15	8.49	395.64	246.97	41.54		65.59
32	8.96	"	1.51	95	412.65	288.86	6.59	295.45	205.95	31.02		27.46
33	6.23	3.375	1.57	85	298.32	208.82	4.58	213.40	133.21	22.41		35.37
34	2.69	2.375	1.51	95	96.47	67.53	3.95	71.48	48.15	7.51		8.31
35	7.35	2.625	1.57	85	302.91	212.04	10.80	222.84	135.27	23.40		40.77
TOTAL	884.77	-	-	-	30379.84	21265.88	1258.42	22524.30	13918.59	2365.04	2365.04	3875.63
Percent	ROM	-	-	-	134.9	94.4	5.6	100.0	61.8	10.5	10.5	17.2

N.B. (1) Seam exceeds mineable thickness in areas 29-33, Half of dilution assumed to be coal, i.e. thickness 3.05, dilution 5cm.

(2) L2 Seam Measured Reserves: 84.7%) approx.
L2 Seam Indicated Reserves: 15.3%)

TABLE 8:5: L1 SEAM RESERVES

Area No.	Area (Ha)	Thickness (m)	R.D.	Th. Yield (%)	Reserves - Thousands of Tonnes (a.d.)							
					In Situ (Mineable)	Recoverable	Dilution	Run of Mine	Washed 1mm-50mm	Fines 125μm-1mm	Slimes -125μm	Reject 1mm-50mm
1	22.13	2.125	1.64	65	771.23	539.86	32.53	572.39	263.36	60.10	60.10	188.83
2	27.10	"	1.61	75	927.16	649.01	39.84	688.85	365.31	72.33	72.33	178.88
3	11.44	"	1.61	75	391.39	273.97	16.82	290.79	154.21	30.53	30.53	75.52
4	4.59	2.375	1.70	45	185.32	129.72	6.75	136.47	43.81	14.33	14.33	64.00
5	3.34	"	1.67	55	132.47	92.73	4.91	97.64	38.28	10.25	10.25	38.86
6	2.25	"	1.67	55	89.24	62.47	3.31	65.78	25.79	6.91	6.91	26.17
7	2.70	"	1.64	65	105.17	73.62	3.97	77.59	35.91	8.15	8.15	25.38
8	2.47	"	1.64	65	96.21	67.35	3.63	70.98	32.86	7.45	7.45	23.32
9	0.68	"	1.64	65	26.49	18.54	1.00	19.54	9.04	2.05	2.05	6.40
10	0.69	"	1.64	65	26.88	18.82	1.01	19.83	9.18	2.08	2.08	6.49
11	9.01	"	1.64	65	350.94	245.66	13.24	258.90	119.84	27.18	27.18	84.70
12	10.30	"	1.61	75	393.85	275.70	15.14	290.84	155.18	30.54	30.54	74.58
13	3.07	"	1.61	75	117.39	82.17	4.51	86.68	46.25	9.10	9.10	22.23
14	2.68	"	1.61	75	102.48	71.74	3.94	75.68	40.38	7.95	7.95	19.40
15	5.14	"	1.61	75	196.54	137.58	7.56	145.14	77.44	15.24	15.24	37.22
16	2.68	"	1.61	75	102.48	71.74	3.94	75.68	40.38	7.95	7.95	19.40
17	2.42	2.625	1.64	65	104.18	72.93	3.56	76.49	35.58	8.03	8.03	24.85
18	4.28	"	1.64	65	184.25	128.98	6.29	135.27	62.92	14.20	14.20	43.95
19	16.89	"	1.61	75	713.81	499.67	24.83	524.50	281.25	55.07	55.07	133.11
TOTAL	133.86	-	-	-	5017.48	3512.26	196.78	3709.04	1836.97	389.44	389.44	1093.19
Percent	ROM	-	-	-	135.3	94.7	5.3	100.0	49.5	10.5	10.5	29.5

N.B. All L1 Seam Reserves are Measured.

TABLE 8.6: M2 SEAM RESERVES

Area No.	Area (Ha)	Thickness (m)	R.D.	Th. Yield (%)	Reserves - Thousands of Tonnes (a.d.) In Situ (Mineable)	Recoverable	Dilution	Run of Mine	Washed 1mm-50mm	Fines 125µm-1mm	Slimes -125µm	Reject 1mm-50mm
1	3.28	1.75	1.61	75	92.41	64.69	4.82	69.51	36.41	7.30	7.30	18.50
2	3.68	"	1.57	85	101.11	70.78	5.41	76.19	45.15	8.00	8.00	15.04
3	19.75	"	1.51	95	521.89	365.32	29.03	394.35	260.46	41.41	41.41	51.07
4	15.73	"	1.47	100	404.65	283.26	23.12	306.38	212.59	32.17	32.17	29.45
5	0.98	2.25	1.61	75	35.50	24.85	1.44	26.29	13.99	2.76	2.76	6.78
6	2.65	"	1.57	85	93.61	65.53	3.90	69.43	41.80	7.29	7.29	13.05
7	4.61	"	1.51	95	156.62	109.63	6.78	116.41	78.16	12.22	12.22	13.81
8	28.31	"	1.47	100	936.35	655.45	41.62	697.07	491.92	73.19	73.19	58.77
9	0.63	2.75	1.57	85	27.20	19.04	0.93	19.97	12.15	2.10	2.10	3.62
10	4.36	"	1.51	95	181.05	126.74	6.41	133.15	90.36	13.98	13.98	14.83
11	33.33	"	1.47	100	1347.37	943.16	49.00	992.16	707.84	104.18	104.18	75.96
TOTAL	117.31	-	-	-	3897.76	2728.45	172.45	2900.91	1990.83	304.60	304.60	300.88
Percent	ROM	-	-	-	134.4	94.1	5.9	100.0	68.6	10.5	10.5	10.4
N.B.	All M2 Seam Reserves are Measured.											

TABLE 8.7: M1 SEAM RESERVES

Area No.	Area (Ha)	Thickness (m)	R.D.	Th. Yield (%)	Reserves - Thousands of Tonnes (a.d.)							
					In Situ (Mineable)	Recoverable	Dilution	Run of Mine	Washed 1mm-50mm	Fines 125µm-1mm	- Slimes -125µm	Reject 1mm-50mm
1	2.67	1.75	1.61	75	75.23	52.66	3.92	56.58	29.64	5.94	5.94	15.06
2	35.90	"	1.61	75	1011.48	708.04	52.77	760.81	398.54	79.89	79.89	202.49
3	6.71	"	1.61	75	189.05	132.34	9.86	142.20	74.49	14.93	14.93	37.85
4	6.18	"	1.57	85	169.80	118.86	9.08	127.94	75.82	13.43	13.43	25.26
5	43.19	"	1.57	85	1186.65	830.66	63.49	894.15	529.90	93.89	93.89	176.47
6	8.09	"	1.51	95	213.78	149.65	11.89	161.54	106.70	16.96	16.96	20.92
7	47.38	"	1.51	95	1252.02	876.41	69.65	946.06	624.86	99.34	99.34	122.52
8	3.37	2.25	1.61	75	122.08	85.46	4.95	90.41	48.10	9.49	9.49	23.33
9	3.84	"	1.61	75	139.10	97.37	5.64	103.01	54.81	10.82	10.82	26.56
10	8.82	"	1.61	75	319.50	223.65	12.97	236.62	125.89	24.85	24.85	61.03
11	3.83	"	1.57	85	135.29	94.70	5.63	100.33	60.41	10.53	10.53	18.86
12	2.59	"	1.57	85	91.49	64.04	3.81	67.85	40.85	7.12	7.12	12.76
13	8.36	"	1.57	85	295.32	206.72	12.29	219.01	131.87	23.00	23.00	41.14
14	5.63	"	1.51	95	191.28	133.90	8.28	142.18	95.47	14.93	14.93	16.85
15	48.14	"	1.51	95	1635.56	1144.89	70.77	1215.66	816.28	127.64	127.64	144.10
16	2.71	2.75	1.61	75	119.99	83.99	3.98	87.97	47.28	9.24	9.24	22.21
17	7.48	"	1.57	85	322.95	226.07	11.00	237.07	144.22	24.89	24.89	43.07
18	3.46	"	1.51	95	143.68	100.58	5.09	105.67	71.71	11.10	11.10	11.76
19	2.93	"	1.51	95	121.67	85.17	4.31	89.48	60.72	9.40	9.40	9.96
20	29.61	"	1.51	95	1229.56	860.69	43.53	904.22	613.65	94.94	94.94	100.69
21	7.04	3.25	1.57	85	359.22	251.45	10.35	261.80	160.41	27.49	27.49	46.41
22	0.79	"	1.51	95	38.77	27.14	1.16	28.30	17.31	2.97	2.97	5.05
23	3.19	"	1.51	95	156.55	109.59	4.69	114.28	78.13	12.00	12.00	12.15
TOTAL	291.91	-	-	-	9520.02	6664.03	429.11	7093.14	4407.06	744.79	744.79	1196.50
Percent	ROM	-	-	-	134.2	94.0	6.0	100.0	62.1	10.5	10.5	16.9

N.B. M1 Seam Measured Reserves: 62.5%)
M1 Seam Indicated Reserves: 37.5%) Approx.

650135

9. CONCLUSIONS AND RECOMMENDATIONS

This report completes the Mine Planning Exploration stage of the Mt. Nicholas evaluation, and is sufficient to establish the existence of a significant reserve of coal, which provided the appropriate market circumstances, should lead to the development of an underground mine.

Our understanding of this reserve is now sufficiently detailed to form the basis of a full feasibility study for the development of such a mine. We do not as yet have sufficient coal washability information for detailed preparation plant design, however this will be forthcoming from the results of large diameter drilling currently in progress. This drilling will also test the veracity of a number of assumptions necessarily made in arriving at reserve estimates advanced in this report.

There are a number of aspects impinging on current mining proposals in which our geological knowledge of the reserve in incomplete. These include as major items the underground extent and orientation of known disruptions including faults, but particularly dykes and washouts. The scale of these structures in relation to the density of the existing drilling must inevitably lead to the conclusion that all such structures existing cannot be presumed to have been located by the drilling to date. Other unknowns include the distribution of small scale faulting and the detailed prediction of mining conditions and support requirements.

This situation cannot be cost-effectively clarified by further drilling and hence no general recommendation is advanced for this. The mapping of disruptive structures of this scale can only be ultimately accomplished by mining.

It is thus important that provision be made in the budgeting and scheduling of any contemplated mining operation to allow problems arising from these sources to be dealt with if or when they should be encountered.

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THE SHELL COMPANY OF AUSTRALIA LIMITED
(Incorporated in Victoria)

AND

INDUSTRIAL AND MINING INVESTIGATIONS PTY. LIMITED
(Incorporated in the A.C.T.)

EL 5/61 GRAY
- TASMANIA -

MOUNT NICHOLAS GEOLOGICAL REPORT

VOLUME 2
APPENDICES

C.L. Patterson
B. Ward

CEPR 31/82

November 1982

CONTENTS VOLUME 2

APPENDICES

APPENDIX 1

GEOTECHNICAL BOREHOLE RECORDS

-

ROOF AND FLOOR SECTIONS

003

650143

LEGEND

LITHOLOGY REFERENCE

NOT CORED/CORE LOSS	COAL STONY
SANDSTONE	CARBONACEOUS MUDSTONE
MUDSTONE	SOIL
COAL (UNDIFF)	SHALE
CONGLOMERATE	CLAYSTONE
SILTSTONE	TONSTEIN
CLAY	BASIC INTRUSIVE

KEY

SAMPLE

Depth is to top of sample

WEATHERING GRADE

FH	Fresh
SW	Slightly weathered
MW	Moderately weathered
HW	Highly weathered
CW	Completely weathered

SLAKING POTENTIAL

SS	Slow slaking
RS	Rapid slaking
(S.D.V.)	Slake durability index - %

5 cm

FIELD STRENGTH

R1	Very weak	C1	Very soft
R2	Weak	C2	Soft
R3	Moderately weak	C3	Firm
R4	Moderately strong	C4	Stiff
R5	Strong	C5	Very stiff
R6	Very strong	C6	Hard

(u.c.s.) Unconfined compressive strength (MN/m^2)

JOINTS

R	Rough
S	Smooth
SK	Slickensided
45	Dip - degrees
NP	Non-planar
FZ	Fault or shear zone

VERTICAL SCALE 1:50

APPENDIX 1

KEY TO BOREHOLE RECORDS

Author: Coal Division	**Date**: November 1982
Report No: CEPR 31/82	**Drawing No**: 2806

004

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APPENDIX 1A

GEOTECHNICAL BOREHOLE RECORDS

L1 & L2 SEAMS

ROOF AND FLOOR SECTIONS

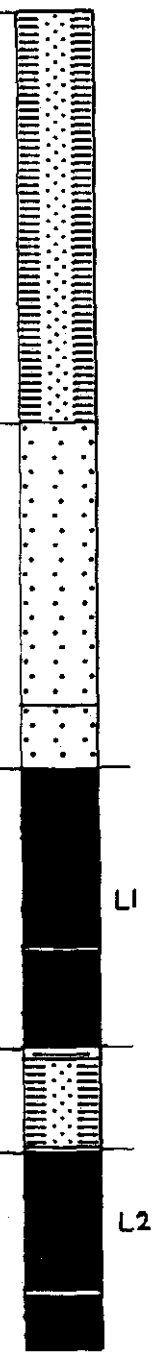
005

650145

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 8**

(a)

SAMPLE		WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
NO.	DEPTH							
								119.05
								121.77
								124.05
		FH		R3				
								125.88
								126.57



006

650146

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 8**

(b)

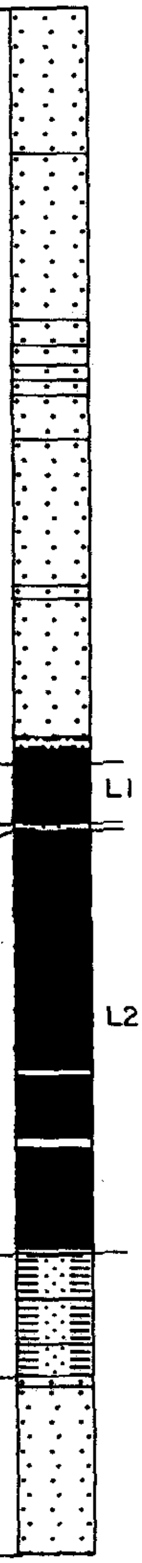
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								125.88
		FH						126.57
				R3				129.16
								130.15
								131.16

007

650147

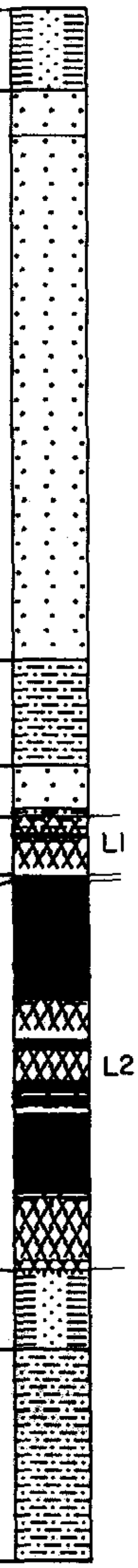
E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 13**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								157.82
		FH		R3			100	
				R4				
				R3				162.82
								163.21
								163.27
			RS					166.05
			SS					166.86
								168.05



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 24**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								240.86
								241.42
								245.22
						S 70		
								245.92
								246.26
						SK 45		
								246.66
								246.70
								249.28
								249.81
								251.76



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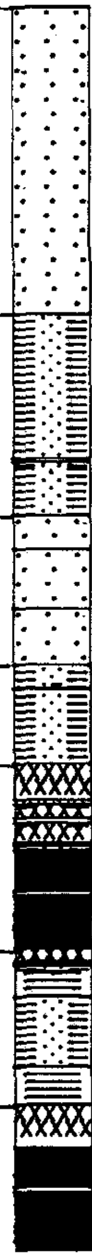
650149

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 26**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								245.30
		FH		R5				247.33
				R3				248.66
				R5				
				R4				249.64
				R3				250.29
								251.51
		FH		R3			0	252.54



L1

L2

010

650150

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 26**

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								251.51
		FH		R3			0	252.54
								255.02
		FH		R3			0	255.58
								255.95
								256.80
				R4				257.12

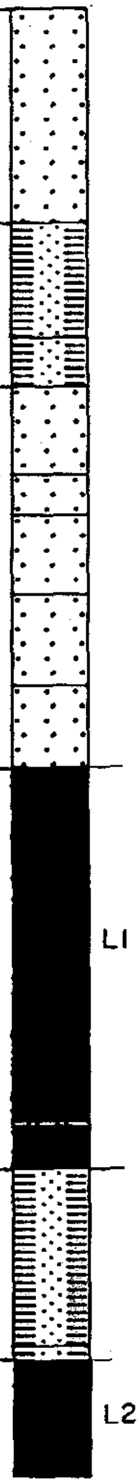
011

650151

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 28**

(a)

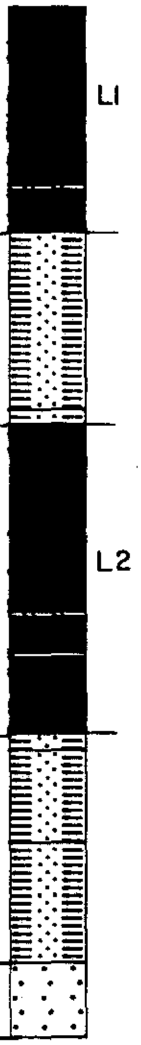
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								229.93
		FH		R3		R 85		231.34
						R 85		
						R 85		232.42
			RS	R4		R 85	91	
				R5				
				R4				
				R5				234.93
								237.57
			RS	R5			74	238.83



E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 28

(b)

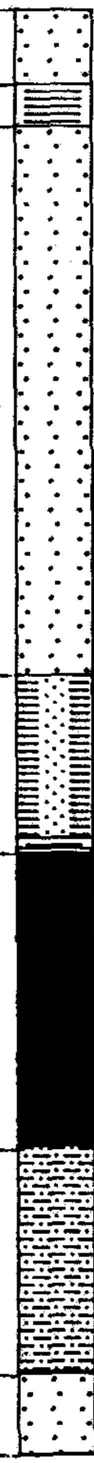
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								237.57
		FH	RS	R5			74	238.83
								240.87
				R4			37	
				R3		S 40		242.38
				R5				242.87



650153

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 31**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								16.95
				R2				17.41
				R1				17.69
				R5		R_60	95	21.31
			RS	R4		R_35	75	22.45
								24.41
							81	25.91
				R4			100	26.41



L2

014

650154

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 33**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								111.86
T06	113.54							
T07	113.65							
T08	113.76							
T09	113.87							
T10	113.98							
				R3				
						SK 40	100	114.64
			SS					
					2.00			115.17
					1.25			115.57
T11	115.60				0.88			
T12	115.78							
T13	115.89	FH		(21.6)				
T14	116.01		SS					
					1.95			
				R4		S 90		116.86
T15	116.86					S 90		
						S 90		
						R 80		
T16	117.42					S 90		
						S 85		
				R3		R 90		
						SK 52		
T17	118.95					S 90		
								119.35
					0.02			
			RS			SK 35	21	
					1.20			120.18
T18	120.39							
								120.60
			RS		0.80		0	120.82

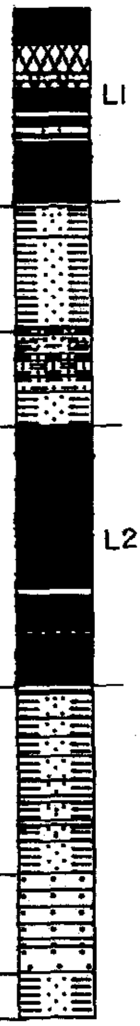
L1

L2

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 33

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								119.35
					0.02			
			RS			SK 35	21	
					1.20			120.18
I18	120.39							
			RS		0.80			120.82
I19	120.88			(29.0)	1.16	S 90	94	
						S 90	94	
		FH		R3				
						S 90	91	122.53
					0.56			
I20	122.75							
					1.30		72	
I21	123.16		RS					
I22	123.30							
I23	123.45			(14.2)				
								123.77
I24	123.77							
I25	123.88							
I26	123.99				2.95		100	
								124.42
					2.00		80	124.73



650156

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 34

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								97.76
I02	99.24				0.93			
				R3				
						R 80		
					0.79			
		FH				90 NP	100	101.97
I03	102.22			(20.5)	0.13			
I04	102.39							
I05	102.55							
								102.76
						R 90		
I06	103.17			(41.0)		R 90		
					0.59	R 90		
						SK 45		
						R 90		
						R 90		104.81
I07	104.81							
I08	104.94				0.85			105.20
I09	105.43							
I10	105.60							
I11	105.77							
					0.45			
								106.81

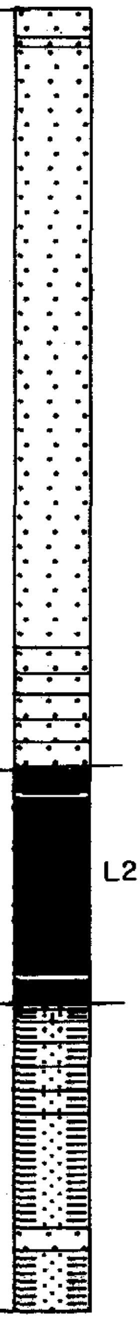
L2

017

650157
GY 36

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								100.60
					0.23			
					0.40			
					0.15		100	
					1.05			
					0.43			
					0.65			
					1.20			
T15	104.82	FH		(15.6)				
T16	104.99							
T17	105.13							
T18	105.29							
T19	105.44			(17.3)				
								105.60
						S 90		
						S 90	59	
						S 90		
					1.54			107.17
					1.32	SK 55		
T20	107.28							
T21	107.42							
T22	107.58							
T23	107.74				1.32			
							100	
					1.58			
								109.17



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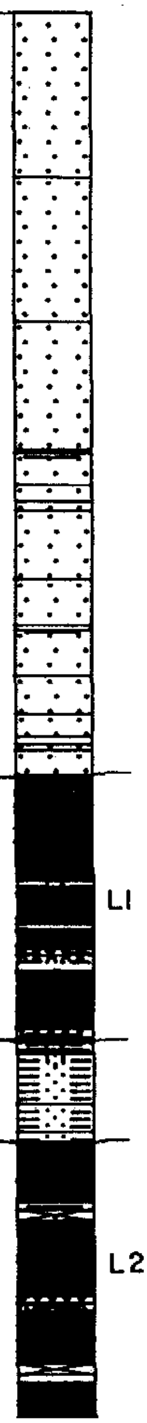
650158

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 39

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								208.82
					0.99			
							100	
					0.33			
		FH		R3				
					0.25			
T11	213.42				0.21			
T12	213.66							
								213.82
						S 85		
						S 90		
T13	215.54			(29.8)		S 55		215.54
			SS			S 35	96	
						S 70		
						S 40		216.22



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650159

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 39**

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
T13	215.54	FH	SS	(29.8)		S 55 S 35 S 70 S 40	96	215.54
				R3		S 90 S 90	89	216.22
T14 T15	218.12 218.29		SS		0.38 0.40		100	218.12
								219.83 220.23

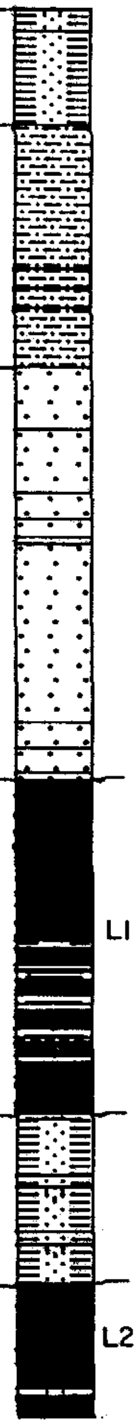
020

650160

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 40

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
T14	212.13				0.23			212.13
								212.90
T15	213.85				0.55			
								214.50
						R 75		
					0.48			
		FH		R3			100	
T16	216.84							
T17	217.01							217.22
						S 90		
						S 90		
						S 90		
						S 90		
						S 90		
						S 90		219.42
T18	219.83			(33.2)				
T19	220.20			(41.0)	0.25 0.22	SK 55		220.54



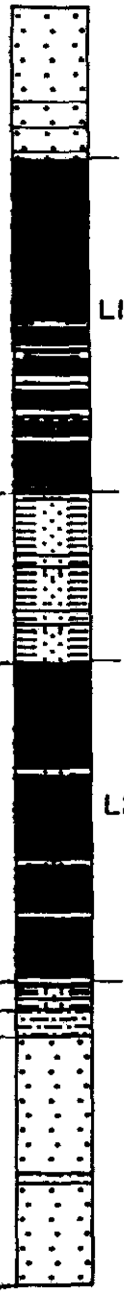
021

650161

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 40

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								219.42
T18	219.83			(33.2)				
T19	220.20			(41.0)	0.25			
					0.22			
						SK 55		220.54
		FH				S 90	100	
				R3				
						S 90		222.65
T20	222.67							222.82
								223.00
					0.20			
					2.05			
								224.65



650162

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 41**

(a)

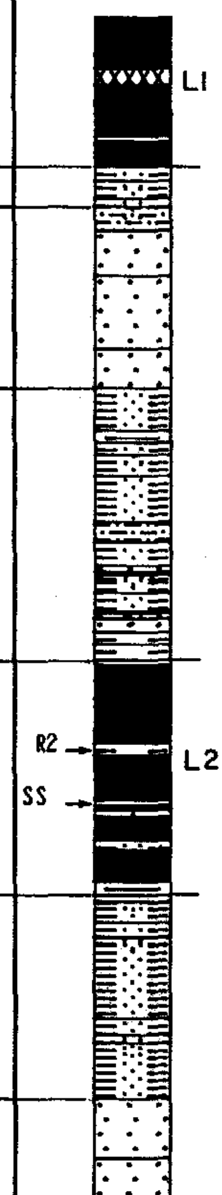
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								94.41
				R2				
				R4				
					0.09			
				R2				
							100	96.94
					0.11			97.28
					1.82			
								97.78
		FH						
					1.90			
T01	98.31			(27.3)				
T02	98.47							
								98.67
T03	98.91			(41.7)				
T04	99.03							
								99.16
					0.19			99.41
						R 82 S 90		
				R3				
					0.30		73	
					1.81			
								101.86

L1

650163

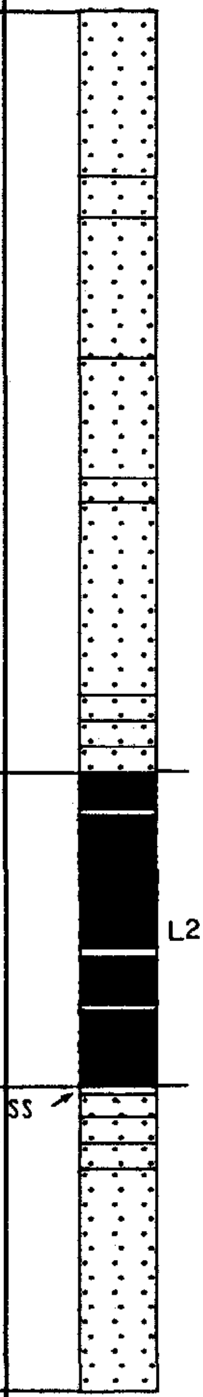
E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 41**
(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
105	101.86							101.86
106	101.95							102.12
					0.39			
					1.79			
								103.32
							100	
107	104.55							
108	104.67							
109	105.01				1.24			105.11
		FH		R3		S 80 R 90		
					0.14 0.48	S 35 S 90	99	
						SK 35 S 90 SK 35 R 90 S 90 SK 35		106.66
110	106.70							
111	106.84				0.34			
112	107.47				2.35			
113	107.58						100	
								108.00
					1.98			
								108.66



E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 42

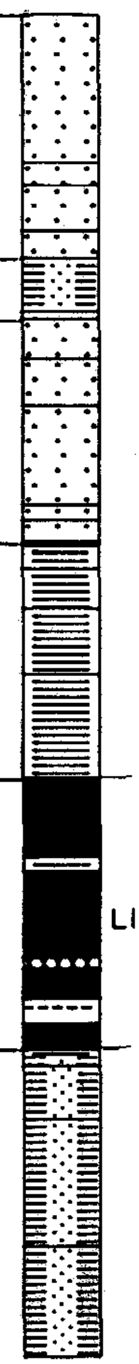
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								208.81
					0.31			
					0.32			
							100	
					1.01			
T08	213.30	FH		R3	0.30			
T09	213.47							
T10	213.64							
								213.81
							99	
						S 90		
						S 90		
								215.87
T11	215.92							
T12	216.07							
T13	216.24							
					0.37			
							98	
					0.49			
					0.26			217.87



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 43**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								207.41
				R3	1.58		100	209.00
				R2	0.46		65	209.40
					1.38			
		FH		R3	2.20		100	
106	210.72							210.88
107	210.89					S-50		
					1.06	SK 20	27	
				R2	0.42	SK 40		
					0.87			212.41
						SK 20		
				R3			100	
					0.90	SK 20		
						SK 20 S 90		214.19



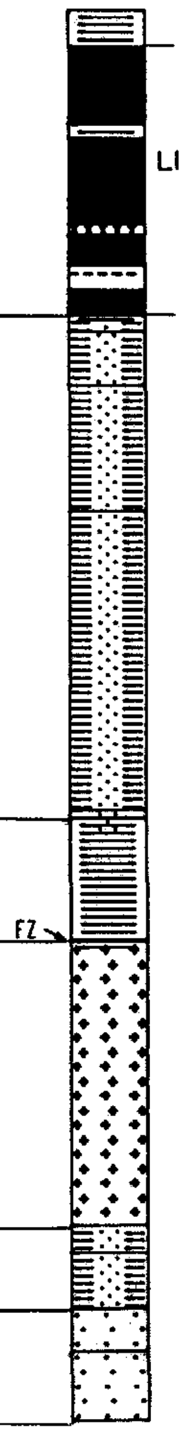
026

650166

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 43**

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
					1.08	S 40		214.19
					0.23	SK 10		
					0.52			
						SK 10		
					1.40			
					0.84			
				R3		SK 40	53	
					1.69			
								217.50
		FH				S 90		
						R 45		
						S 55FZ		218.31
					5.55			
				R6		S 70	100	
								220.18
					0.36	SK 40		
						SK 20	67	220.73
				R3		SK 55		
						S 50	100	
					0.08			221.48

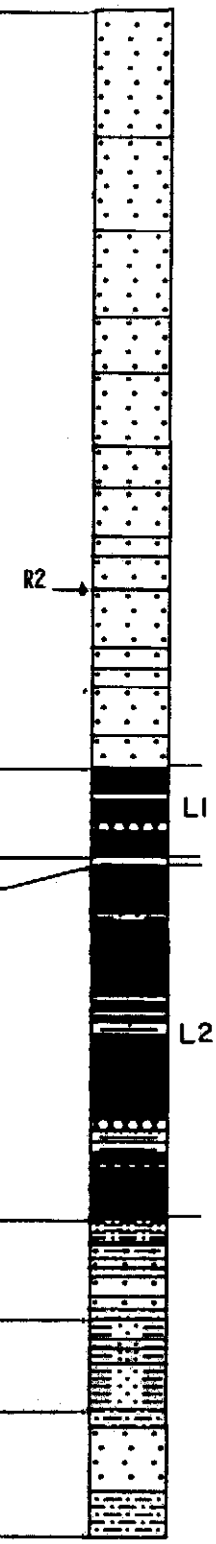


027

650167

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 44

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								136.22
						S_70		
						S_90		
						S_70	100	
						SK_50		
						S_70		
						S_50		
						S_40		
						S_75		
						S_90		
						S_50		
						SK_55		
						S_55		
						S_90		
T10	140.43				0.03		84	
T11	140.57							
						S_65		
		FH		R3				141.22
						S_80		
						S_90		
								141.81
								141.87
						S_90		
						S_90		
						S_80	30	
						S_65		
						S_90		
						S_80		
					0.03			
						S_90		144.18
T13	144.20							
T14	144.58							
T15	144.86							144.86
						S_50		
					0.02	S_40	100	
								145.45
					0.03			
								146.28

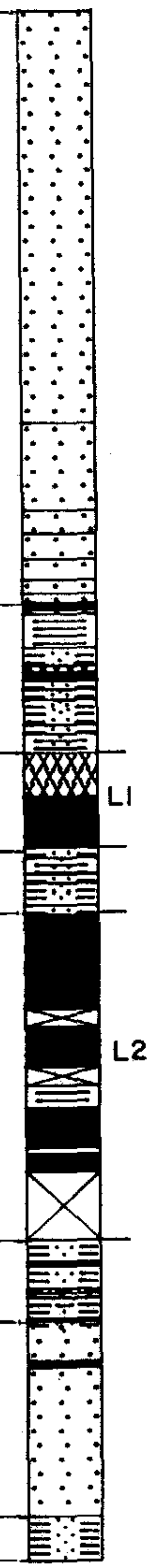


028

650168

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 45**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								101.35
					1.80			
						S 70		
						S 70		
						S 70		
							100	
						S 70		
					2.20			
						85NP		
						85NP		
						S 80		
T11	105.18				2.90			105.33
						S 90		
						SK 30		
						SK 40	83	
T12	105.99		(96.3)		0.23			
						SK 40		106.35
		FH		R3		S 90		
							90	106.99
					0.07	S 75		
						S 45		107.44
						S 40		
					0.07			
						S 90		
							61	
						S 70		
								109.64
						S 60		
						SK 25	93	
								110.19
T13	110.03							
					0.01		100	
								111.51
								111.81

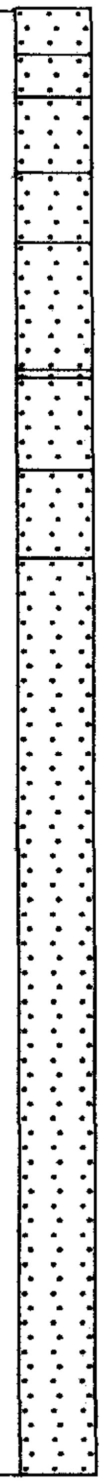


029

650169

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 46**

SAMPLE		WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
NO.	DEPTH							
								150.89
		FH		R3			100	
								160.55

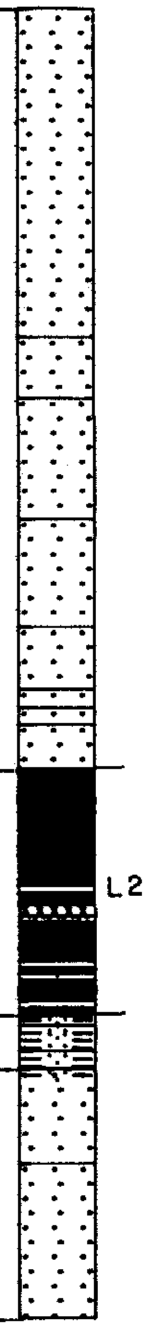


030

650170

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 106**

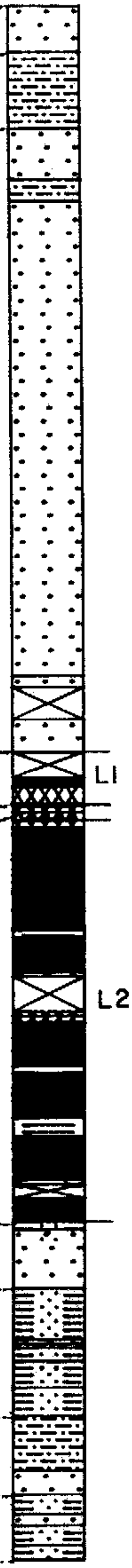
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								104.38
						S_75	100	
						S_75		
T1	108.86	FH		R3				
T2	108.98							
								109.38
						S_72		
						S_90		
						S_90	63	
						S_90		
								110.99
T3	110.99							
T4	111.24		(73.6)				100	111.36
						S_35	0	
								112.99



650171

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 108**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								62.10
					1.29			
								62.45
								63.00
					1.78			
					0.32			
							100	
				R2				
					1.53			
		FH				S 70 S 90	0	67.45
						S 90		
								67.84
								67.94
					0.15	S 55 S 90 S 80		
						S 90	46	
					2.21	S 90 S 90		
						S 70 S 90 S 90 S 90		70.80
				R3	2.28			71.27
						SK 45	75	
						SK 26 SK 45		72.18
							100	72.74
								73.20



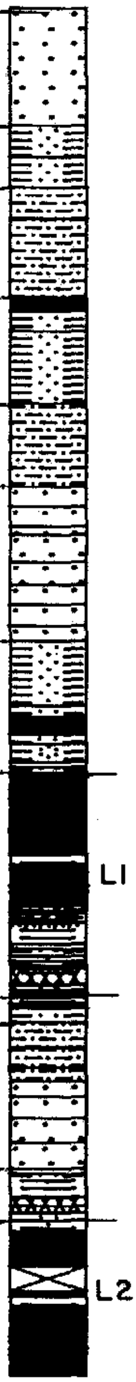
032

650172

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 119**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m2	JOINTS	R.Q.D.	DEPTH
								196.31
								197.04
								197.45
					1.05	SK 40		
				R2		SK 30		
					1.07			
								198.17
							100	
								198.86
					0.79			
								199.41
		FH						
T4	200.18				4.86			
					4.22			
								200.42
						SK 45		
							80	
T5	201.09					S 90		
						S 45		
					0.29	SK 60		201.31
						S 85		
				R3		S 90		
						S 90	36	
					0.96			
						S 90		202.75
								202.91
							55	
T6	203.08							
					1.95			
							100	
T7	203.70							
								203.87
						S 65	41	204.21



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 119**

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								202.75
								202.91
							55	
T6	203.08							
					1.95			
T7	203.70						100	203.87
						S 65	41	204.21
		RH		R3		S 90		
						S 65		
						R 55		
						S 65	9	
						R 90		
						S 90		
						S 90		206.46
						R 53		
T8	206.69					S 90		206.98
					0.27			
					0.59		100	
								208.46

L 1

L2

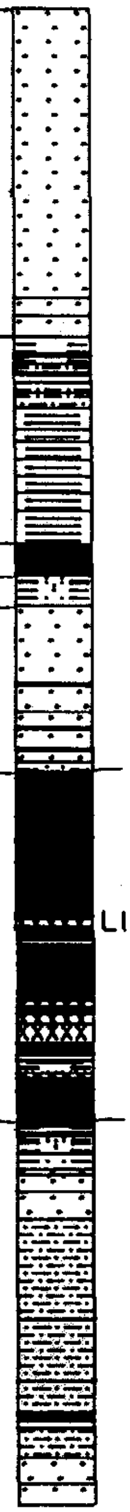
034

650174

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 123**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								119.74
					2.16			
T4	121.62				0.15			
								121.88
T5	121.74							
T6	121.88							
					0.94		100	
T7	122.11							
						SK 50		
T8	122.35							
T9	122.49				0.51			
T10	122.69	FH		R2		SK 50		123.25
T11	122.80							123.44
								123.65
					2.42			
T12	124.18							
T13	124.35				2.20	R 90		
								124.74
T15	124.61							
						R 90		
						R 90		
					0.72	R 90	87	
						R 90		
						R 80		
						R 90		127.04



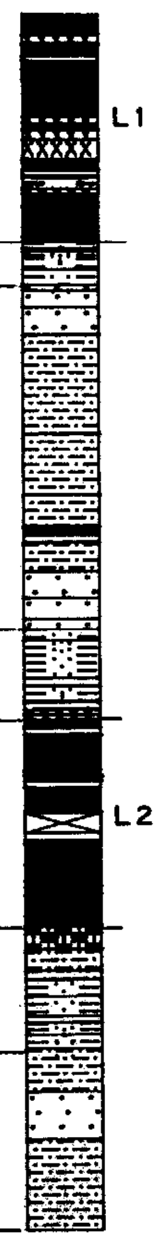
035

650175

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 123

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								127.04
T16	127.08							
								127.36
T17	127.14				3.08			
T18	127.26							
T14	127.40			R2				
					3.36			
				R3		R 70	100	
					0.15			
T19	129.26				1.74			
T20	129.43							129.64
T21	129.64				2.48			
					0.25			
T22	130.01							130.23
T23	130.12	FH				R 90		
						R 90		
						R 90		
				R2			74	
						R 90		
								131.60
T24	131.64							
T25	131.75				1.50			
T26	131.95				0.66			
T27	132.06				0.76			
								132.40
							100	
					2.55			133.60



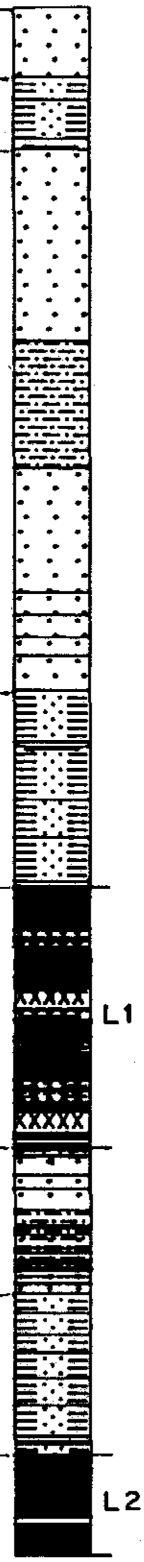
036

650176

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 132**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								264.81
								265.24
								265.72
							100	
T46	268.65							
T47	268.80							
T48	268.95							
		FH		R3				269.30
						SK 35		
						SK 35		270.61
							0	
								272.32
T49	272.37							
T50	272.59							
							100	
								273.28
T51	273.41							
T52	273.55							
T53	273.67						99	
T54	273.84		(98.8)	(29.2)		S 40		
								274.34



650177

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 132

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								272.32
T49	272.37							
T50	272.59						100	
								273.28
T51	273.41							
T52	273.55							
T53	273.67		(98.8)	(29.2)			99	
T54	273.84					S 40		
								274.34
		FH		R3		S: 85	100	
T55	276.18		(99.4)					276.01
T56	276.43							
								276.79
							100	
								278.01

L1

L2

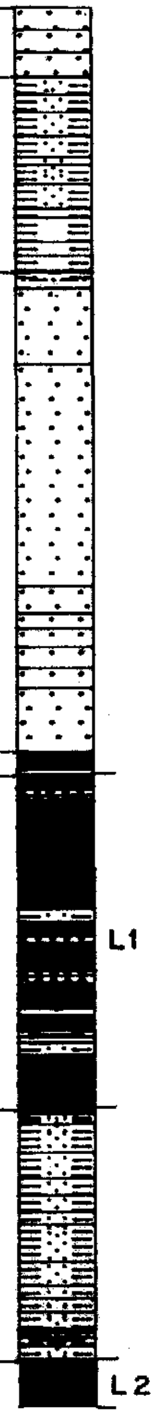
038

650178

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 151**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								165.70
T 6	165.70							
T 7	165.85							
T 8	166.00							
								166.17
T 9	166.40							
T10	166.56							
T11	166.88							
T12	167.10							
T13	167.26							
T14	167.35							
								167.46
							100	
T15	169.54							
T16	169.72	FH		R2				
T17	169.82							
T18	169.94							
T19	170.08							
						R 80		170.63
						S 90		170.78
						R 85		
						R 90		
						R 90		
						R 90	70	
						S 90		
						S 90		
						R 90		
						S 90		
						R 90		
						S 70		172.97
T20	173.09							
T21	173.28							
T22	173.67						100	
T24	174.00		(95.2)	(33.8)				
T25	174.16							
T26	174.56							
								174.65



039

650179

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 151

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								172.97
T20	173.09							
T21	173.28							
T22	173.67							
							100	
T24	174.00		(95.2)	(33.8)				
T25	174.16							
T26	174.56							
								174.65
						S 90		
						S 90		
						R 90		
						R 80		
		FH		R2		R 90	92	
						S 90		
						S 90		
						R 90		
								176.46
T27	176.60		(85.5)					
T28	176.79							
T29	176.84							
T30	176.90							
T31	176.98							
							100	177.64
T32	177.72							
T33	177.93							
T34	178.06							
T35	178.20							
T36	178.27							
T37	178.38							
								178.48

L1

L2

040

650180

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 157**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								35.94
							100	
T32	37.67							
T33	37.79							
T34	38.00							
T35	38.20							
T36	38.49							
								39.18
			SS					39.34
		FH		R2				
T37	40.00						91	
T38	40.23							
T39	40.34							
								40.68
T40	40.74						88	40.94
						S 90		
						R 90		
						S 90		
						R 90		
						R 90	60	
						S 90		
						S 90		
						S 90		
						S 90		
						S 90		
								43.42

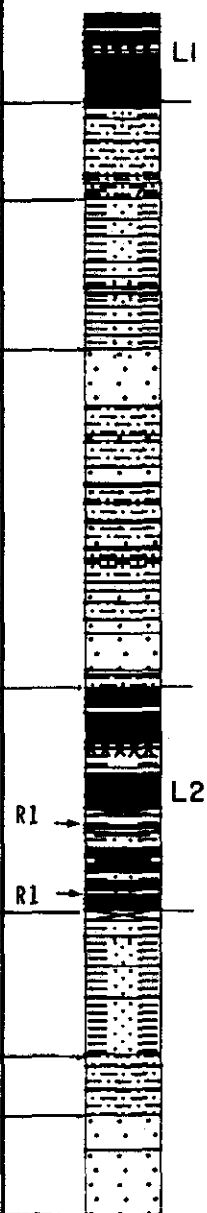
L1

650181

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 157

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								43.42
T41	43.54							
T42	43.69							
T43	43.97							
								44.07
T44	44.32							
T45	44.78							
T46	44.88							
								45.06
							100	
				R2				
T47	45.95							
T48	46.08							
T49	46.21							
T50	46.45							
		FH						
T51	46.94							
T52	47.21							
								47.30
						R 80		
				R1		SK44		
						S 70	69	
						S 90		
						R 85		48.76
T53	48.93							
T54	49.13			R2				
								49.71
T55	49.79						100	
T56	49.94							
T57	50.11							50.11
								50.76

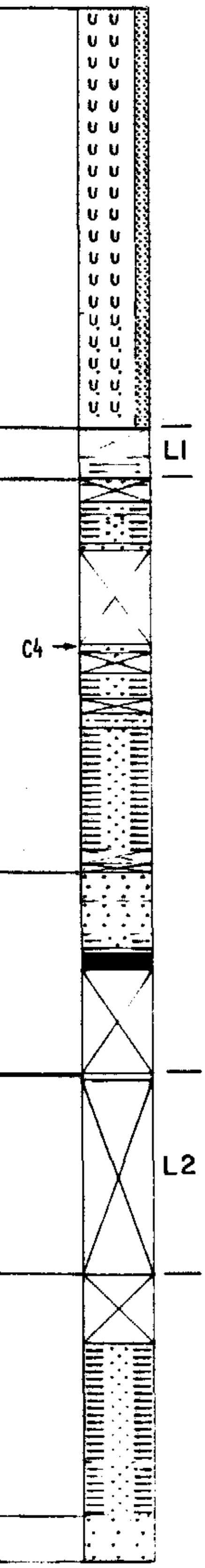


042

650182

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 164**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								2.13
								5.03
		HW		R1			0	5.37
				C4				
		SW		R1				
		HW		R1			47	8.12
		SW				S 70		
		SW		R1				9.52
								10.92
		FH		R2			93	12.60
							100	12.92

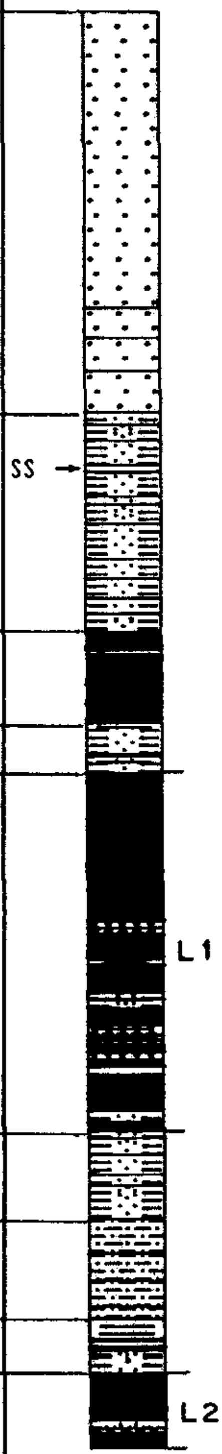


650183

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 166**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								21.25
						S 70		
		HW				S 70		
				R1				
						S 70		
T10	23.18						100	
		MW				S 65		
						S 60		
								23.87
T11	23.95							
T12	24.26							
T13	24.61							
T14	24.97							
T15	25.10							
T16	25.20							
								25.32
						R 90		
						S 80		
						S 90		25.90
						S 90		26.25
		FH		R2		S 85		
							41	
						R 90		
						S 90		
						S 90		
						R 90		
						R 90		
						S 90		
								28.60
T17	28.66							
T18	28.90		SS					
T19	28.97		(65.7)	(6.3)				29.19
T20	29.42		(93.0)	(19.9)			96	
T21	29.60							
								29.85
								30.23

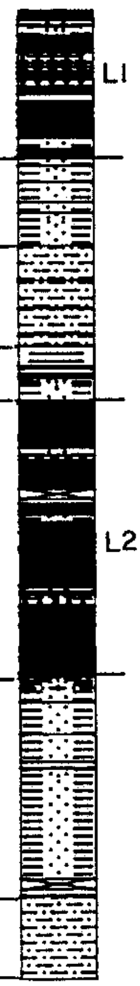


044

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 166

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								28.60
T17	28.66		SS					
T18	28.90							
T19	28.97		(65.7)	(6.3)				
								29.19
T20	29.42		(93.0)	(19.9)			96	
T21	29.60							
								29.85
								30.23
						R 90		
						S 90		
						S 90		
		FH				S 90	49	
				R2				
						S 90		
						R 90		
								32.00
T22	32.03		(81.9)					
T23	32.20		(86.2)					
T24	32.41					R 90		
							95	
			SS					
								33.47
						R 50	100	
								34.00

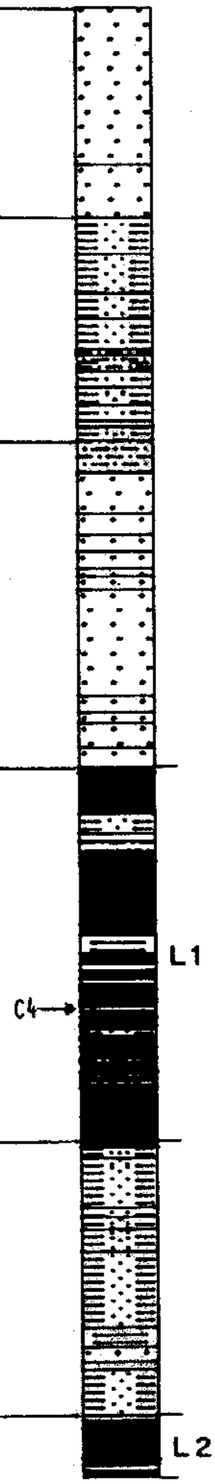


650185

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 168**

(a)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								115.06
								116.43
T38	117.45		SS					
T39	117.55		(45.2)				100	
T40	117.67					R 90		117.90
T41	118.39							
T42	118.53							
T43	118.64							
				R2				
T44	119.59	FH						
T45	119.77							
T46	119.93							120.06
						S 90		
							92	
						R 70		
						R 70		
						R 90		122.53
T47	122.97							
T48	123.03							
T49	123.11							
							100	
				R3				
				R2		SK 50		124.34



E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 168

(b)

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								122.53
T47 T48 T49	122.97 123.03 123.11	FH		R2 R3		SK 50	100	124.34
						R 90 R 80	99	125.90
T50 T51 T52 T53	125.94 126.04 126.16 126.23			R2			100	126.23 127.90

APPENDIX 1B

GEOTECHNICAL BOREHOLE RECORDS

M2 SEAM

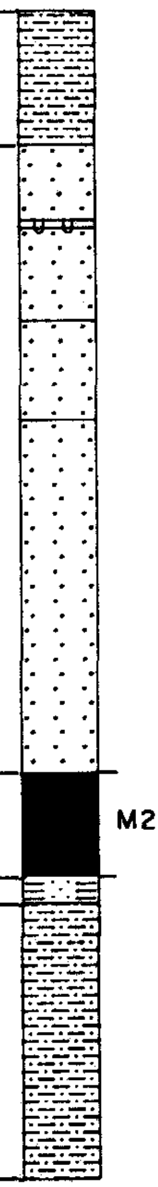
ROOF AND FLOOR SECTIONS

048

650188

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 8**

SAMPLE		WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
NO.	DEPTH							
								40.14
								41.00
								45.14
								45.82
								46.00
								47.82

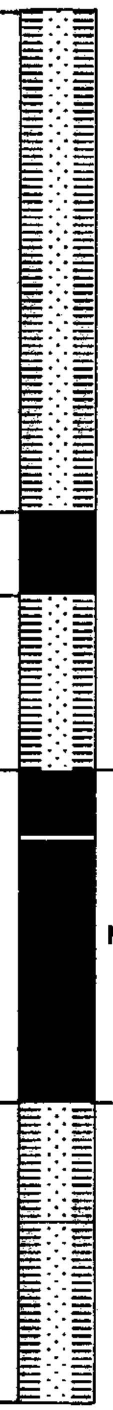


Drg No 2775

049

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 13**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								80.50
								83.79
								84.33
								85.50
		FH		R3				
								87.68
								89.68



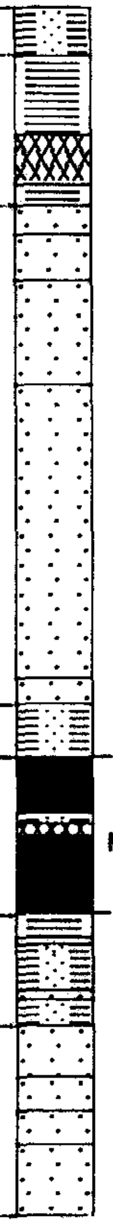
M2

050

650190

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 24**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								166.16
								166.48
				R3				167.47
				R4				
				R6				
								170.75
								171.10
						SK 45		
								172.13
								172.87
								174.13



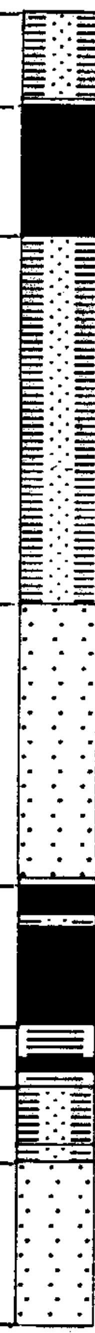
M2

051

650191

E.L.5/61 GRAY MOUNT NICHOLAS **BORHOLE RECORD** GY 26

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								171.08
		FH		R3				171.71
								172.57
		FH		R3				174.99
				R5				176.83
				R3				177.74
		FH		R3				178.15
								178.64
				R5				179.74

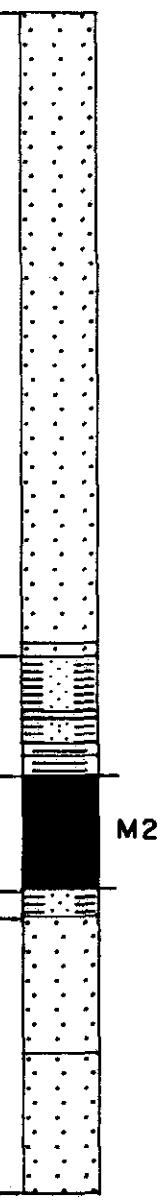


M2

052

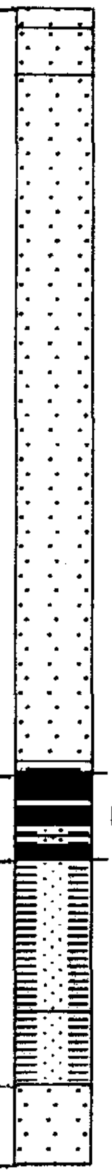
E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 28**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
		FH		R5				158.87
				R3				163.09
								163.87
				R3				164.62
				R4				164.80
				R5				
								166.62



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 33**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								40.96
		FH		R3	1.80		100	
				R1/R2				45.96
				R2/R3	0.96	SK 80	46	46.52
				R2		SK 50	70	
							100	48.00
				R3	1.55			48.52

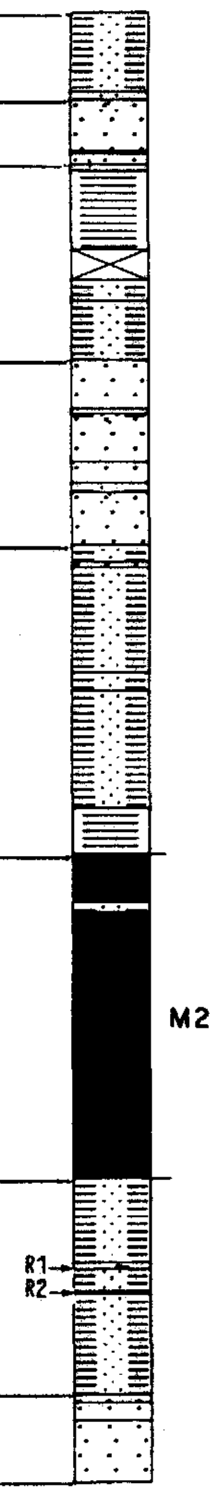


054

650194

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 34**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								23.76
				R2	0.46	SK 70	100	24.39
				R3				24.82
						SK 45	90	
					0.35	SK 45	41	26.11
					0.56			
					0.41		97	27.33
						SK 60		
							100	
		FH	RS	R2	0.06			
					0.27			29.36
						R 90 SK 45 R 90 R 90 S 90	72	31.50
			SS		0.11	SK 45		
							88	
			SS					
					0.11			32.92
							100	
					0.39			33.50



055

650195

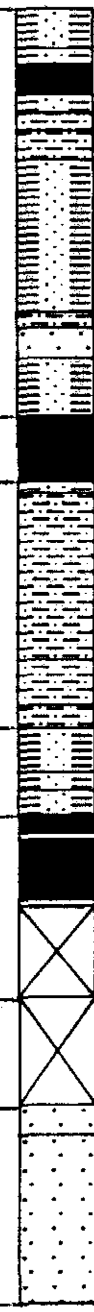
E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 36

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								21.67
					0.05			22.13
								22.55
				R3			100	
								24.62
					0.56			
			SS					
				R2				25.60
		FH				R 65 R 60FZ		25.91
			SS			S 40	97	
I07	26.47			(3.4)	0.03			
I11	26.85			(38.0)		S 70		26.72
					0.80			
				R3	0.12 1.05	R 80 R 85 R 62 R 90		
						R 90	100	
I08	28.25					70		28.25
I09	28.49			R1				28.64
					0.47			
I10	29.15			R3	0.26			29.38
							0	
				R1/R2				29.73
			SS	R3			100	30.25

M2

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 39**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								133.38
						SK 45 S 85		
					0.16			
					0.15			
						SK 45		136.05
				R3		S 75 S 85	100	
								136.49
					0.16			
		FH						
TQ4	137.96				0.10	SK 45		138.11
T05	138.40							
						S 90		138.68
						SK 65		
					0.19			
								139.88
								140.59
				R3	0.14		100	
								141.88



M2

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 40

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								140.18
							0	
					0.04			
				R3				
								143.11
						S 90 S 55	21	143.64
		FH			0.01			
								144.64
T12	144.72				0.32			
					0.20	SK 45 SK 90		145.18
				R2				
T13	146.15				0.22	SK 90 S 45	100	146.14
				R1				
						S 40		147.52
				R3				148.14

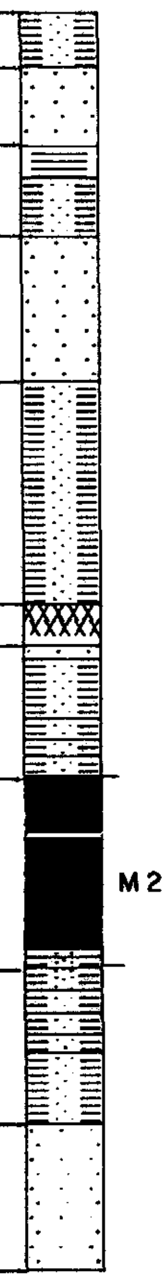
M2

058

650198

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 42**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								129.87
								130.20
					1.70			130.72
					1.04			
								131.32
					1.77			132.27
						SK 25		
								133.74
		FH		R3			100	134.01
					0.60			
T05 T06	134.49 134.63							
								134.87
						S 90 S 80 S 90 SK 60		
								136.13
T07 T08	136.43 136.57		SS		0.95			
								137.16
					1.59			
								138.13

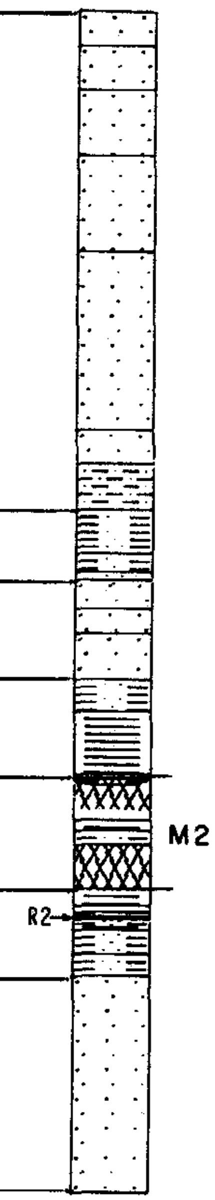


059

650199

E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 43

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								137.82
							100	
					0.64	S 30		141.06
						SK 25		
		FH		R3		SK 30		141.52
						SK 25		
								142.17
					0.32			
					0.44			142.82
			SS		1.25	R 80		
						[illegible] 15		
						S 90	69	143.54
								144.11
							100	
					0.16			145.54



060

650200

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 44**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								66.98
						SK 45		
				R3	1.40			
					1.29			
				R2		S 50 S 50	100	70.00
						S 90		70.75
						S 30		71.08
T05	71.09				2.20			71.57
		FH				R 63		
					0.07	S 45		
				R3	0.64	SK 50 S 75		72.38
						S 90 S 60		
							51	
						S 80		
						S 90		
						S 90		
					0.38	S 80		75.12
				R2			22	
					0.56			75.87
				R3			80	76.33
					0.41			
								77.53
				R2/R3	0.91		100	77.87

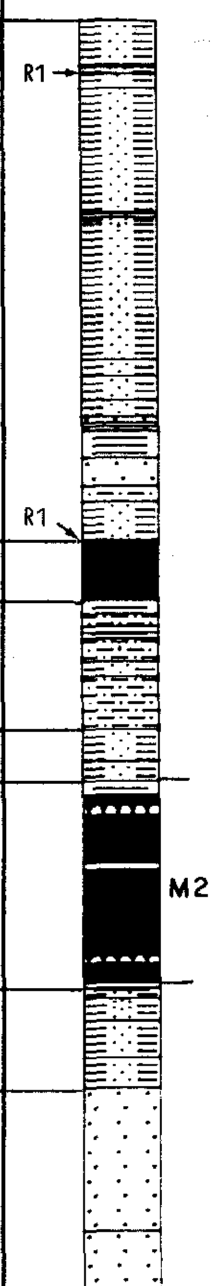
Drg No. 2775

061

650201

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 46

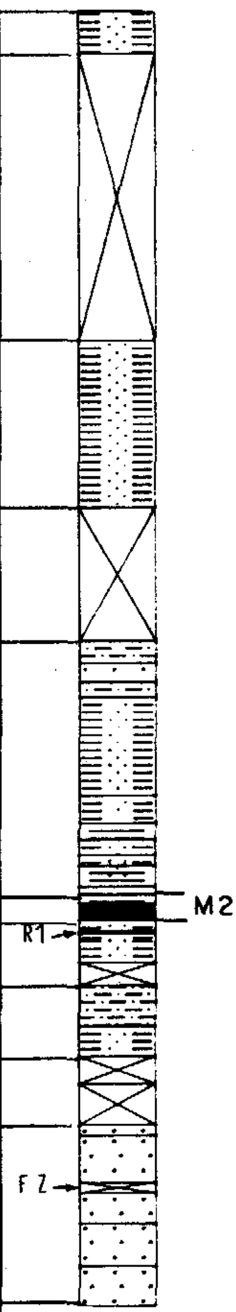
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								71.67
		MW				S 50 S 60		
		SW		R2		S 60 S 50	0	
					0.00			
					0.04	S 20 SK 40	88	
					0.02			
								75.10
								75.48
						S 40 S 90	7	
						S 90		76.33
		FH		R3				76.67
T01	76.54							
						S 90		
							0	
					0.00	S 90		
						SK 50		78.03
T02	78.10		SS			SK 45		
								78.69
							100	
						S 25		
					0.06 0.07			
								80.03



662

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** 650202 GY 106

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
		HW		R1		S_60	0	30.75 31.00
								32.90
		HW		R1			0	34.00
								34.88
		FH		R3		S_30 S_50 S_60 S_40 S_30	0 100 0	36.55 36.72 37.15 37.62
						FZ		38.07
				R2		S 70 S 90	100	39.26



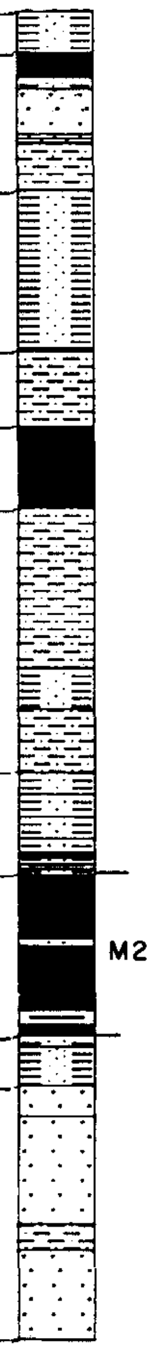
Drg No 2775

063

650203

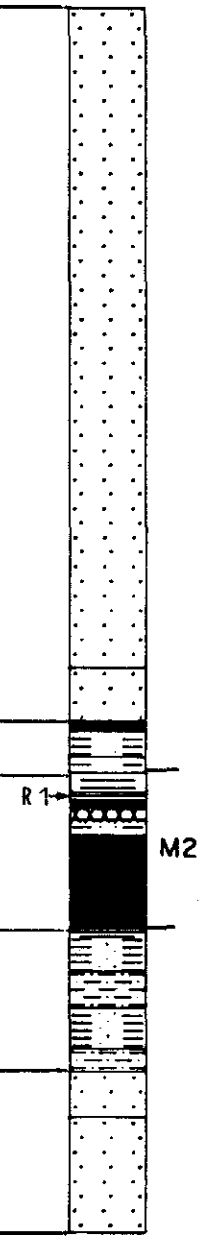
E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 119

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								123.01
						SK 60		
								123.29
								124.20
								125.24
								125.76
							100	
				R2	0.79			
								126.29
					1.65			
		FH						
					0.27			
								128.04
T1	128.18							
T2	128.33							
T3	128.47							
					1.42			
								128.71
					2.19			
						SK 40	99	
				R3	2.04			
								129.77
						SK 55		
								130.10
						SK 40		
				R2			100	
					1.10			
					1.06			
								131.77



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 123

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								51.32
		FH		R2			100	
						SK 40	90	55.98
			SS				100	56.32
						R 90 SK 60	93	
			SS	R1				
					1.53 1.63	S 90 R 90		57.35
			SS	R2	1.33			
					0.25		100	58.29
								59.35

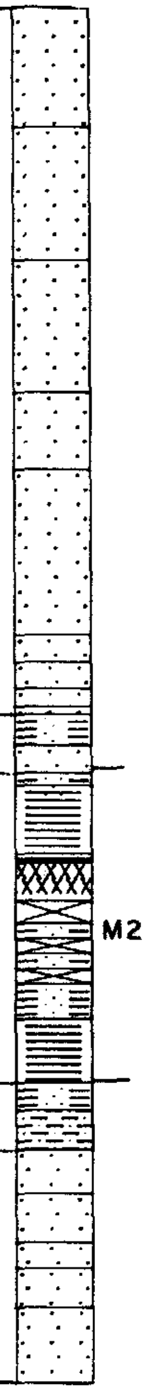


065

650205

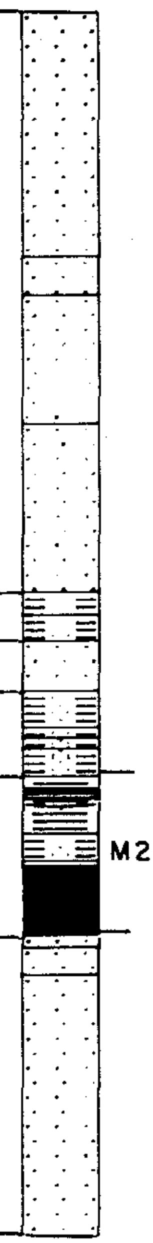
E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 132**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								193.28
							100	
I20	197.37	FH		R3				
I21	197.55							
								197.89
						S 40		
								198.28
							62	
								200.32
						SK 60		
								200.76
							100	
I22	201.37							
								202.32



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 151**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								92.92
								96.71
		FH		R2			100	97.03
								97.36
								97.92
						R 90		
			SS					
						R 80		
								98.97
								100.97

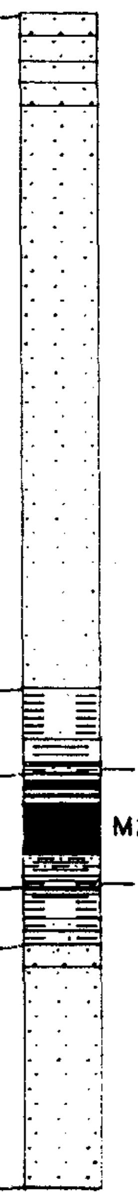

M2

067

650207

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 168

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
T34	44.26							44.26
T35	44.41							
T36	44.58							
T37	44.72							
		FH		R2			100	
			SS					48.71
								49.28
			SS					50.04
								50.40
								52.04



APPENDIX 1C

GEOTECHNICAL BOREHOLE RECORDS

M1 SEAM

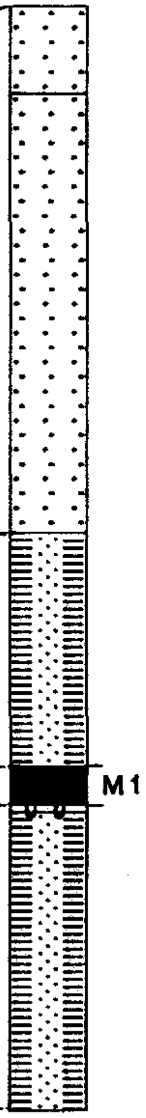
ROOF AND FLOOR SECTIONS

069

650209

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 8**

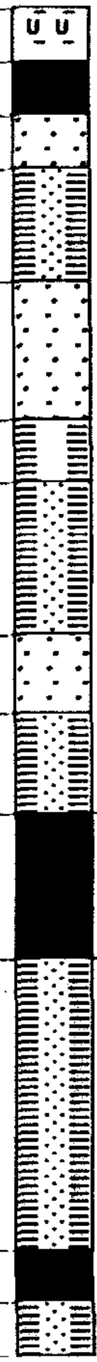
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								18.32
								21.79
								23.32
								23.57
								25.57



650210

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **DOM 13**

SAMPLE		WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
NO.	DEPTH							
								68.49
								68.89
								69.24
								69.59
								70.34
								71.25
				C2				71.66
								72.66
								73.18
								73.84
								74.79
								76.71
								77.04
								77.39



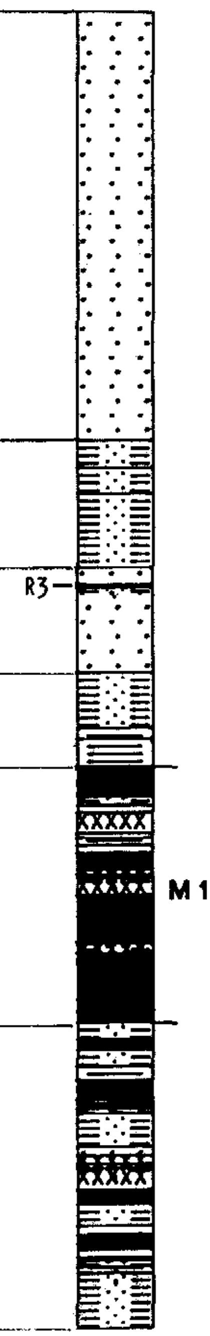
M1

071

650211

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 24

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								155.15
				R4				
								158.00
				R3				
				R4				
				R3				
								158.84
				R4				
								159.53
				R3				
								160.15
								161.84
								163.84

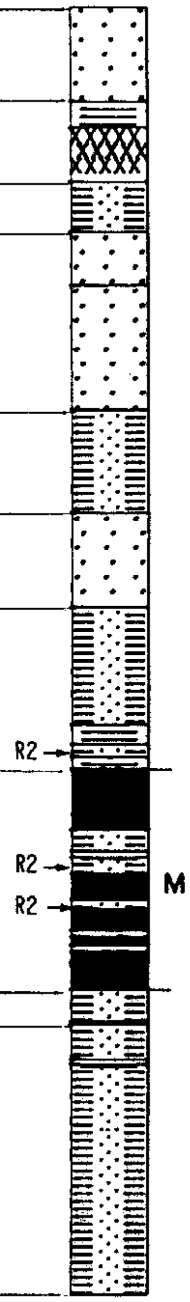


0772

650212

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 26

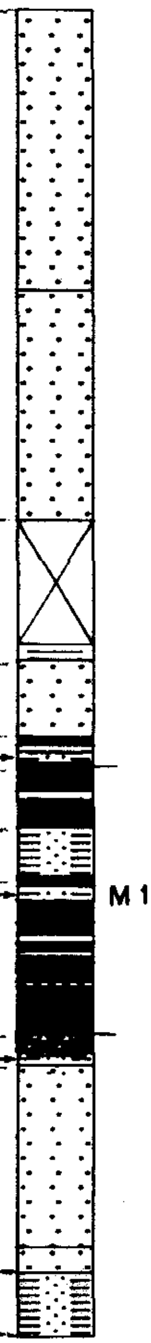
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								155.38
		FH		R5				155.99
				R3				
								156.52
				R3				156.85
				R5				158.02
				R3				158.70
				R5				159.32
				R3				
								160.38
				R3				
								161.83
				R2				162.06
				R3				163.83



650213

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 28

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								133.92
		FH		R5			100	
								137.30
				R3				
				R4				138.23
				R3		R_85		138.73
								138.92 C3
						R_80		
			SS	R2			100	139.33
				R3		R_90 SK_30 NP S_90 S_90 S_70		139.67 SSC4
								140.68
			RS					140.90 R2
				R4				
				R5				142.27
				R3				142.68

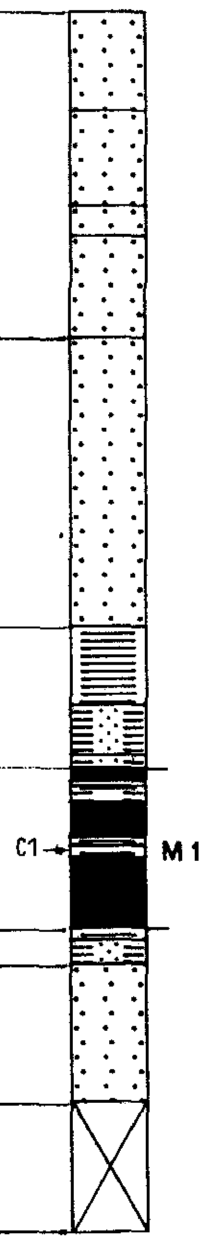


074

650214

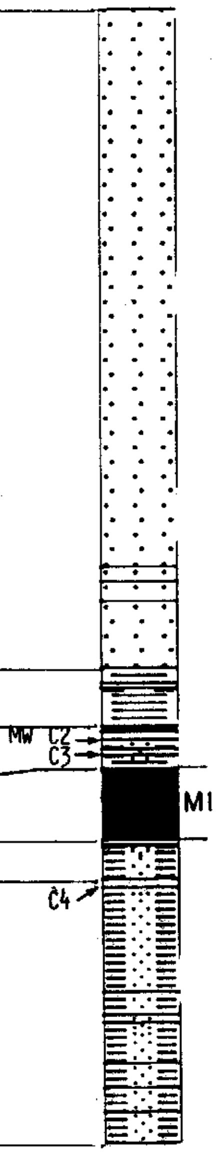
E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 33**

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								12.99
		FH			0.05		100	
							90	
				R3		SK 30 NP		
								15.15
		SW					100	
					1.15			
								17.06
				R2	0.84		80	
							100	
								17.99
				R2/R3		R 90		
				R1		S 80	0	
		FH		R2/R3	1.35	R 90 S 90	80	
								19.05
			RS		0.52			19.29
				R2			100	
					0.82			
								20.20
								21.05



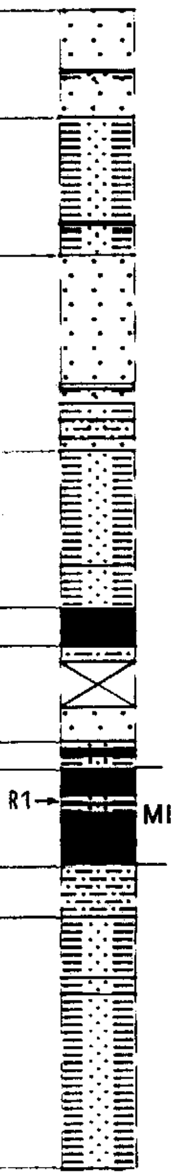
E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 36

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								7.34
		HW		R1			10	
							100	11.67
				C1		S 70		12.05
		SW		R2				
				R1				12.34
		MW				S 80		12.80
			SS	R2				13.06
T01	13.80	FH		R3			100	
T02	14.27		RS					
T03	14.43							14.80



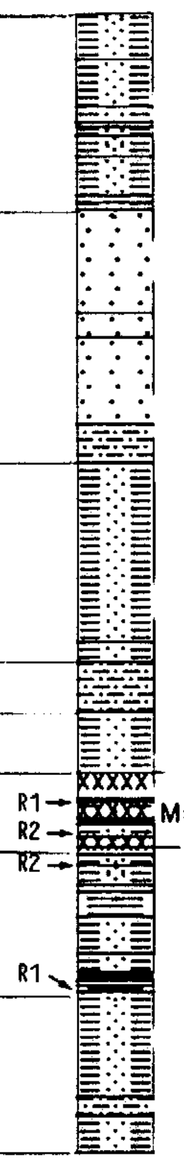
E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 39

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								120.02
					1.20	S 50 SK		
								120.73
					0.19			
								121.64
							100	
				R3		S 57		
						SK 35		
						SK 17		
								122.93
					0.10	SK 37		
		FH						
						S 90		123.97
							0	124.22
						SK 55	50	
						S 40		
					0.16			
						S 60	50	124.84
						SK 45		125.02
						SK 40	0	
						R 90		
					0.19	SK 45		125.65
						S 40		
				R3				126.00
						SK 50		
							100	
						SK 60		
					0.07			
								127.65



E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 40

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								114.40
						SK 30	0	
					0.04	SK 45	100	
						SK 40	0	
								115.69
					0.16			
							100	117.36
		FH		R3		SK 70		
					0.05			
								118.67
								119.00
					0.02			119.40
						S 75 S 90	0	
					0.02			119.89
							100	
					0.56			120.80
					0.26			
					0.14			
							50	121.89



650218

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 42

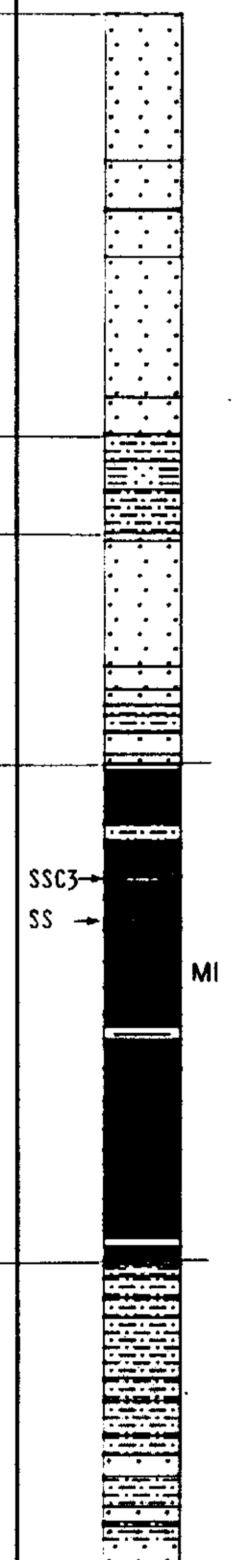
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								118.47
				R3		SK 40	100	
				R1/R2			0	119.21
					0.10	R 62 R 76 S 90		119.51 119.66
					0.23			120.25
								121.01
				R3			100	
		FH			0.14			122.97
						SK 45		
					0.14			
			SS	R2	0.53			124.12
					0.41	S 90	50	
							0	124.81
				R3		SK 55		
T03 T04	125.66 125.74							125.87
					1.15		100	
						SK 35		126.55
				R2	0.04			
				R3		SK 20		127.23
						SK 45		127.66

SS

MI

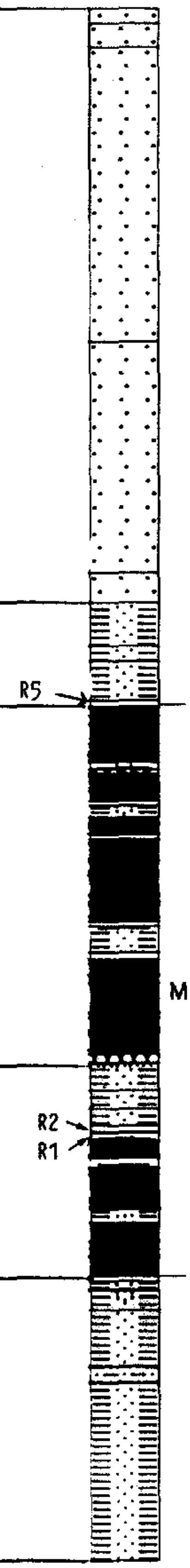
E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 43

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								114.42
							95	
							100	
							0	117.24
						SK 35		
						SK 40		117.90
							100	
T01	118.78							
							0	
T02	119.22	FH		R3		SK 35		
						SK 45		119.42
						SK 30 SK 20 SK 03 SK 60 SK 70 SK 30	100	
						SK 90	90	
						R 90		
								122.71
T03	122.81							
T04	122.95							
T05	123.48							
						S 70		
								124.71



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 44**

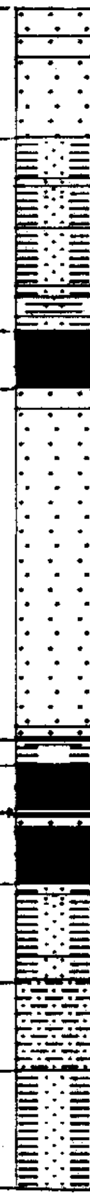
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								55.40
				R3				
								59.66
T01	59.97							
			SS					
								60.40
		FH					100	
				R2				
						S 90		
						S 90 SK 08		
								62.95
T02 T03	63.15 63.28							
				R3		S 90		
						S 90 S 90		
								64.48
T04	64.58					S 40		
								66.48



E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 119

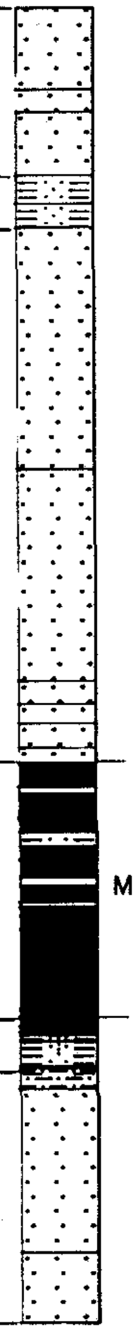
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								110.50
					0.83			
								111.35
				R2	0.29	S 45 S 70		
								112.62
							100	
					0.21			113.00
		FH		R3		S 65		
					1.22			
								115.30
			RS	R1			0	115.48
							100	
				R3			0	
								116.26
					0.27			
								116.89
				R2	0.21		100	
								117.49
					1.52			
								118.26

RS R1 → MI



E.L.5/61 GRAY MOUNT NICHOLAS BOREHOLE RECORD GY 123

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
					0.20			29.02
			SS				100	
								30.05
						SK 30	45	
								30.40
				R2	0.14			
					0.13			
							100	
				R3	0.36			
		FH						
T1 T2	33.55 33.68			R2				
					0.10			34.02
				R1/R2		S 90		
				R1			46	
				R2		S 90 R 90 S 90		
					0.78	R 70 R 90		
								35.72
T3	35.78			R1				
							100	35.96
				R2				
				R1				
								37.72



MI

E.L.5/61 GRAY MOUNT NICHOLAS **BORROWHOLE RECORD** GY 132

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m^2	JOINTS	R.Q.D.	DEPTH
								171.40
				R3			100	
T10	174.51							
		FH						
T11	175.70							
T12	175.86							
T13	175.99							
								176.13
			RS	R1				176.40
						S 35		
						S 50 85 NP	0	
						S 90		
				R3				
								178.35
T14	178.64							
T15	178.95							
							100	
								179.60
								180.00
								180.35

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** **GY 151**

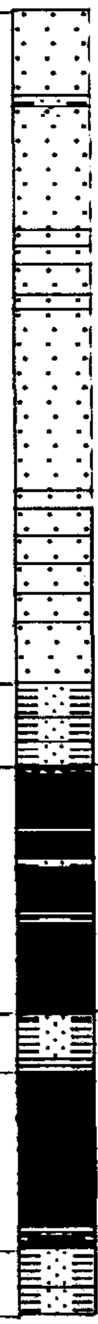
SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								66.79
				R2				
				R3				
							100	
						R 60		
T3 T4	71.24 71.42	FH		R2				
								71.66
						S 30	40	71.79
							0	
						R 90 SK 30		72.23
								72.70
						S 90		
						SK 50 S 90		
						R 90		
							100	73.79
			SS					
			SS					
				R1		SK 60 S 80	0	75.47
						S 90	100	
				R2		R 90	70	
								76.42
							100	76.74

085

650225

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 167

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								32.16
		MW		R2				
		HW		R1				
I32	33.60							
I33	33.71							
I34	33.83							
I35	34.03							
							100	
I35	35.33							
I37	35.45							
I38	35.63							
I39	36.01			R2				
								36.60
								37.16
		FH				R 90		
						R 90	70	
				R1		R 80		
								38.77
							37	39.18
				R2			55	
						S 80		
								40.34
			SS				100	
I40	40.60							40.77



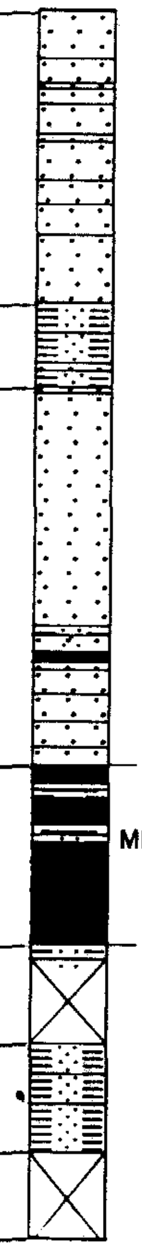
MI

086

650226

E.L.5/61 GRAY MOUNT NICHOLAS **BOREHOLE RECORD** GY 168

SAMPLE NO.	SAMPLE DEPTH	WEATHERING GRADE	SLAKING POTENTIAL (S.D.V.)	FIELD STRENGTH (U.C.S.)	POINT LOAD STRENGTH MN/m²	JOINTS	R.Q.D.	DEPTH
								17.56
T13	17.88							
T14	18.18							
							100	
T14	18.43							
T15	18.69							
T16	18.85							
								19.50
						R 90	47	
								20.06
		FH		R2				
							100	
T17	21.93							
T18	22.09							
T19	22.27							
								22.56
						R 90		
						SK 30		
						R 90		
						R 90	59	
T20	23.74					R 70		23.73
T21	24.40							24.40
T22	24.60	FH		R2			100	
								25.12
								25.73



APPENDIX 2

POINT LOAD TEST RESULTS

KEY FOR POINT LOAD TEST DATA

TYPE OF TEST

PLA	AXIAL
PLR	DIAMETRICAL

FAILURE TYPE

NF	NORMAL TENSILE FAILURE
PF	PARTIAL FAILURE

PRIMARY LITHOLOGY

SS	SANDSTONE
SC	COARSE GRAINED SANDSTONE
SM	MEDIUM GRAINED SANDSTONE
SF	FINE GRAINED SANDSTONE
ST	SILTSTONE
MS	MUDSTONE
MS	MUDSTONE
CM	CARBONACEOUS MUDSTONE
CS	CARBONACEOUS SHALE
CO	COAL
C1-C3	BRIGHT COAL
C4	BANDED COAL
C5-C8	DULL COAL
M1-M2	MID LUSTROUS COAL
TO	TONSTEIN
DO	DOLERITE

QUALIFYING LITHOLOGY

CO	COALY
CS	CARBONACEOUS
LS	CALCAREOUS
LT	LITHIC
SA	ARENACEOUS
SA	ARENACEOUS
SL	SILTY
CL	ARGILLACEOUS
FO	FOSSILIFEROUS
BR	BRECCIATED
CR	CINDERED
VC	VERY COARSE GRAINED
MC	MEDIUM TO COARSE GRAINED
MF	FINE TO MEDIUM GRAINED
VF	VERY FINE GRAINED
VA	BANDS
LM	LAMINAE
MP	WITH MUD PELLETS
WX	SLIGHTLY WEATHERED
WE	MODERATELY WEATHERED
WH	HIGHLY WEATHERED

089

650229

POINT LOAD TEST RESULTS

BOREHOLE GY33

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
8.25	5.0	PLA	0.4	0.16	SS	NF	MOIST
10.23	5.0	PLA	0.1	0.04	SS	NF	MOIST
12.11	5.0	PLA	0.3	0.12	SS	NF	MOIST
13.84	4.5	PLA	0.1	0.05	SS	PF	MOIST
16.85	4.0	PLA	2.0	1.15	SS	PF	DRY
17.09	4.0	PLA	1.5	0.84	C8	PF	DRY
18.67	4.5	PLA	3.0	1.35	C7	NF	DRY
19.24	4.5	PLA	1.1	0.52	MS	NF	DRY
19.95	4.0	PLA	1.5	0.82	SF	PF	DRY
25.04	5.0	PLA	1.6	0.64	MS	NF	DRY
26.15	3.5	PLA	5.5	3.75	SS	PF	DRY
28.15	5.0	PLA	4.5	1.80	SF/CM	NF	DRY
29.20	4.5	PLA	4.9	2.30	SM	NF	DRY
30.86	4.5	PLA	5.5	2.60	SM	NF	DRY
31.94	5.0	PLA	5.6	2.24	SM	NF	DRY
35.66	5.0	PLA	3.5	1.40	SM	NF	DRY
36.69	5.0	PLA	4.8	1.92	MS	NF	DRY
37.92	6.0	PLA	6.0	1.81	MS	NF	DRY
40.87	6.5	PLA	12.5	3.35	SFLS	NF	DRY
44.45	6.0	PLA	6.0	1.80	SM	NF	DRY
46.11	4.5	PLA	0.2	0.96	C7	NF	DRY
47.05	4.0	PLA	2.8	1.55	MS	NF	DRY
48.48	5.5	PLA	4.4	1.51	SSMS	NF	DRY
50.65	4.5	PLA	4.0	1.87	SS	NF	DRY
54.29	5.0	PLA	4.7	1.88	SS	NF	DRY
55.47	4.0	PLA	4.6	2.65	SS	NF	DRY
59.60	4.5	PLA	4.0	1.87	SS	NF	DRY
60.11	5.0	PLA	9.0	3.60	SSLS	NF	DRY
60.32	3.7	PLA	12.0	7.00	SSLS	NF	DRY
60.93	4.0	PLA	4.2	2.25	SS	NF	DRY
62.35	4.0	PLA	3.7	1.95	MS	NF	DRY
64.15	5.5	PLA	3.4	1.95	SS	PF	DRY
65.01	5.5	PLA	4.6	1.60	SS	NF	DRY
65.87	4.5	PLA	4.7	2.20	SS	NF	DRY
67.19	4.0	PLA	0.8	0.45	MS	PF	DRY
68.80	6.0	PLA	4.8	1.44	SS	NF	DRY
70.68	4.0	PLA	4.5	2.50	SS	NF	DRY
72.50	4.0	PLA	3.4	1.87	SC	NF	DRY
73.43	4.0	PLA	3.9	2.00	SC	NF	DRY
74.97	4.5	PLA	5.5	2.55	SS	NF	DRY
76.29	4.0	PLA	6.3	3.60	SS	NF	DRY
78.96	4.0	PLA	4.5	2.50	SS	NF	DRY
79.41	4.5	PLA	6.3	2.95	SS	NF	DRY
81.05	5.0	PLA	5.9	2.36	SS	NF	DRY
82.03	5.0	PLA	4.8	1.92	SS	PF	DRY
84.10	4.0	PLA	3.9	2.00	SS	NF	DRY
85.35	4.0	PLA	3.6	1.95	SS	NF	DRY
87.20	4.5	PLA	2.9	1.37	SS	NF	DRY
88.14	4.5	PLA	5.1	2.40	SS	NF	DRY
90.25	4.0	PLA	3.8	2.00	SS	NF	DRY
93.22	5.0	PLA	6.5	2.60	SS	NF	DRY
95.50	4.5	PLA	4.0	1.87	SS	NF	DRY
99.35	5.0	PLA	5.0	2.00	SSMP	NF	DRY
100.81	6.0	PLA	7.5	2.25	SS	NF	DRY
102.45	5.0	PLA	6.8	2.75	SS	NF	DRY
103.56	5.5	PLA	5.3	1.83	SS	PF	DRY
103.78	4.0	PLA	3.6	1.95	MS	NF	DRY
104.68	4.0	PLA	3.8	2.00	MS	NF	DRY
105.35	6.0	PLA	4.4	1.33	MS	NF	DRY
105.67	5.0	PLA	7.1	2.84	MS	PF	DRY
106.63	4.5	PLA	3.5	1.60	MS	NF	MOIST
107.47	5.0	PLA	3.7	1.48	MS	NF	MOIST
107.76	5.0	PLA	9.1	3.64	SSLS	NF	DRY
108.40	4.5	PLA	3.5	1.60	SS	NF	DRY
109.34	4.5	PLA	3.8	1.79	SS	NF	MOIST
113.37	5.0	PLA	3.1	1.24	SS	NF	MOIST

POINT LOAD TEST RESULTS

BOREHOLE GY33

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
111.82	5.0	PLA	9.0	3.60	SS	NF	MOIST
115.21	4.5	PLA	4.4	2.00	MS	NF	MOIST
115.51	6.0	PLA	4.2	1.25	MS	PF	WET
115.78	5.0	PLA	2.2	0.88	MS	NF	WET
116.53	4.5	PLA	4.2	1.95	MS	PF	WET
119.52	6.0	PLA	0.9	0.02	MS	NF	WET
120.13	4.0	PLA	2.1	1.20	MS	NF	WET
120.77	4.5	PLA	1.7	0.80	MS	NF	MOIST
120.87	5.5	PLA	3.4	1.16	CO	PF	MOIST
122.75	4.0	PLA	1.0	0.56	MS	PF	MOIST
123.07	4.5	PLA	2.8	1.30	MS	NF	MOIST
124.14	4.0	PLA	5.1	2.95	MS	NF	MOIST
124.61	4.5	PLA	4.3	2.00	MS	NF	MOIST
126.20	5.0	PLA	5.5	2.20	SS	NF	MOIST
127.33	5.0	PLA	5.7	2.28	SS	PF	DRY
129.04	5.0	PLA	5.0	2.00	SS	PF	DRY
129.49	4.0	PLA	5.1	2.85	SSMP	NF	DRY
131.39	4.5	PLA	4.2	1.90	SS	NF	DRY
132.83	4.8	PLA	5.5	2.37	SS	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY34

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
19.45	4.0	PLA	0.8	0.43	MS	NF	DRY
19.83	5.0	PLA	0.5	0.19	MS	NF	DRY
20.75	5.2	PLA	0.8	0.28	CMCO	PF	DRY
22.10	5.0	PLA	0.7	0.27	MS	NF	DRY
23.30	5.3	PLA	0.0	0.02	MS	NF	DRY
23.91	4.5	PLA	1.0	0.46	MS	NF	DRY
25.45	4.5	PLA	0.8	0.35	MSCS	NF	DRY
26.30	5.1	PLA	1.4	0.56	SS	PF	DRY
26.75	5.0	PLA	1.0	0.41	MS	NF	DRY
28.70	4.9	PLA	0.1	0.06	MS	NF	DRY
29.21	5.1	PLA	0.7	0.27	MS	PF	DRY
31.85	5.2	PLA	0.3	0.11	MSCS	NF	DRY
32.77	5.1	PLA	0.3	0.11	MS	PF	DRY
33.47	5.6	PLA	1.2	0.39	SS	NF	DRY
34.16	4.0	PLA	1.5	0.83	SS	NF	DRY
34.35	4.2	PLA	0.8	0.39	MS	NF	DRY
35.40	4.8	PLA	1.4	0.61	SS	NF	DRY
36.35	4.8	PLA	1.0	0.44	SS	PF	DRY
37.57	4.0	PLA	2.7	1.49	SSLS	NF	DRY
37.62	5.0	PLA	1.6	0.65	SSLS	NF	DRY
39.29	5.0	PLA	1.0	0.41	SS	PF	DRY
40.24	4.5	PLA	0.5	0.24	MS	NF	DRY
41.54	4.0	PLA	0.1	0.08	MS	NF	DRY
42.76	4.8	PLA	0.8	0.32	MS	NF	DRY
43.64	4.5	PLA	1.3	0.60	SS	NF	DRY
45.45	4.7	PLA	1.2	0.52	SS	NF	DRY
49.52	4.8	PLA	1.6	0.67	SS	NF	DRY
51.78	4.5	PLA	1.5	0.69	SS	NF	DRY
55.69	5.0	PLA	3.4	1.35	SSLS	NF	DRY
57.49	4.3	PLA	2.0	0.98	SS	NF	DRY
62.30	4.6	PLA	1.6	0.74	SSLT	NF	DRY
62.86	3.9	PLA	2.9	1.66	CM	PF	DRY
63.02	4.5	PLA	0.9	0.43	CM	PF	DRY
63.15	4.8	PLA	1.2	0.51	CM	PF	DRY
63.61	4.2	PLA	1.6	0.82	SS	NF	DRY
69.64	4.2	PLA	1.4	0.73	SS	NF	DRY
72.15	4.8	PLA	1.8	0.78	SF	NF	DRY
75.33	5.1	PLA	1.3	0.51	SS	NF	DRY
77.07	5.3	PLA	1.3	0.47	SS	NF	DRY
80.81	6.2	PLA	0.8	0.23	SS	PF	DRY
82.98	4.5	PLA	1.2	0.57	MS	NF	DRY
83.90	4.2	PLA	2.5	1.31	MS	NF	DRY
86.80	4.9	PLA	1.0	0.40	MS	PF	DRY
87.69	5.0	PLA	2.1	0.82	MS	PF	DRY
88.45	4.5	PLA	1.8	0.84	MS	NF	DRY
88.66	5.2	PLA	1.9	0.70	MS	NF	DRY
89.41	5.3	PLA	1.9	0.68	SS	NF	DRY
90.40	5.0	PLA	1.6	0.63	SS	PF	DRY
93.10	4.8	PLA	2.3	0.99	SS	PF	DRY
94.29	4.5	PLA	1.0	0.46	SS	NF	DRY
96.45	5.1	PLA	0.8	0.32	SS	NF	DRY
97.07	5.0	PLA	1.4	0.55	SF	PF	DRY
99.44	4.5	PLA	2.0	0.93	SS	NF	DRY
101.61	5.0	PLA	2.0	0.79	SS	NF	DRY
102.22	4.8	PLA	0.3	0.13	MS	PF	DRY
103.71	4.8	PLA	0.6	0.25	CO	PF	DRY
105.14	4.7	PLA	1.9	0.85	MS	NF	DRY
106.10	6.0	PLA	1.5	0.45	SS	NF	DRY
107.14	5.0	PLA	0.5	0.19	SS	NF	DRY
107.47	5.0	PLA	0.4	0.16	SS	NF	DRY
108.65	5.0	PLA	2.8	1.11	SS	NF	DRY
110.36	4.8	PLA	3.1	1.33	SS	NF	DRY
111.22	4.9	PLA	1.6	0.67	SS	PF	DRY
111.85	4.2	PLA	6.0	3.09	SSLS	NF	DRY
114.08	4.2	PLA	0.8	0.44	SS	NF	DRY
114.68	5.2	PLA	2.3	0.84	SS	PF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE GY36

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
13.54	6.5	PLA	1.1	0.28	MS	NF	DRY
15.26	6.8	PLA	1.4	0.33	MS	NF	DRY
17.82	7.1	PLA	1.8	0.40	MS	NF	DRY
18.66	6.6	PLA	1.8	0.43	MS	PF	DRY
22.10	4.2	PLA	0.1	0.05	MS/SS	NF	DRY
24.77	4.3	PLA	1.1	0.56	MS/SS	NF	DRY
26.51	3.8	PLA	0.1	0.03	MS	NF	DRY
27.06	5.7	PLA	2.6	0.80	C7	NF	DRY
27.36	5.5	PLA	0.3	0.12	CO	PF	DRY
27.53	4.9	PLA	2.6	1.05	CO	NF	DRY
28.69	5.0	PLA	1.2	0.47	SS	PF	MOIST
29.15	4.8	PLA	0.6	0.26	SS	PF	MOIST
33.25	4.5	PLA	2.2	1.05	SS	NF	MOIST
38.79	6.0	PLA	8.0	2.30	SSLS	NF	DRY
42.56	5.0	PLA	0.5	0.20	SF	NF	DRY
45.05	4.8	PLA	2.6	1.12	SS	NF	MOIST
50.87	4.2	PLA	2.6	1.30	SS	NF	MOIST
51.53	4.2	PLA	2.4	1.28	SS	NF	MOIST
54.95	5.0	PLA	2.4	0.96	SS	NF	MOIST
58.29	5.2	PLA	1.8	0.67	SS	NF	MOIST
63.02	5.9	PLA	0.5	0.17	SS	PF	MOIST
63.97	5.2	PLA	2.6	1.00	C8	NF	MOIST
66.07	5.5	PLA	1.8	0.70	SS	NF	MOIST
69.96	5.0	PLA	3.1	1.26	SS	NF	DRY
72.91	5.3	PLA	2.3	0.86	SS	PF	DRY
75.27	5.0	PLA	2.3	0.90	SS	PF	DRY
79.56	4.9	PLA	2.1	0.87	SS	PF	DRY
81.51	4.5	PLA	2.3	1.09	SS	NF	DRY
82.56	5.5	PLA	3.1	1.12	MS	PF	DRY
83.26	5.0	PLA	3.2	1.28	MS	NF	DRY
83.68	4.2	PLA	3.2	1.75	MS	PF	DRY
84.88	5.5	PLA	2.5	0.90	MS	PF	DRY
86.03	4.5	PLA	2.8	1.30	SS	NF	DRY
86.43	4.5	PLA	3.2	1.55	MS	PF	DRY
86.96	5.0	PLA	3.3	1.30	SS	PF	DRY
88.86	5.5	PLA	3.2	1.20	SS/MS	PF	DRY
89.51	4.5	PLA	3.3	0.00	MS	PF	DRY
90.36	4.0	PLA	3.2	1.70	MS/SF	NF	DRY
91.07	5.5	PLA	3.1	1.12	SS	NF	DRY
92.94	4.0	PLA	3.3	1.80	SS	NF	DRY
94.41	5.0	PLA	0.8	0.32	SS	PF	DRY
96.06	5.0	PLA	0.4	0.16	SS	NF	DRY
97.47	4.5	PLA	0.8	0.37	SS	NF	DRY
99.49	5.0	PLA	3.3	1.30	SSMP	NF	DRY
99.92	5.5	PLA	1.8	0.70	SSMP	PF	DRY
100.96	4.0	PLA	0.4	0.23	SS	NF	DRY
102.40	5.0	PLA	1.0	0.40	SS	PF	DRY
103.10	5.3	PLA	0.4	0.15	SS	PF	DRY
103.40	5.5	PLA	3.0	1.05	SS	PF	DRY
103.86	4.7	PLA	1.0	0.43	SS	PF	DRY
104.40	5.3	PLA	1.8	0.65	SS	PF	DRY
104.65	5.0	PLA	3.0	1.20	SS	PF	DRY
107.11	4.5	PLA	3.2	1.54	MS	NF	DRY
107.28	5.0	PLA	3.3	1.32	MS	PF	DRY
107.89	5.0	PLA	3.3	1.32	MS	PF	DRY
108.56	4.5	PLA	3.3	1.58	MS	NF	DRY
109.39	5.0	PLA	3.4	1.36	SS	NF	DRY
109.87	5.0	PLA	3.3	1.47	MS/SF	NF	DRY
110.80	5.1	PLA	3.3	1.25	SS	PF	DRY
111.88	5.0	PLA	3.2	1.28	SS	PF	DRY
114.02	4.8	PLA	13.2	4.70	SSLS	NF	DRY
114.94	5.5	PLA	1.0	0.36	SS	PF	DRY
116.75	5.0	PLA	0.8	0.32	SS	PF	DRY
117.54	4.5	PLA	0.6	0.28	SS	PF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY39

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
13.21	4.5	PLA	0.1	0.05	SF	NF	MOIST
19.32	4.2	PLA	0.1	0.05	SM	NF	MOIST
22.32	5.0	PLA	0.1	0.04	SM	NF	MOIST
25.27	5.3	PLA	0.0	0.02	SM	PF	MOIST
29.49	4.5	PLA	0.4	0.18	MS	PF	MOIST
32.16	4.5	PLA	0.4	0.18	MS	NF	MOIST
33.76	4.0	PLA	0.5	0.29	MS	NF	MOIST
35.54	4.5	PLA	0.7	0.33	SF	NF	MOIST
38.24	5.0	PLA	2.0	0.80	SM	NF	MOIST
39.98	5.0	PLA	3.1	1.24	SM	PF	MOIST
40.89	4.8	PLA	1.0	0.43	SM	NF	MOIST
42.97	5.2	PLA	1.2	0.50	SM/CM	PF	MOIST
43.46	4.3	PLA	0.2	0.09	SMMP	NF	MOIST
46.64	4.5	PLA	2.0	0.92	SM	PF	MOIST
48.06	5.0	PLA	1.7	0.68	SM	PF	MOIST
48.58	5.3	PLA	0.1	0.04	MS	PF	MOIST
48.76	4.5	PLA	0.0	0.02	MS	NF	MOIST
49.45	5.0	PLA	0.0	0.02	MSCS	PF	MOIST
49.80	5.0	PLA	0.0	0.02	MS	NF	MOIST
50.03	4.9	PLA	4.2	1.72	C6	PF	MOIST
50.75	4.5	PLA	0.3	0.14	MS	NF	MOIST
51.51	4.0	PLA	0.1	0.06	MS	PF	MOIST
52.45	5.0	PLA	1.1	0.44	SF	PF	MOIST
53.10	5.6	PLA	2.9	0.97	MS	PF	MOIST
54.05	5.2	PLA	0.3	0.11	ST	PF	MOIST
54.31	4.5	PLA	0.0	0.02	MSCS	NF	MOIST
55.04	4.6	PLA	0.1	0.07	MSST	PF	MOIST
55.39	5.0	PLA	0.8	0.32	MSST	PF	MOIST
55.95	5.0	PLA	0.1	0.04	ST	PF	MOIST
56.72	5.0	PLA	0.1	0.04	MS	PF	MOIST
57.15	5.0	PLA	1.3	0.52	MSLS	PF	MOIST
57.70	4.7	PLA	0.2	0.09	MSLS	PF	MOIST
58.97	3.6	PLA	0.1	0.06	MS	NF	MOIST
60.09	4.9	PLA	0.1	0.04	ST	PF	MOIST
60.83	6.3	PLA	4.0	1.10	MS	PF	DRY
62.36	4.1	PLA	3.0	1.60	C7	NF	DRY
63.12	4.1	PLA	2.5	1.34	STCS	NF	DRY
63.57	5.7	PLA	0.0	0.02	ST	PF	DRY
65.43	5.0	PLA	3.0	1.20	ST	NF	DRY
67.61	5.4	PLA	0.6	0.22	MS	NF	DRY
68.33	5.5	PLA	0.0	0.02	MS	NF	DRY
69.04	4.0	PLA	0.0	0.03	CO	NF	DRY
71.17	4.4	PLA	0.0	0.02	MSFO	NF	DRY
72.41	4.2	PLA	0.3	0.12	CO	NF	DRY
72.57	4.5	PLA	0.1	0.05	MS	NF	DRY
73.67	5.0	PLA	2.5	1.00	MS	PF	DRY
74.04	4.5	PLA	0.0	0.02	MS	PF	DRY
75.88	4.5	PLA	5.5	2.45	MS	NF	DRY
77.16	5.4	PLA	4.0	1.40	MS	PF	DRY
78.56	5.5	PLA	0.3	0.17	MS	PF	DRY
79.84	5.2	PLA	2.7	1.05	ST	PF	DRY
80.99	4.2	PLA	2.0	1.20	MS	PF	DRY
81.40	5.3	PLA	1.3	0.48	MS	PF	DRY
81.97	5.8	PLA	0.1	0.03	ST	PF	DRY
82.38	6.0	PLA	2.2	0.68	ST	NF	DRY
83.00	4.5	PLA	0.0	0.02	MS	NF	DRY
85.33	5.0	PLA	0.0	0.02	MS	NF	DRY
86.62	4.7	PLA	4.0	1.74	SSVF	NF	DRY
86.88	4.5	PLA	1.6	0.75	MSLM	NF	DRY
87.53	4.3	PLA	0.1	0.05	MSCO	NF	DRY
88.28	4.6	PLA	0.1	0.04	MS	PF	DRY
89.12	5.5	PLA	0.1	0.03	CM	PF	DRY
90.98	5.3	PLA	0.1	0.04	STCS	PF	DRY
92.73	5.5	PLA	0.0	0.02	MS	NF	DRY
93.65	4.3	PLA	0.3	0.13	MS	NF	DRY
94.62	5.0	PLA	0.1	0.04	MS	NF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE GY39

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
95.94	4.3	PLA	0.2	0.10	CM	NF	DRY
98.83	4.0	PLA	0.8	0.44	SF	NF	DRY
106.33	5.8	PLA	0.9	0.30	SM	NF	DRY
104.77	4.7	PLA	1.0	0.44	SF	NF	DRY
99.75	4.4	PLA	0.8	0.39	SM	NF	DRY
107.60	5.2	PLA	0.4	0.15	SF	NF	DRY
107.65	4.7	PLA	0.7	0.30	SF	NF	DRY
109.34	6.0	PLA	0.3	0.09	SM	PF	MOIST
110.04	5.0	PLA	0.3	0.12	SM	NF	MOIST
112.71	6.2	PLA	0.8	0.24	SM	PF	DRY
113.87	4.9	PLA	2.0	0.82	SMLS	PF	MOIST
115.28	5.8	PLA	3.1	0.99	SMMP	NF	MOIST
117.53	5.0	PLA	3.2	1.28	SMLS	NF	MOIST
118.34	6.2	PLA	6.0	1.69	SFLS	NF	MOIST
120.62	5.5	PLA	3.4	1.20	SFLS	NF	MOIST
121.14	5.2	PLA	0.5	0.19	MS	NF	DRY
123.30	4.1	PLA	0.2	0.10	MS	NF	DRY
124.66	5.8	PLA	0.5	0.16	SF	NF	MOIST
126.28	4.1	PLA	0.4	0.19	MS	NF	MOIST
127.42	5.1	PLA	0.2	0.07	MS	NF	DRY
129.02	5.5	PLA	0.3	0.11	ST	NF	DRY
132.13	3.5	PLA	0.2	0.12	C7	NF	DRY
133.34	4.0	PLA	0.3	0.15	MS	PF	DRY
134.14	5.0	PLA	0.4	0.16	ST	PF	DRY
135.18	4.0	PLA	0.3	0.15	MS	PF	DRY
136.62	5.0	PLA	0.4	0.16	ST	PF	DRY
137.96	4.3	PLA	0.2	0.10	MS	NF	DRY
139.23	4.3	PLA	0.4	0.19	C7	PF	DRY
141.31	5.5	PLA	0.4	0.14	SF	NF	DRY
142.33	5.3	PLA	0.2	0.07	SF	NF	DRY
145.28	3.8	PLA	0.5	0.29	SM	NF	DRY
147.87	4.2	PLA	0.3	0.17	SFFO	PF	DRY
151.28	4.8	PLA	0.1	0.05	SF	NF	DRY
154.28	4.8	PLA	0.1	0.05	SSMF	NF	DRY
154.69	4.1	PLA	1.0	0.55	SSMF	NF	DRY
155.44	4.7	PLA	0.8	0.34	SF	PF	DRY
158.58	4.0	PLA	0.6	0.33	SSMC	NF	DRY
161.17	6.8	PLA	0.9	0.24	SSMF	PF	DRY
161.76	4.4	PLA	0.6	0.29	SC	NF	DRY
163.28	5.0	PLA	0.5	0.20	SM	NF	DRY
164.26	5.0	PLA	1.0	0.40	SFLS	NF	DRY
167.28	4.4	PLA	0.6	0.29	SSMF	NF	DRY
169.28	5.3	PLA	0.6	0.22	SM	NF	DRY
171.30	5.8	PLA	0.6	0.19	SF	PF	DRY
174.44	5.4	PLA	0.5	0.18	SSVC	NF	DRY
175.28	4.6	PLA	0.6	0.26	SMFO	NF	DRY
178.34	6.0	PLA	0.7	0.23	SM	PF	DRY
181.23	4.8	PLA	0.5	0.21	SF	NF	MOIST
183.41	4.2	PLA	0.3	0.15	SSFM	NF	MOIST
184.75	4.5	PLA	0.3	0.14	SF	NF	MOIST
186.82	4.8	PLA	0.5	0.21	ST	PF	MOIST
187.92	3.8	PLA	0.5	0.29	STCS	PF	MOIST
188.65	5.8	PLA	0.3	0.10	MS	PF	DRY
190.23	4.8	PLA	0.5	0.21	SF	NF	MOIST
193.27	4.3	PLA	0.3	0.15	SF	PF	MOIST
196.28	5.0	PLA	0.6	0.24	SFLS	NF	DRY
198.10	5.0	PLA	0.5	0.20	SF/CM	NF	DRY
199.92	5.5	PLA	0.5	0.17	STSA	NF	DRY
200.62	4.8	PLA	0.4	0.17	MS	NF	DRY
202.32	4.0	PLA	0.6	0.32	ST/CM	NF	DRY
204.88	5.5	PLA	0.6	0.22	ST/CM	NF	DRY
206.33	5.0	PLA	0.4	0.16	MS	PF	DRY
207.30	4.5	PLA	0.4	0.18	ST/CM	PF	DRY
207.93	4.0	PLA	0.4	0.21	STCS	NF	DRY
210.46	4.6	PLA	2.1	0.99	SMLS	NF	DRY
211.94	4.5	PLA	0.7	0.33	SF/CM	NF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE CY39

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
212.92	4.8	PLA	0.6	0.25	SF	NF	DRY
213.42	4.0	PLA	0.4	0.21	SF	NF	DRY
218.53	5.2	PLA	1.0	0.38	MS	NF	DRY
218.84	5.0	PLA	1.0	0.40	ST	NF	DRY
220.55	5.5	PLA	3.0	1.10	SF	PF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE GY40

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
34.55	5.5	PLA	0.1	0.04	SM	PF	MOIST
36.04	5.0	PLA	0.1	0.04	SM	NF	MOIST
36.88	5.0	PLA	0.0	0.02	ST	NF	MOIST
38.01	5.3	PLA	0.0	0.02	SF	NF	MOIST
39.34	5.3	PLA	1.5	0.58	SF	NF	MOIST
41.45	5.2	PLA	0.0	0.02	SF	NF	MOIST
43.56	6.2	PLA	3.5	1.03	SM	NF	MOIST
45.46	6.6	PLA	0.0	0.01	SM	PF	MOIST
46.42	4.8	PLA	0.1	0.04	SM	NF	MOIST
49.18	6.3	PLA	0.2	0.06	SSMF	PF	MOIST
51.50	5.6	PLA	5.0	1.70	SF	NF	MOIST
52.50	4.9	PLA	0.0	0.02	SF	NF	MOIST
53.81	5.0	PLA	0.1	0.04	SSMP	NF	MOIST
54.99	4.0	PLA	0.0	0.03	CM	NF	MOIST
57.70	4.2	PLA	1.3	0.67	MS	NF	MOIST
58.50	5.0	PLA	3.2	1.28	MS	NF	MOIST
59.54	5.5	PLA	0.1	0.04	MS	NF	MOIST
61.28	4.4	PLA	0.1	0.05	MSCS	NF	MOIST
61.65	5.0	PLA	0.0	0.02	CM	NF	MOIST
63.27	5.0	PLA	0.0	0.02	SSMF	NF	MOIST
65.00	5.8	PLA	0.1	0.03	STCS	NF	MOIST
65.41	5.6	PLA	0.2	0.07	ST	NF	DRY
67.50	4.1	PLA	0.0	0.03	MS	NF	DRY
68.05	5.8	PLA	0.5	0.02	MS	NF	DRY
68.90	5.0	PLA	0.5	0.02	MS	NF	DRY
69.75	4.7	PLA	1.4	0.62	ST	NF	DRY
70.99	5.0	PLA	0.3	0.12	MS	PF	DRY
72.64	5.2	PLA	0.7	0.27	ST	PF	DRY
73.50	5.3	PLA	0.5	0.02	MS	PF	DRY
74.80	4.8	PLA	5.0	2.12	SF	NF	DRY
75.50	6.0	PLA	1.8	0.55	MSCS	NF	DRY
76.40	6.3	PLA	0.5	0.15	MS	PF	DRY
78.19	5.4	PLA	3.6	1.28	MSCS	NF	DRY
79.27	5.2	PLA	0.8	0.30	MSCS	PF	DRY
79.52	4.0	PLA	0.2	0.11	MSCS	NF	DRY
80.80	4.5	PLA	0.4	0.18	MSCS	PF	DRY
82.00	4.2	PLA	0.5	0.25	MS	NF	DRY
83.00	4.9	PLA	0.5	0.20	ST	PF	DRY
84.00	5.0	PLA	0.6	0.24	MS	PF	DRY
84.70	4.7	PLA	0.8	0.35	MSCS	NF	DRY
85.56	6.0	PLA	0.6	0.19	MSCS	NF	DRY
87.03	6.4	PLA	1.7	0.47	CB	PF	DRY
88.54	4.0	PLA	0.8	0.45	MSCS	PF	DRY
90.04	6.0	PLA	4.0	1.25	MS	NF	DRY
90.88	4.5	PLA	0.7	0.33	MSCS	NF	DRY
93.00	4.5	PLA	0.4	0.18	CB	PF	DRY
94.57	4.0	PLA	0.4	0.21	MS	NF	DRY
95.13	5.0	PLA	0.8	0.32	CB	PF	DRY
97.50	5.1	PLA	0.7	0.28	MS	PF	DRY
68.68	5.0	PLA	1.0	0.40	MSLS	NF	DRY
98.09	4.7	PLA	1.0	0.43	ST	NF	DRY
99.26	5.7	PLA	1.0	0.33	MS	NF	DRY
100.50	4.9	PLA	1.0	0.41	MS	NF	DRY
101.96	5.1	PLA	0.8	0.31	MS	NF	DRY
103.16	5.5	PLA	0.9	0.31	MS	NF	DRY
104.67	5.0	PLA	0.0	0.02	MS	NF	MOIST
105.74	5.4	PLA	1.0	0.36	ST	NF	DRY
106.65	4.8	PLA	0.4	0.16	MSCS	PF	DRY
108.50	4.5	PLA	0.6	0.28	MS	NF	DRY
109.46	4.6	PLA	0.8	0.36	SF	NF	MOIST
110.34	5.0	PLA	0.4	0.16	MSLM	NF	MOIST
111.72	4.7	PLA	0.5	0.20	MS	NF	MOIST
112.48	4.5	PLA	0.1	0.05	MS	NF	MOIST
113.11	4.0	PLA	0.1	0.06	MS	NF	MOIST
115.02	5.2	PLA	0.1	0.04	CM	PF	DRY
116.37	4.0	PLA	0.3	0.16	ST	NF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE GY40

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
118.33	4.7	PLA	0.1	0.05	MS	NF	DRY
119.30	4.9	PLA	0.0	0.02	MS	NF	DRY
119.88	5.5	PLA	0.0	0.02	C7	PF	DRY
120.75	5.0	PLA	1.4	0.56	C7	NF	DRY
121.19	5.3	PLA	0.7	0.26	CM	PF	DRY
121.50	4.5	PLA	0.3	0.14	CM	NF	DRY
122.26	5.7	PLA	0.4	0.14	MS	NF	DRY
124.50	4.4	PLA	0.1	0.05	SM	NF	MOIST
125.99	4.4	PLA	0.3	0.14	SM	NF	MOIST
126.36	4.8	PLA	0.3	0.13	SF	NF	MOIST
128.76	6.0	PLA	0.2	0.06	SM	NF	MOIST
130.50	5.4	PLA	0.2	0.07	SM	NF	MOIST
131.43	5.8	PLA	0.1	0.05	SFCO	PF	MOIST
133.06	6.3	PLA	0.0	0.01	SF	PF	MOIST
137.62	6.0	PLA	0.0	0.01	SF	PF	MOIST
139.46	5.0	PLA	0.1	0.04	SF	NF	MOIST
142.26	5.0	PLA	0.1	0.04	SF	NF	DAMP
144.17	6.0	PLA	0.0	0.01	MS	NF	DAMP
144.77	5.0	PLA	0.8	0.32	MS	NF	DRY
145.20	4.2	PLA	0.4	0.20	C7	NF	DRY
146.15	5.6	PLA	0.6	0.22	SF	NF	DAMP
148.53	5.0	PLA	0.4	0.16	ST	PF	DRY
150.99	5.0	PLA	0.4	0.16	MS	NF	DRY
152.95	5.5	PLA	0.8	0.28	SF	NF	DRY
157.50	6.6	PLA	0.5	0.14	SM	NF	DRY
162.98	6.0	PLA	0.5	0.15	ST	NF	DRY
163.94	6.5	PLA	0.3	0.09	STBR	NF	DRY
166.56	6.0	PLA	0.2	0.07	SM	NF	DRY
167.50	5.0	PLA	0.4	0.16	SM	PF	DRY
168.06	5.5	PLA	0.6	0.22	ST	NF	DRY
169.87	5.8	PLA	0.3	0.10	SM	NF	DRY
172.66	6.6	PLA	0.4	0.11	SM	PF	DRY
173.73	4.8	PLA	17.4	7.30	SFLS	NF	DRY
174.73	5.8	PLA	1.0	0.32	SFLS	PF	DRY
176.20	6.7	PLA	13.5	3.55	SFLS	NF	DRY
178.50	4.6	PLA	0.7	0.32	SM	NF	DRY
180.40	5.0	PLA	0.4	0.16	SM	NF	DRY
182.50	4.0	PLA	0.5	0.36	SF	NF	DRY
184.50	5.0	PLA	0.5	0.20	SF	NF	DRY
186.49	5.3	PLA	0.4	0.15	SF	NF	DRY
189.38	5.0	PLA	0.3	0.12	SF	NF	DRY
190.55	4.0	PLA	0.3	0.16	SM	NF	DRY
191.28	4.0	PLA	0.4	0.22	CM	NF	DRY
193.50	4.0	PLA	0.3	0.16	SF	NF	DRY
195.52	4.8	PLA	0.6	0.25	SM	NF	DRY
197.58	4.8	PLA	0.2	0.08	SM	PF	DRY
199.40	4.3	PLA	0.3	0.15	SM	NF	DAMP
200.88	5.3	PLA	0.4	0.15	SFLS	PF	DRY
202.54	4.0	PLA	0.2	0.11	SF	NF	DRY
204.10	4.0	PLA	0.5	0.36	MS	NF	DRY
204.70	4.2	PLA	0.7	0.37	ST	NF	DRY
205.29	4.4	PLA	0.2	0.10	STLS	NF	DRY
208.50	4.8	PLA	0.5	0.21	SF	PF	DRY
209.79	5.0	PLA	0.4	0.16	SF	PF	DRY
211.50	4.6	PLA	0.2	0.09	MS	NF	DRY
212.40	5.3	PLA	0.6	0.23	MSCS	NF	DRY
213.98	5.8	PLA	1.7	0.55	SF	NF	DRY
215.72	5.0	PLA	1.2	0.48	SM	NF	DRY
220.15	5.5	PLA	0.7	0.25	MS	NF	DRY
220.32	4.5	PLA	0.5	0.22	MS	PF	DRY
222.98	5.7	PLA	0.6	0.20	SF	PF	DRY
223.58	5.8	PLA	6.2	2.05	SF	PF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY41

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
15.00	3.3	PLA	36.0	25.00	DO	NF	DRY
43.45	4.8	PLA	47.0	20.00	DO	NF	DRY
55.00	4.9	PLA	35.0	14.20	DO	NF	DRY
58.07	5.0	PLA	0.1	0.04	SM	NF	MOIST
59.50	4.9	PLA	0.7	0.28	SM	NF	MOIST
61.48	5.8	PLA	1.5	0.49	SM	NF	MOIST
66.14	5.8	PLA	0.5	0.16	SM	PF	MOIST
70.00	6.2	PLA	0.8	2.40	SM	NF	MOIST
74.04	4.2	PLA	0.4	0.21	SM	NF	MOIST
77.16	5.7	PLA	1.0	0.33	SM	NF	MOIST
80.38	5.8	PLA	1.1	0.36	SM	NF	MOIST
85.06	5.7	PLA	3.0	0.99	SM	NF	MOIST
79.12	4.8	PLA	3.5	1.50	SM	NF	MOIST
88.00	4.7	PLA	1.9	0.83	MS	NF	DRY
88.95	5.7	PLA	5.4	1.80	MS	NF	DRY
89.18	5.7	PLA	0.3	0.10	MS	NF	DRY
90.41	4.3	PLA	2.0	0.09	SF	NF	MOIST
93.25	5.6	PLA	0.4	0.13	SM	NF	MOIST
95.57	6.0	PLA	0.3	0.09	SM	NF	MOIST
97.20	5.7	PLA	0.3	0.11	CM	NF	DRY
97.50	5.3	PLA	5.0	1.82	ST	NF	DRY
98.31	5.8	PLA	6.0	1.90	STSF	NF	MOIST
99.33	4.8	PLA	0.4	0.19	MS	NF	DRY
100.56	3.2	PLA	0.4	0.30	COM2	NF	DRY
101.24	4.3	PLA	3.5	1.81	COC7	NF	DRY
102.14	4.7	PLA	0.9	0.39	MSCS	NF	MOIST
102.46	5.8	PLA	5.6	1.79	SF	NF	MOIST
105.11	5.8	PLA	4.0	1.24	MSST	NF	MOIST
105.89	3.8	PLA	0.3	0.14	CO	NF	DRY
105.96	6.7	PLA	2.0	0.48	CO	PF	DRY
106.98	5.0	PLA	0.8	0.34	MSST	NF	DRY
107.47	4.5	PLA	5.1	2.35	MSST	NF	MOIST
108.36	4.6	PLA	4.5	1.98	SF	PF	MOIST
110.20	5.0	PLA	3.5	1.40	SM	NF	MOIST
111.39	4.8	PLA	12.0	5.15	SSLS	NF	MOIST
113.61	6.0	PLA	3.3	1.07	SM	NF	MOIST
117.89	5.1	PLA	3.4	1.32	SM	NF	MOIST

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POINT LOAD TEST RESULTS

BOREHOLE GY42

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
31.91	5.0	PLA	0.4	0.16	SM	NF	DRY
34.83	6.2	PLA	0.3	0.88	MS	NF	DRY
37.37	4.2	PLA	0.3	0.15	SS	NF	MOIST
39.31	4.8	PLA	0.3	0.13	SS	NF	MOIST
42.51	5.5	PLA	0.6	0.21	SS	NF	MOIST
43.13	4.7	PLA	1.0	0.43	MS	NF	MOIST
44.50	5.4	PLA	0.4	0.21	CMST	NF	MOIST
46.41	5.2	PLA	2.2	0.83	CO	NF	MOIST
46.90	6.0	PLA	2.0	0.60	MS	NF	MOIST
48.67	4.5	PLA	5.3	2.45	MS	NF	DRY
49.84	5.0	PLA	0.4	0.16	CM	PF	DRY
50.43	5.6	PLA	0.4	0.31	CM	PF	DRY
51.14	6.4	PLA	0.4	0.11	MS	PF	DRY
53.26	5.0	PLA	5.6	2.24	SM	NF	DRY
55.01	4.0	PLA	0.3	0.18	SSCL	NF	DRY
60.71	5.4	PLA	0.4	0.14	SS	NF	DRY
62.71	4.6	PLA	2.8	1.27	MS	NF	DRY
65.57	5.5	PLA	1.5	0.51	MS	PF	DRY
65.70	5.2	PLA	0.6	0.25	MS	NF	DRY
66.00	5.5	PLA	4.8	1.69	CO	NF	DRY
68.31	3.8	PLA	0.1	0.06	MSCR	NF	DRY
69.12	4.1	PLA	0.2	0.10	CM	NF	DRY
71.55	6.1	PLA	0.5	0.15	MS	NF	DRY
72.85	4.8	PLA	3.0	1.28	MSST	NF	DRY
74.24	4.7	PLA	1.0	0.43	CMST	PF	MOIST
76.77	5.5	PLA	9.6	1.59	MSST	NF	MOIST
77.94	4.8	PLA	1.1	0.46	CM	PF	MOIST
78.68	6.2	PLA	2.3	0.62	MSCR	PF	DRY
79.65	4.9	PLA	6.0	2.43	ST	NF	DRY
82.51	5.5	PLA	2.0	0.69	MSST	NF	DRY
84.40	5.0	PLA	0.7	0.28	CM	PF	DRY
87.18	4.7	PLA	1.1	0.48	MS	PF	MOIST
88.98	4.6	PLA	0.7	0.32	MS	PF	MOIST
89.98	4.7	PLA	2.3	1.01	MS	NF	MOIST
91.00	5.3	PLA	1.5	0.55	CM	PF	MOIST
91.30	6.0	PLA	1.1	0.33	MSFO	PF	MOIST
91.98	5.4	PLA	0.6	0.22	MS	PF	MOIST
92.48	4.5	PLA	3.6	1.70	ST	NF	MOIST
94.00	6.5	PLA	0.5	0.14	MS	NF	MOIST
95.10	5.6	PLA	0.6	0.20	SM	NF	DRY
97.93	6.1	PLA	1.9	0.57	SM	NF	MOIST
99.86	6.0	PLA	1.0	0.29	SM	NF	MOIST
103.57	5.5	PLA	15.0	5.10	SMLS	NF	DRY
104.54	5.0	PLA	3.7	1.48	SM	NF	MOIST
106.40	5.0	PLA	3.3	1.32	SC	NF	MOIST
109.97	5.6	PLA	3.0	1.05	SM	NF	MOIST
112.06	4.9	PLA	3.7	1.51	SM	NF	MOIST
114.88	4.6	PLA	0.9	0.41	MS	NF	MOIST
116.57	4.9	PLA	1.0	0.40	ST	NF	MOIST
117.60	5.5	PLA	2.6	0.90	MSST	NF	MOIST
118.76	4.5	PLA	0.8	0.39	MS	NF	MOIST
119.27	5.1	PLA	0.3	0.10	CO	PF	MOIST
119.76	5.2	PLA	0.6	0.23	MSST	NF	MOIST
122.93	5.5	PLA	0.4	0.14	ST	NF	MOIST
123.48	4.6	PLA	0.3	0.14	MS	NF	MOIST
124.19	4.6	PLA	1.2	0.53	CB	PF	MOIST
124.32	4.6	PLA	0.9	0.41	CB	PF	MOIST
125.93	5.7	PLA	3.5	1.15	SF	NF	MOIST
126.77	5.2	PLA	0.1	0.04	CO	NF	MOIST
127.36	5.2	PLA	0.2	0.08	MS	NF	MOIST
129.44	5.0	PLA	0.3	0.12	MSSS	NF	MOIST
130.69	5.1	PLA	4.4	1.70	SM	NF	MOIST
131.00	4.5	PLA	2.2	1.04	MS	NF	MOIST
132.26	4.9	PLA	4.3	1.77	SF	NF	MOIST
134.33	4.5	PLA	1.3	0.60	MS	PF	MOIST
136.74	5.2	PLA	2.5	0.95	MS	NF	MOIST

POINT LOAD TEST RESULTS

BOREHOLE GY42

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
137.70	5.4	PLA	4.4	1.59	SF	NF	MOIST
140.05	5.8	PLA	5.5	1.78	SM	NF	MOIST
143.54	5.3	PLA	3.2	1.20	SC	NF	MOIST
145.45	5.5	PLA	2.3	0.80	SM	NF	MOIST
149.42	6.2	PLA	1.5	0.43	SM	NF	MOIST
150.89	5.2	PLA	0.7	0.27	MS	NF	MOIST
151.55	4.9	PLA	1.1	0.45	MSST	NF	MOIST
152.96	6.2	PLA	4.8	1.35	SF	NF	MOIST
154.62	5.2	PLA	0.5	0.20	MSST	NF	MOIST
158.00	5.9	PLA	3.2	1.02	SM	NF	MOIST
161.38	5.7	PLA	0.9	0.30	MSST	NF	MOIST
163.92	4.8	PLA	1.4	0.57	SM	PF	MOIST
165.19	4.5	PLA	0.5	0.20	SSMF	NF	DRY
170.68	4.5	PLA	0.2	0.09	MS	PF	DRY
171.58	5.0	PLA	0.4	0.16	SC	NF	DRY
173.28	5.0	PLA	1.5	0.60	CMCO	NF	DRY
175.34	5.0	PLA	3.5	1.40	SM	NF	DRY
182.02	4.8	PLA	4.4	1.86	SM	NF	DRY
184.28	4.7	PLA	3.6	1.60	SM	NF	DRY
186.04	4.5	PLA	0.3	0.12	SSMC	NF	DRY
191.85	5.3	PLA	0.3	0.11	SSMC	NF	DRY
194.77	5.3	PLA	4.2	1.52	MS/ST	NF	DRY
197.00	5.5	PLA	4.7	1.50	SF	NF	DRY
198.20	5.5	PLA	11.0	3.82	SFLS	NF	DRY
201.82	5.5	PLA	4.1	1.40	SM	NF	DRY
203.08	5.0	PLA	1.6	0.64	MS	PF	DRY
203.96	4.7	PLA	2.0	0.89	ST	NF	DRY
206.10	5.0	PLA	4.3	1.72	ST	NF	DRY
208.79	5.0	PLA	2.8	1.12	SM	NF	DRY
210.08	5.5	PLA	0.9	0.31	SM	PF	DRY
210.33	5.0	PLA	0.8	0.32	SSMC	PF	DRY
212.07	4.8	PLA	2.4	1.01	SM	PF	DRY
213.30	5.2	PLA	0.8	0.30	SM	NF	DRY
216.60	4.5	PLA	0.8	0.37	MS	NF	DRY
217.34	4.9	PLA	1.2	0.49	ST	NF	DRY
217.75	5.3	PLA	0.7	0.26	MS/BA	NF	DRY
223.58	4.7	PLA	0.2	0.08	SSMC	NF	DRY
224.14	5.5	PLA	0.1	0.03	SM	NF	DRY
229.37	5.5	PLA	0.1	0.05	CM	NF	DRY
232.95	5.0	PLA	3.7	1.48	SMMP	PF	DRY
235.22	5.0	PLA	1.0	0.40	C6	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY43

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
45.30	7.0	PLA	0.1	0.03	SM/WH	NF	MOIST
47.11	7.3	PLA	0.0	0.01	SC/WH	NF	MOIST
55.70	5.5	PLA	0.1	0.03	SF	NF	DRY
61.07	4.5	PLA	0.1	0.04	SF/CM	NF	DRY
61.86	5.5	PLA	0.1	0.03	ST/CS	NF	DRY
65.69	4.5	PLA	0.4	0.17	MSCS	NF	DRY
67.67	4.7	PLA	0.2	0.08	MSBR	NF	DRY
69.31	4.9	PLA	0.2	0.08	CM	PF	DRY
71.18	4.9	PLA	0.2	0.08	TO	PF	DRY
73.45	5.0	PLA	0.3	0.12	CM	NF	DRY
73.89	5.5	PLA	0.4	0.14	TO	PF	DRY
79.95	5.0	PLA	0.3	0.12	MS	NF	DRY
80.90	5.5	PLA	3.0	1.10	MS	NF	DRY
82.88	4.7	PLA	1.0	0.44	MS/CS	PF	DRY
83.89	5.0	PLA	5.1	2.04	MS	NF	DRY
88.00	5.0	PLA	0.1	0.03	C6	NF	DRY
88.36	5.0	PLA	0.5	0.20	ST	NF	DRY
91.49	4.5	PLA	0.6	0.21	ST	NF	DRY
92.50	5.0	PLA	0.2	0.08	MS	NF	DRY
94.76	5.0	PLA	0.3	0.12	MS	PF	DRY
96.18	4.5	PLA	0.2	0.09	MSCR	PF	DRY
97.25	5.1	PLA	0.1	0.04	SFCS	PF	DRY
99.46	5.5	PLA	0.4	0.14	MSFO	NF	DRY
101.76	5.0	PLA	0.2	0.08	MS	PF	DRY
106.39	5.5	PLA	2.8	0.98	SF/CS	NF	DRY
107.87	5.5	PLA	14.8	5.10	SFLS	NF	DRY
110.19	5.0	PLA	1.0	0.42	SSMF	NF	DRY
112.32	5.0	PLA	0.4	0.16	MS	PF	DRY
113.30	5.0	PLA	0.4	0.16	SM	NF	DRY
127.81	5.0	PLA	1.2	0.48	SSMF	NF	DRY
133.40	5.5	PLA	4.8	1.50	SM	NF	DRY
136.50	4.5	PLA	0.6	0.27	SM	NF	DRY
140.96	5.0	PLA	1.6	0.64	ST	NF	DRY
142.42	5.0	PLA	0.8	0.32	MS	PF	DRY
142.72	5.0	PLA	1.1	0.44	CM	PF	DRY
143.12	4.5	PLA	2.7	1.25	MSCS	NF	DRY
145.40	5.0	PLA	0.4	0.16	SF	NF	DRY
148.37	5.0	PLA	0.6	0.24	SF	NF	DRY
153.12	5.5	PLA	0.7	0.25	SM	NF	DRY
157.73	4.8	PLA	0.5	0.20	C8	PF	DRY
157.90	5.0	PLA	0.4	0.16	MSCS	NF	DRY
165.33	5.3	PLA	2.5	0.91	SC	NF	DRY
169.58	5.6	PLA	0.4	0.13	SM	NF	DRY
175.59	5.0	PLA	0.1	0.06	SM	NF	DRY
179.05	5.0	PLA	1.5	0.60	SSMC	NF	DRY
180.19	5.0	PLA	0.2	0.08	SSMC	NF	DRY
185.34	4.8	PLA	2.1	0.90	MSST	NF	DRY
188.00	5.0	PLA	1.6	0.64	SF	NF	DRY
191.58	5.0	PLA	0.1	0.04	SM	NF	DRY
196.69	5.5	PLA	0.3	0.12	SM	NF	DRY
202.19	5.5	PLA	4.8	1.61	MS	NF	DRY
205.17	5.5	PLA	4.8	1.61	SF	NF	DRY
218.81	4.5	PLA	12.0	5.55	DO	NF	DRY
220.35	5.0	PLA	0.9	0.36	MSCS	NF	DRY
221.41	5.0	PLA	0.2	0.08	SF	NF	DRY
224.01	5.6	PLA	11.0	3.70	SFLS	NF	DRY
228.08	5.0	PLA	0.1	0.04	SM	NF	DRY
229.07	5.1	PLA	0.2	0.08	C7	NF	MOIST
231.78	4.5	PLA	0.2	0.09	MSST	NF	DRY
232.41	5.0	PLA	0.1	0.06	ST/LM	PF	DRY
233.95	4.5	PLA	0.1	0.04	C8	NF	DRY
115.47	5.6	PLA	4.6	1.51	SM	NF	MOIST
118.36	5.6	PLA	4.0	1.30	SM	NF	MOIST
118.78	5.5	PLA	2.7	0.92	SM	NF	MOIST
119.63	5.6	PLA	0.5	1.69	C7	NF	MOIST
120.78	5.4	PLA	0.5	1.82	C7	PF	MOIST

POINT LOAD TEST RESULTS

BOREHOLE GY43

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
121.40	5.8	PLA	0.2	0.06	C7	PF	MOIST
121.74	5.3	PLA	0.5	0.18	C7	PF	MOIST
122.81	5.6	PLA	0.4	0.15	MS	NF	MOIST
123.13	4.8	PLA	0.5	0.21	MS	NF	MOIST
123.72	4.8	PLA	2.9	1.23	ST	NF	MOIST
124.41	4.9	PLA	5.0	2.04	SM	NF	MOIST
127.15	5.6	PLA	8.0	2.75	SM	NF	MOIST
206.02	5.0	PLA	2.7	1.08	SM	NF	WET
208.35	4.8	PLA	3.7	1.58	SM	NF	WET
209.32	4.2	PLA	0.5	0.46	MS	NF	MOIST
209.80	4.5	PLA	2.9	1.38	ST	NF	MOIST
210.45	4.8	PLA	5.2	2.20	SS	NF	MOIST
211.35	5.2	PLA	2.0	0.76	CM	NF	MOIST
212.01	5.4	PLA	1.2	0.42	CMCO	PF	MOIST
212.30	4.7	PLA	2.0	0.87	CMCO	NF	MOIST
213.59	4.6	PLA	2.0	0.90	COCM	NF	MOIST
214.20	5.0	PLA	2.7	1.08	ST	NF	MOIST
214.42	3.9	PLA	0.4	0.23	MSST	PF	MOIST
214.78	4.5	PLA	1.1	0.52	MS	NF	MOIST
215.34	4.5	PLA	3.0	1.40	SFST	PF	MOIST
215.83	4.4	PLA	1.7	0.84	MSST	NF	MOIST
217.15	4.0	PLA	3.0	1.69	MS	NF	MOIST

POINT LOAD TEST RESULTS

BOREHOLE GY44

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
15.78	4.6	PLA	0.1	0.04	MS	PF	DRY
16.15	6.0	PLA	3.0	0.90	MS	NF	DRY
16.83	5.1	PLA	3.8	1.47	MS	PF	DRY
20.70	5.5	PLA	4.4	1.64	MS	PF	DRY
24.50	5.5	PLA	0.6	0.22	SM	NF	DRY
25.10	5.2	PLA	0.3	0.13	ST	NF	DRY
27.85	5.8	PLA	2.8	0.90	SM	PF	DRY
29.16	6.2	PLA	4.5	1.27	SM	NF	DRY
31.05	5.7	PLA	2.0	0.65	SM	NF	WET
32.14	5.7	PLA	0.5	0.17	SM	NF	WET
35.56	5.0	PLA	0.7	0.28	SM	NF	WET
37.43	4.8	PLA	0.3	0.12	SM	NF	WET
39.74	5.0	PLA	1.4	0.56	SS	NF	WET
43.06	6.1	PLA	7.0	2.04	SMLS	NF	DRY
43.64	6.4	PLA	7.1	1.92	SFLS	NF	DRY
45.50	5.2	PLA	2.0	0.75	SM	NF	MOIST
49.45	4.7	PLA	0.2	0.09	SM	NF	WET
50.19	4.6	PLA	3.2	1.43	SF	NF	WET
52.55	5.2	PLA	3.5	1.31	SM	NF	WET
53.76	4.5	PLA	1.1	0.52	MSST	NF	WET
83.89	5.3	PLA	4.6	1.62	SM	NF	DRY
84.76	5.1	PLA	4.0	1.55	STMS	PF	DRY
85.39	5.8	PLA	5.3	1.72	SFMS	NF	DRY
88.00	5.8	PLA	4.4	1.40	SFMS	NF	MOIST
90.40	5.7	PLA	4.7	1.52	SM	NF	MOIST
93.25	5.4	PLA	10.0	3.54	SMLS	NF	DRY
97.05	5.2	PLA	3.5	1.32	SM	NF	DRY
99.48	5.3	PLA	2.1	0.80	SM	NF	WET
103.71	5.8	PLA	3.2	1.03	SM	NF	WET
105.20	5.1	PLA	0.5	0.21	SF	NF	WET
109.48	4.8	PLA	1.2	0.51	SM	NF	WET
110.65	4.1	PLA	2.4	1.28	SM	NF	WET
113.83	5.1	PLA	3.5	1.35	SM	NF	WET
58.42	4.2	PLA	4.0	1.97	SM	NF	DRY
56.80	5.3	PLA	3.8	1.40	SSMF	PF	DRY
57.74	4.9	PLA	7.0	2.83	SSMF	NF	DRY
58.99	4.5	PLA	1.2	0.57	SSMF	PF	DRY
59.59	5.0	PLA	2.8	1.12	SS/LM	PF	DRY
59.96	5.0	PLA	0.4	0.16	MSST	PF	DRY
60.37	4.0	PLA	0.2	0.10	MSCS	NF	DRY
62.98	3.8	PLA	3.2	1.95	STCS	PF	DRY
64.50	3.5	PLA	1.3	0.88	MS	PF	DRY
65.14	5.0	PLA	3.6	1.44	ST	NF	DRY
66.04	4.8	PLA	3.6	1.48	MS	NF	DRY
66.93	5.5	PLA	1.7	0.58	MS	PF	DRY
68.32	5.4	PLA	4.0	1.40	MS	NF	DRY
69.16	5.5	PLA	3.7	1.29	MS	NF	DRY
71.28	5.0	PLA	5.5	2.20	MSST	NF	DRY
72.03	5.7	PLA	0.2	0.07	MSST	PF	DRY
72.26	4.8	PLA	1.5	0.64	MS	PF	DRY
75.17	5.5	PLA	1.1	0.38	MSCS	PF	DRY
75.70	5.0	PLA	1.4	0.56	MS	PF	DRY
76.20	4.8	PLA	1.9	0.41	MS	NF	DRY
76.50	4.8	PLA	0.7	0.29	MS	PF	DRY
76.77	4.6	PLA	1.1	0.50	MS	NF	DRY
77.68	5.5	PLA	2.7	0.91	ST	PF	DRY
79.29	5.0	PLA	1.0	0.40	SF	PF	DRY
81.15	4.7	PLA	3.5	1.50	SF	NF	DRY
82.24	5.6	PLA	0.2	0.07	MS	PF	DRY
83.08	4.5	PLA	0.4	0.18	ST	NF	DRY
83.56	4.6	PLA	4.8	2.15	SM	NF	DRY
118.37	5.4	PLA	0.0	0.01	SM	NF	MOIST
121.74	5.3	PLA	0.1	0.03	SSMF	NF	MOIST
124.92	4.5	PLA	0.2	0.08	MS	NF	DRY
128.23	5.0	PLA	0.1	0.06	ST	NF	DRY
129.17	5.0	PLA	4.4	1.78	SF	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY44

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
130.38	5.0	PLA	0.4	0.16	MS	PF	DRY
136.04	5.1	PLA	0.2	0.07	SF	NF	MOIST
140.57	5.3	PLA	0.1	0.03	SSMF	NF	MOIST
143.86	5.5	PLA	0.1	0.03	C8	NF	MOIST
145.96	5.1	PLA	0.1	0.03	ST	NF	DRY
145.17	4.8	PLA	0.0	0.02	MS	PF	MOIST
147.69	4.5	PLA	0.1	0.04	STSS	NF	MOIST
148.39	4.5	PLA	0.3	0.16	ST	NF	DRY
151.40	4.9	PLA	2.3	0.94	SSVF	NF	DRY
152.16	5.5	PLA	3.1	1.08	SSMF	NF	DRY
155.29	5.0	PLA	0.2	0.08	MS	NF	DRY
154.59	5.0	PLA	0.2	0.08	ST	NF	DRY
157.84	5.0	PLA	3.7	1.49	SF	NF	DRY
160.83	5.0	PLA	0.3	0.12	CM	PF	DRY
162.29	4.5	PLA	0.1	0.07	MS	PF	DRY
162.91	5.2	PLA	0.1	0.03	C7	NF	DRY
164.69	4.3	PLA	0.3	1.45	MS	NF	DRY
166.86	5.6	PLA	4.6	1.55	MSCS	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY45

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
17.23	6.2	PLA	0.1	0.35	SM	NF	WET
19.14	5.2	PLA	0.1	0.06	SM	NF	WET
20.72	5.5	PLA	0.1	0.06	SM	NF	WET
23.42	4.0	PLA	0.5	0.30	SM	NF	WET
29.02	5.3	PLA	0.1	0.04	SM	NF	WET
29.07	6.0	PLA	1.4	0.39	MSFO	NF	WET
29.35	6.0	PLA	0.1	0.03	SM	NF	WET
32.36	4.6	PLA	0.3	0.14	MSST	PF	WET
33.83	6.2	PLA	0.2	0.70	MS	PF	WET
38.33	4.6	PLA	0.2	0.09	MS	NF	WET
41.36	4.9	PLA	0.1	0.06	MS	PF	WET
43.75	5.0	PLA	3.8	1.52	SM	NF	WET
45.73	4.5	PLA	4.0	1.85	SM	NF	WET
49.57	5.0	PLA	0.2	0.80	SM	NF	WET
51.32	4.8	PLA	2.1	0.90	SM	NF	WET
53.12	4.5	PLA	0.3	0.16	SM	NF	WET
54.57	5.3	PLA	0.4	0.16	SM	NF	WET
57.10	6.0	PLA	2.2	0.64	SM	NF	WET
59.17	5.4	PLA	0.1	0.05	SM	PF	WET
63.34	5.2	PLA	0.5	0.19	SM	NF	WET
69.47	5.0	PLA	0.9	0.38	SM	NF	WET
71.12	5.8	PLA	1.5	0.47	SM	NF	WET
75.92	5.7	PLA	0.9	0.30	SM	NF	WET
77.24	4.0	PLA	3.9	2.30	SM	NF	WET
77.74	5.3	PLA	2.3	0.86	MS	NF	WET
80.39	5.5	PLA	0.8	0.29	ST	PF	WET
81.07	4.6	PLA	0.4	0.20	SF	NF	WET
83.49	5.3	PLA	0.3	0.09	CM	NF	WET
83.88	4.8	PLA	4 0	1.73	SF	NF	WET
84.87	5.8	PLA	0.3	0.92	MSFO	PF	WET
86.17	5.3	PLA	0.3	0.14	MS	NF	WET
89.12	5.2	PLA	0.4	0.16	SF	NF	DRY
91.07	5.0	PLA	0.1	0.06	SF	NF	DRY
93.71	5.3	PLA	0.4	0.15	MS	PF	DRY
95.18	6.0	PLA	0.3	0.07	MS	NF	DRY
98.51	4.3	PLA	1.0	0.52	CM	PF	DRY
98.64	5.5	PLA	4.6	1.69	SSMF	NF	DRY
101.57	5.8	PLA	5.5	1.80	SS	NF	DRY
103.95	4.9	PLA	5.5	2.20	SM	NF	DRY
105.18	5.5	PLA	8.0	2.90	SS	NF	DRY
106.20	4.3	PLA	0.4	0.23	MS	NF	DRY
107.26	4.5	PLA	0.3	0.07	MS	NF	WET
107.81	4.5	PLA	0.2	0.07	C7	NF	WET
111.03	5.5	PLA	0.0	0.01	MSST	PF	DRY
111.93	4.9	PLA	0.0	0.02	MS	NF	DRY
115.03	5.0	PLA	0.0	0.01	CM/CO	PF	DRY
113.38	4.6	PLA	0.2	0.09	SFLS	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE CY46

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
73.70	4.7	PLA	0.0	0.00	MS	NF	DRY
74.17	4.8	PLA	0.1	0.04	C7	PF	DRY
74.48	4.6	PLA	0.0	0.02	MSCS	NF	DRY
77.69	5.0	PLA	0.0	0.00	C7	NF	DRY
79.59	4.8	PLA	0.1	0.06	ST	PF	DRY
79.82	5.3	PLA	0.2	0.07	SF	NF	DRY
82.44	5.5	PLA	0.1	0.05	SSMF	NF	DRY
83.34	4.9	PLA	0.4	0.17	SF	NF	MOIST
88.93	4.8	PLA	0.1	0.04	SM	NF	MOIST
91.08	5.0	PLA	0.1	0.04	SF	NF	MOIST
95.61	4.5	PLA	0.0	0.02	SM	NF	MOIST
100.47	5.0	PLA	0.0	0.02	SSMF	NF	MOIST
105.93	4.5	PLA	0.0	0.00	SSMC	NF	MOIST
112.82	5.6	PLA	0.1	0.03	SSMC	NF	MOIST
115.53	5.6	PLA	0.0	0.00	SSMF	NF	MOIST
118.58	5.0	PLA	0.0	0.02	SSMF	NF	MOIST
119.47	4.8	PLA	0.1	0.06	SSMF	NF	MOIST
123.36	5.3	PLA	0.1	0.03	SF	NF	MOIST
129.47	5.3	PLA	0.0	0.00	SSMC	NF	MOIST
132.73	5.3	PLA	0.7	0.26	SF	NF	MOIST
135.09	5.0	PLA	0.0	0.00	MS	NF	DRY
136.51	5.0	PLA	0.2	0.08	ST	NF	DRY
139.30	5.0	PLA	0.3	0.10	SF	NF	DRY
142.25	5.1	PLA	0.0	0.00	MS	NF	DRY
143.20	5.0	PLA	1.8	0.74	MSST	NF	DRY
146.87	5.3	PLA	0.3	0.12	SF	NF	DRY
151.48	5.1	PLA	0.1	0.03	SSMF	NF	DRY
155.23	5.5	PLA	1.4	0.48	SSMF	NF	DRY
161.46	5.0	PLA	0.1	0.04	SF	NF	MOIST
167.23	5.0	PLA	0.1	0.06	SSMF	NF	MOIST
172.55	5.0	PLA	0.0	0.02	SSMF	NF	MOIST
176.65	5.3	PLA	0.0	0.01	C8	NF	MOIST
176.80	5.7	PLA	0.0	0.01	CM	NF	DRY
178.59	4.5	PLA	0.0	0.02	SSMF	NF	DRY
181.55	4.9	PLA	0.1	0.04	MSST	NF	DRY
181.99	4.1	PLA	0.0	0.01	C6	PF	DRY
183.77	4.8	PLA	0.1	0.04	MSST	NF	DRY
186.06	4.4	PLA	0.0	0.02	MSCS	PF	DRY
186.64	5.0	PLA	0.1	0.04	ST	PF	DRY
187.14	5.0	PLA	0.1	0.04	MSFO	PF	DRY
188.01	5.0	PLA	0.0	0.02	CM	PF	DRY
190.56	5.3	PLA	5.3	1.91	SSMF	NF	DRY
191.81	4.7	PLA	0.1	0.04	MSST	NF	DRY
193.07	5.0	PLA	0.1	0.04	MS	PF	DRY
194.66	5.0	PLA	0.0	0.02	MSCS	NF	DRY
197.37	5.0	PLA	0.0	0.02	MSCS	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY108

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
10.28	4.3	PLA	0.1	0.04	SM	NF	DRY
11.76	4.6	PLA	0.1	0.05	ST	NF	DRY
12.66	4.2	PLA	0.2	0.08	SMF	NF	DRY
13.63	4.2	PLA	0.1	0.07	ST	NF	DRY
14.63	4.5	PLA	0.4	0.17	SF	NF	DRY
18.13	5.2	PLA	0.7	0.26	SM	NF	DRY
22.00	4.5	PLA	0.5	0.22	SMC	NF	DRY
22.44	4.5	PLA	0.4	0.18	SMC	NF	DRY
24.24	4.9	PLA	6.3	2.57	C8	NF	DRY
25.25	5.1	PLA	0.3	0.10	SM	NF	DRY
29.37	4.7	PLA	0.3	0.13	SMC	NF	MOIST
29.70	4.7	PLA	4.6	2.02	SMC	NF	DRY
34.33	4.7	PLA	0.2	0.07	SMC	NF	MOIST
35.56	5.1	PLA	0.7	0.28	SMC	NF	DRY
36.80	4.1	PLA	6.2	3.31	CSMS	NF	DRY
38.08	5.2	PLA	3.2	1.19	SMC	NF	MOIST
41.04	4.8	PLA	0.3	0.14	SMC	NF	DRY
42.18	4.5	PLA	2.3	1.04	MS	NF	DRY
42.70	5.4	PLA	0.5	0.17	MS	NF	DRY
43.43	4.5	PLA	0.6	0.27	MS	NF	DRY
44.11	4.1	PLA	0.4	0.23	ST/MS	NF	DRY
47.45	4.7	PLA	0.4	0.17	SMF	NF	DRY
50.80	4.3	PLA	3.8	1.89	ST/MS	NF	DRY
52.84	4.0	PLA	2.8	1.55	SMF	PF	DRY
53.83	4.0	PLA	0.2	0.12	MS	NF	DRY
54.14	5.3	PLA	0.5	0.17	ST	NF	DRY
55.50	4.5	PLA	1.8	0.83	SF	NF	DRY
56.49	4.7	PLA	6.0	2.61	SF	NF	DRY
59.38	4.3	PLA	4.4	2.19	SM	NF	DRY
62.12	4.7	PLA	3.0	1.29	SM	NF	DRY
63.40	4.5	PLA	3.8	1.78	SF	NF	DRY
64.04	4.3	PLA	0.6	0.32	SMC	NF	DRY
67.47	5.2	PLA	4.1	1.53	SC	NF	DRY
68.05	5.0	PLA	0.4	0.15	C8	NF	DRY
69.80	4.7	PLA	5.1	2.21	M3	NF	DRY
71.19	4.1	PLA	4.3	2.28	ST	NF	DRY
73.42	4.2	PLA	5.3	2.73	MS	PF	DRY
75.44	4.0	PLA	1.4	0.77	ST	NF	DRY
76.92	5.2	PLA	5.5	2.05	ST/MS	NF	DRY
79.12	4.8	PLA	14.8	6.23	SSMF	NF	DRY
80.33	4.5	PLA	2.0	0.93	SM	NF	DRY
81.45	5.0	PLA	6.5	2.57	MS	NF	DRY
82.24	4.8	PLA	2.6	1.10	ST	PF	DRY
83.04	5.0	PLA	4.3	1.70	ST/MS	NF	DRY
85.37	4.8	PLA	1.2	0.52	M3	NF	DRY
86.90	4.5	PLA	2.0	0.93	ST	NF	DRY
90.00	4.0	PLA	0.6	0.33	MS	NF	DRY
91.06	4.2	PLA	1.9	1.00	CM	NF	DRY
92.16	4.5	PLA	1.7	0.79	STCS	NF	DRY
93.16	4.7	PLA	2.6	1.13	SFCS	PF	DRY
93.59	4.8	PLA	2.1	0.88	SM	NF	DRY
94.25	4.2	PLA	4.7	2.42	SC	NF	DRY
98.12	4.9	PLA	2.6	1.06	SM	NF	DRY
99.50	4.3	PLA	4.4	2.21	ST	NF	DRY
100.31	4.3	PLA	5.5	2.73	SM	NF	DRY
101.64	5.3	PLA	4.7	1.72	ST	NF	DRY
104.88	4.2	PLA	1.3	0.68	ST	NF	DRY
107.16	4.8	PLA	1.0	0.42	CM	PF	DRY
108.97	5.4	PLA	3.0	1.06	SF	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY119

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
45.83	4.5	PLA	0.4	0.19	SF	NF	DRY
47.59	4.8	PLA	5.1	2.19	CSMS	NF	DRY
49.85	4.5	PLA	0.3	0.12	STCS	NF	DRY
64.74	4.4	PLA	0.5	0.26	MS	NF	DRY
67.65	4.8	PLA	0.9	0.39	MS/ST	NF	DRY
67.96	4.4	PLA	0.8	0.33	MSCS	PF	DRY
68.68	4.6	PLA	2.0	0.88	STCS	PF	DRY
68.66	4.8	PLA	5.8	2.48	ST	NF	DRY
73.06	5.3	PLA	1.4	0.50	ST/MS	PF	DRY
76.04	4.3	PLA	0.9	0.44	ST	NF	DRY
76.91	3.8	PLA	0.6	0.36	MS	NF	DRY
77.60	5.0	PLA	0.9	0.36	CSMS	NF	DRY
78.59	4.3	PLA	1.8	0.89	MS	NF	DRY
79.27	4.6	PLA	1.1	0.49	MSCS	PF	DRY
81.36	4.1	PLA	0.5	0.28	MS	PF	DRY
81.98	5.1	PLA	1.6	0.62	CSMS	NF	DRY
83.15	5.0	PLA	6.3	2.49	ST	NF	DRY
85.84	4.5	PLA	3.0	1.39	MSCS	PF	DRY
86.74	5.4	PLA	5.8	2.06	SF	NF	DRY
87.98	5.0	PLA	1.0	0.40	MS/ST	PF	DRY
88.43	4.0	PLA	3.6	1.97	ST/MS	NF	DRY
89.88	5.0	PLA	1.5	0.59	SMF	NF	DRY
91.57	4.7	PLA	1.3	0.54	SF	NF	DRY
94.46	4.8	PLA	1.4	0.60	SMF	NF	DRY
97.16	4.6	PLA	17.7	7.81	SMF	NF	DRY
99.74	4.8	PLA	0.8	0.32	SMF	NF	DRY
100.88	5.5	PLA	2.3	0.78	SF	NF	DRY
104.36	4.8	PLA	1.8	0.77	SF/ST	PF	DRY
105.51	4.8	PLA	1.1	0.48	SMF	NF	DRY
107.21	5.3	PLA	4.2	1.52	SM	NF	DRY
108.52	4.8	PLA	1.3	0.52	SMF	NF	DRY
110.00	4.6	PLA	3.5	1.54	ST	NF	DRY
111.15	4.7	PLA	1.9	0.83	SF	NF	DRY
111.61	5.3	PLA	0.8	0.29	ST	NF	DRY
112.95	4.7	PLA	0.5	0.21	MS	NF	DRY
114.98	4.8	PLA	2.8	1.22	SF	NF	DRY
116.58	4.1	PLA	0.5	0.27	C4	NF	DRY
116.93	4.4	PLA	0.4	0.21	MSCS	NF	DRY
117.68	4.8	PLA	3.6	1.52	ST	NF	DRY
118.65	4.8	PLA	1.7	0.71	MS	PF	DRY
119.56	5.0	PLA	5.0	1.99	SS/ST	NF	DRY
120.33	5.1	PLA	0.6	0.25	ST/MS	NF	DRY
121.50	4.1	PLA	0.6	0.30	MS/ST	NF	DRY
122.29	4.3	PLA	0.7	0.34	MS	NF	DRY
126.00	5.0	PLA	2.0	0.79	C8	NF	DRY
126.80	4.1	PLA	3.1	1.65	MS	PF	DRY
127.90	4.1	PLA	0.5	0.27	MS/ST	NF	DRY
128.48	4.5	PLA	3.1	1.42	MS	PF	DRY
128.91	3.5	PLA	3.2	2.19	STCS	NF	DRY
129.71	4.6	PLA	4.6	2.04	C7	NF	DRY
130.87	4.6	PLA	2.5	1.10	SF	NF	DRY
131.43	4.6	PLA	2.4	1.06	ST	NF	DRY
133.31	4.7	PLA	1.2	0.52	SF	NF	DRY
135.73	4.2	PLA	1.8	0.93	SM	NF	DRY
136.64	4.3	PLA	11.9	6.01	SMF	NF	DRY
138.21	4.9	PLA	2.8	1.13	SM	NF	DRY
139.80	5.0	PLA	4.0	1.57	SMF	NF	DRY
142.83	4.7	PLA	2.5	1.11	SMF	NF	DRY
145.60	5.3	PLA	3.6	1.30	SMF	NF	DRY
148.31	4.8	PLA	1.5	0.64	SM	NF	MOIST
152.62	4.8	PLA	5.7	2.40	SF	NF	DRY
152.95	5.2	PLA	1.3	0.49	SM	NF	DRY
156.71	4.9	PLA	6.1	2.49	SMF	NF	DRY
159.42	4.6	PLA	1.2	0.54	SMF	NF	DRY
163.40	4.6	PLA	1.7	0.75	SMF	NF	MOIST
165.77	4.8	PLA	3.6	1.56	SM	NF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE GY119

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
166.52	5.3	PLA	3.1	1.14	SMF	NF	DRY
168.01	4.8	PLA	3.1	1.33	SC	PF	DRY
169.60	4.8	PLA	2.7	1.15	SMF	NF	DRY
172.60	4.8	PLA	1.6	0.68	SMC	NF	DRY
173.88	5.0	PLA	6.3	2.47	SM	NF	DRY
177.09	4.8	PLA	2.3	0.97	SMF	NF	DRY
177.88	4.0	PLA	2.8	1.54	CSMS	PF	DRY
178.00	4.8	PLA	3.9	1.67	CB	NF	DRY
180.42	5.1	PLA	1.1	0.42	SMC	NF	DRY
181.64	4.4	PLA	6.2	2.97	SM	NF	DRY
183.30	5.0	PLA	0.8	0.32	SMF	NF	MOIST
184.03	5.0	PLA	3.5	1.39	SF	NF	DRY
186.59	5.8	PLA	3.4	1.09	SM	NF	DRY
187.23	4.6	PLA	1.0	0.44	ST	NF	DRY
188.15	5.3	PLA	2.8	1.04	MS/ST	NF	DRY
188.94	4.3	PLA	1.2	0.59	MS	NF	DRY
190.72	5.0	PLA	0.8	0.31	MS/ST	NF	DRY
192.03	4.5	PLA	2.6	1.20	MS	NF	DRY
193.50	5.2	PLA	5.2	1.93	ST	NF	DRY
194.92	5.0	PLA	7.0	2.73	SF	NF	DRY
197.42	4.5	PLA	2.3	1.05	MS/ST	NF	DRY
198.11	5.2	PLA	2.9	1.07	STCS	NF	DRY
199.42	5.0	PLA	2.0	0.79	ST	NF	DRY
200.34	4.6	PLA	11.0	4.86	SF	NF	DRY
200.58	4.3	PLA	8.5	4.22	SF	NF	DRY
201.30	3.5	PLA	0.4	0.29	MS	NF	DRY
202.53	4.7	PLA	2.2	0.96	CB	NF	DRY
203.59	5.1	PLA	5.1	1.95	ST	NF	DRY
204.52	4.6	PLA	0.4	0.19	MSCS	PF	DRY
206.79	4.3	PLA	0.6	0.27	MSCS	NF	DRY
207.10	5.2	PLA	1.6	0.59	MS/ST	NF	DRY
209.57	4.5	PLA	4.9	2.26	ST	NF	DRY
210.92	4.3	PLA	1.5	0.76	SMF	NF	DRY
213.30	5.3	PLA	7.5	2.76	SMF	NF	DRY

POINT LOAD TEST RESULTS

BOREHOLE GY123

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
24.38	4.7	PLA	0.4	0.17	SFWX	NF	MOIST
26.47	4.5	PLA	0.6	0.30	ST	NF	MOIST
28.19	4.8	PLA	4.6	1.92	SMF	NF	MOIST
29.03	4.7	PLA	0.5	0.20	SMC	NF	MOIST
30.56	4.6	PLA	0.3	0.14	SM	NF	MOIST
31.70	4.9	PLA	0.3	0.13	SMF	NF	MOIST
32.76	4.2	PLA	0.7	0.36	SF	NF	DRY
34.02	5.2	PLA	0.3	0.10	SMF	NF	MOIST
35.49	5.1	PLA	2.0	0.78	C7	NF	DRY
38.87	4.3	PLA	0.7	0.34	SMF	NF	DRY
41.04	5.0	PLA	4.4	1.74	SF	NF	DRY
44.42	4.5	PLA	6.2	2.88	SMF	NF	DRY
46.25	4.2	PLA	5.7	2.93	SF	NF	DRY
48.12	5.0	PLA	1.8	0.73	SMF	NF	DRY
49.00	4.4	PLA	2.0	0.96	SM	NF	DRY
51.40	4.3	PLA	7.8	3.81	SM	NF	DRY
53.38	4.4	PLA	5.8	2.76	SF	NF	DRY
54.41	4.8	PLA	5.1	2.12	SMF	NF	DRY
48.84	4.3	PLA	4.8	2.33	SF	NF	DRY
49.85	3.5	PLA	1.2	0.82	C8	NF	DRY
57.03	4.5	PLA	3.3	1.53	C7	PF	DRY
57.26	3.6	PLA	2.5	1.63	C8	NF	DRY
57.86	4.0	PLA	2.4	1.33	ST	NF	DRY
58.33	4.0	PLA	0.4	0.25	MS	NF	DRY
59.44	4.5	PLA	5.4	2.50	SF	NF	DRY
60.40	4.3	PLA	1.3	0.64	SM	NF	DRY
61.76	4.8	PLA	4.4	1.86	SMF	NF	DRY
64.46	4.7	PLA	3.8	1.66	SM	NF	DRY
66.10	4.3	PLA	1.8	0.87	SMF	NF	DRY
68.90	4.3	PLA	4.6	2.31	SF	NF	DRY
69.36	3.8	PLA	4.8	2.85	SM	NF	DRY
70.80	4.4	PLA	0.4	0.22	MS/ST	NF	DRY
71.97	4.0	PLA	6.1	3.38	SF	NF	DRY
73.19	4.6	PLA	0.8	0.36	ST/MS	NF	DRY
75.53	4.5	PLA	4.3	1.97	ST	NF	DRY
76.59	5.0	PLA	3.6	1.41	SF	NF	DRY
79.17	4.3	PLA	2.0	1.01	SMC	NF	DRY
81.60	4.8	PLA	1.3	0.53	SM	NF	DRY
84.49	4.7	PLA	12.3	5.34	SMF	NF	DRY
85.80	4.3	PLA	5.5	2.76	SF	NF	DRY
88.13	4.5	PLA	2.3	1.09	SMF	PF	DRY
88.46	4.0	PLA	0.6	0.33	STCS	PF	DRY
90.40	4.3	PLA	2.7	1.35	SMF	NF	DRY
92.80	4.9	PLA	5.3	2.16	SF	NF	DRY
94.76	5.2	PLA	5.3	1.99	SMC	NF	DRY
97.25	5.0	PLA	5.6	2.22	SC	NF	DRY
100.75	4.4	PLA	1.2	0.58	SM	NF	DRY
103.48	4.9	PLA	1.5	0.61	SMC	NF	DRY
105.36	4.4	PLA	6.0	2.88	SMF	NF	DRY
107.00	4.3	PLA	4.6	2.32	SM	NF	DRY
108.60	5.0	PLA	5.6	2.23	SM	NF	DRY
112.37	5.2	PLA	6.1	2.28	SM	NF	DRY
114.58	5.2	PLA	2.2	0.83	ST	NF	DRY
115.76	4.5	PLA	3.8	1.75	SMF	NF	DRY
117.40	4.6	PLA	3.6	1.63	SMC	NF	DRY
119.55	5.0	PLA	3.6	1.43	SM	NF	DRY
120.97	5.0	PLA	5.4	2.16	SMF	NF	DRY
121.62	4.1	PLA	0.3	0.15	SF	NF	DRY
122.31	4.0	PLA	1.7	0.94	MS	PF	DRY
122.96	5.0	PLA	1.3	0.51	MS	PF	DRY
124.14	5.0	PLA	6.1	2.42	SF/MS	NF	DRY
124.57	4.0	PLA	4.0	2.20	SF	NF	DRY
128.90	4.2	PLA	0.3	0.15	CM	NF	DRY
125.80	5.5	PLA	2.1	0.72	CM	PF	DRY
127.49	5.1	PLA	8.0	3.08	ST/SS	NF	DRY
128.20	4.4	PLA	7.0	3.36	SS/ST	NF	DRY

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POINT LOAD TEST RESULTS

BOREHOLE GY123

DEPTH (M)	THICKNESS (CM)	TYPE	LOAD (KN)	IS(50) MN/M2	LITHOLOGY	FAILURE TYPE	CONDITION
129.36	4.7	PLA	4.0	1.74	ST	NF	DRY
129.74	4.7	PLA	5.7	2.48	SS/ST	NF	DRY
129.91	4.4	PLA	0.5	0.25	MS/ST	NF	DRY
131.57	4.1	PLA	6.4	3.41	SF	PF	DRY
131.88	5.5	PLA	4.4	1.50	SS/ST	NF	DRY
132.16	4.0	PLA	1.2	0.66	MS/ST	NF	DRY
132.32	4.7	PLA	1.7	0.76	ST/MS	NF	DRY
133.57	4.5	PLA	5.5	2.55	SS/ST	NF	DRY
134.84	5.3	PLA	5.8	2.10	SF	NF	DRY
136.47	5.1	PLA	2.7	1.04	SS	NF	DRY
138.25	4.9	PLA	7.3	2.98	SMF	NF	DRY

APPENDIX 3

ANALYTICAL SEAM SECTIONS

LEGEND
BRIGHTNESS PROFILE REFERENCE

- COAL - BRIGHT
- COAL - BRIGHT WITH DULL BANDS
- COAL - INTERBANDED DULL AND BRIGHT
- COAL - MAINLY DULL . FREQ. BRIGHT BANDS
- COAL - DULL WITH MINOR BRIGHT BANDS
- COAL - DULL
- COAL STONY
- COAL - UNDIFFERENTIATED
- COAL - WEATHERED
- COAL - CINDERED
- TONSTEIN
- NOT CORED / CORE LOST

LEGEND
LITHOLOGY REFERENCE

- SOIL
- DOLERITE SCREE
- COAL
- COAL STONY
- NOT CORED / CORE LOST
- BRECCIA
- SANDSTONE
- MUDSTONE
- CARBONACEOUS MUDSTONE
- CLAYSTONE
- INTERBEDDED SEDIMENTS (SANDST / MUDST 50:50)

5 cm

SEAM SECTION
1 : 20

0.40 0.20 0.00 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00

METRES

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION

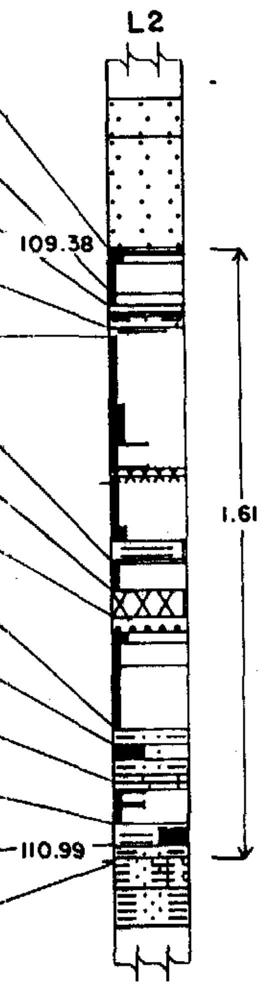
REFERENCE LEGEND

APPENDIX 3

AUTHOR: Coal Division	DATE: November 1982	ENCL.
REPORT NO: CEPR 31/82	DRAWING NO: 2777 a	

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

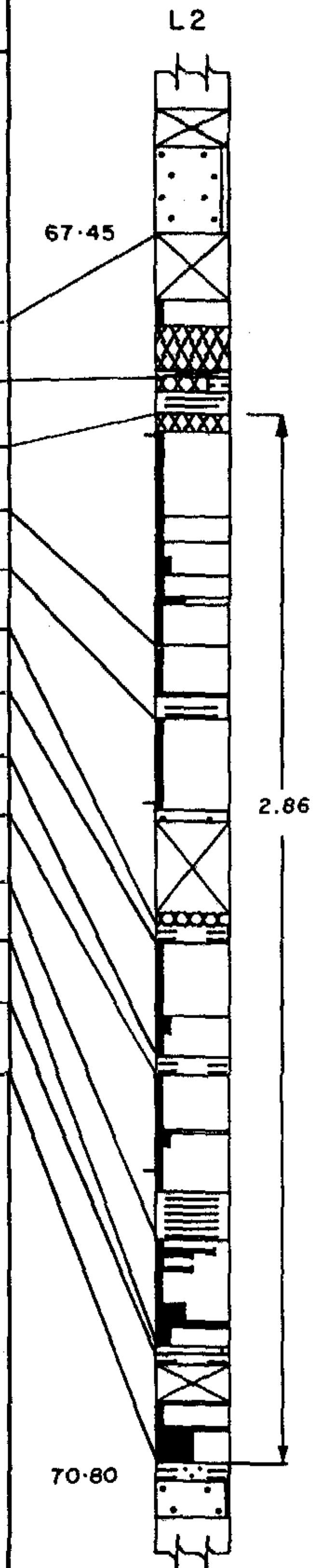
CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						21.1	1.54	0.12	1
						49.0	1.87	0.03	2
						80.3	2.37	0.05	3
						60.7	2.02	0.03	4
						18.3	1.51	0.60	5
						28.1	1.62	0.07	6
62.8	16.8	70.3	18.7	74.8	20.2	82.4	2.48	0.07	7
						18.5	1.52	0.30	8
						81.4	2.45	0.04	9
						60.3	2.06	0.10	10
						26.2	1.58	0.11	11
						35.9	1.68	0.07	12
						40.6	1.72	0.02	13
						MINEABLE SEAM COMPOSITE			
						34.4	1.68	1.61	1-13



Drg 2800

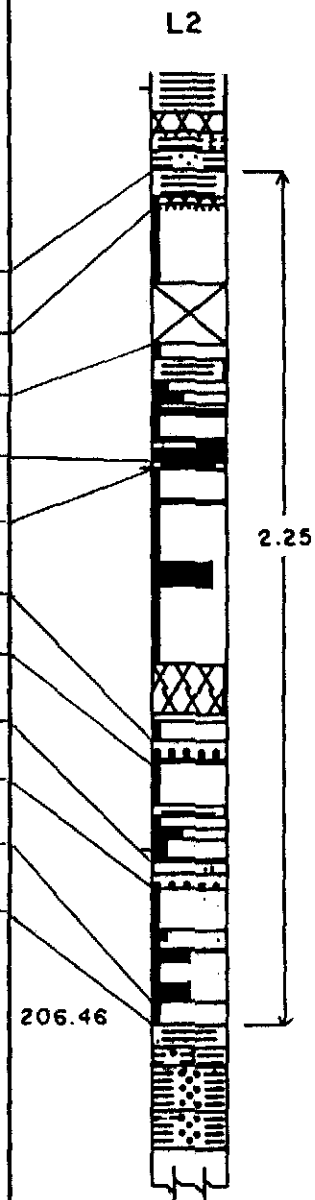
EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						44.9	1.77	0.39	61
						59.1	1.98	0.10	62
						29.3	1.63	0.63	63
						45.0	1.80	0.20	64
						33.1	1.67	0.56	65
						82.9	2.53	0.05	66
						13.6	1.44	0.31	67
56.7	11.1	63.8	13.1	69.9	15.4	83.1	2.48	0.05	68
						32.9	1.66	0.45	69
						15.6	1.45	0.29	70
						75.1	2.21	0.02	71
						11.9	1.42	0.30	72
						MINEABLE SEAM COMPOSITE			
						30.8	1.63	2.86	63-72



EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
58.3	12.5	68.6	15.3	74.9	17.4	42.7	1.76	0.09	81
						30.4	1.65	0.37	82
						28.8	1.63	0.31	83
						83.0	2.47	0.02	84
						22.2	1.56	0.71	85
						82.3	2.41	0.05	86
						21.8	1.55	0.27	87
						72.6	2.24	0.07	88
						21.4	1.53	0.30	89
						13.3	1.44	0.06	90
						MINEABLE SEAM COMPOSITE			
						29.9	1.63	2.25	81-90



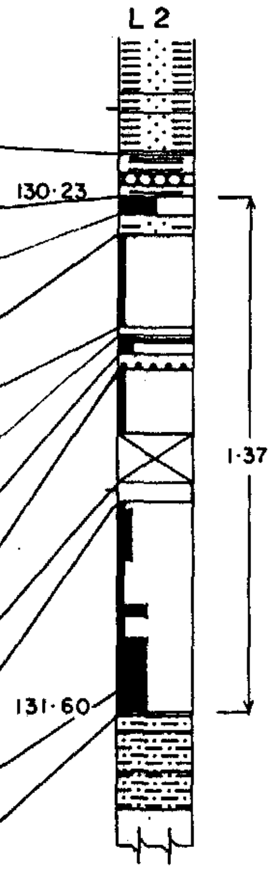
117

650257

GY 123

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						62.9	1.96	0.11	81
						27.9	1.61	0.05	82
59.4	18.0	72.4	20.5	78.0	22.1	77.6	2.22	0.05	83
						32.4	1.64	0.24	84
						77.1	2.27	0.02	85
						37.5	1.67	0.05	86
						82.1	2.38	0.04	87
						22.4	1.53	0.30	88
						81.1	2.32	0.05	89
						22.1	1.51	0.50	90
						15.8	1.44	0.07	91
						MINEABLE SEAM COMPOSITE			
						33.9	1.64	1.37	82-91



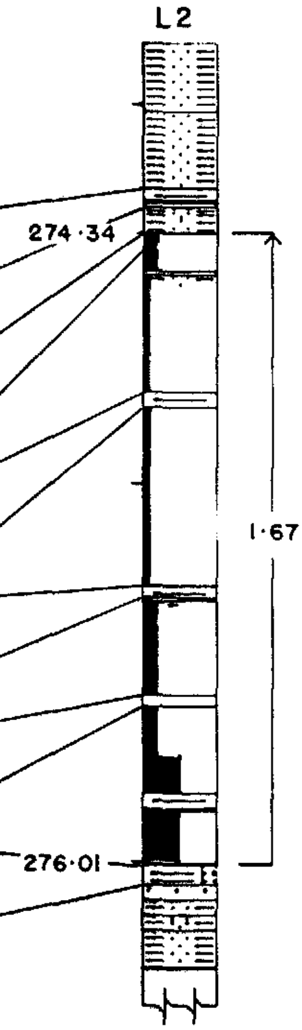
Drg 2800

11c

650258
GY 132

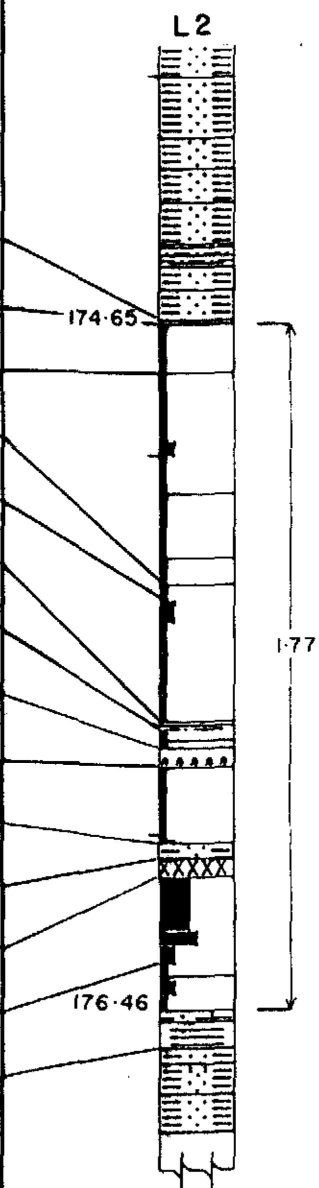
EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						48.4	1.87	0.04	71
						83.9	2.52	0.08	72
						11.3	1.41	0.05	73
						28.0	1.62	0.37	74
						67.3	2.11	0.04	75
61.1	17.3	75.4	20.0	82.3	21.8	30.6	1.64	0.47	76
						65.1	2.10	0.04	77
						24.3	1.57	0.25	78
						71.4	2.21	0.03	79
						23.4	1.57	0.42	80
						78.6	2.36	0.05	81
						MINEABLE SEAM COMPOSITE			
						30.0	1.63	1.67	73-80



EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						76.2	2.24	0.01	81
						18.9	1.51	0.13	82
						29.1	1.63	0.56	83
						71.4	2.21	0.04	84
						27.2	1.62	0.33	85
						74.3	2.26	0.01	86
59.3	14.4	70.1	17.0	76.4	18.9	32.5	1.66	0.05	87
						82.6	2.52	0.05	88
						24.7	1.58	0.20	89
						82.1	2.47	0.04	90
						47.5	1.83	0.05	91
						12.6	1.44	0.31	92
						68.8	2.12	0.14	93
						MINEABLE SEAM COMPOSITE			
						31.5	1.65	1.77	82-92



Drg 2890

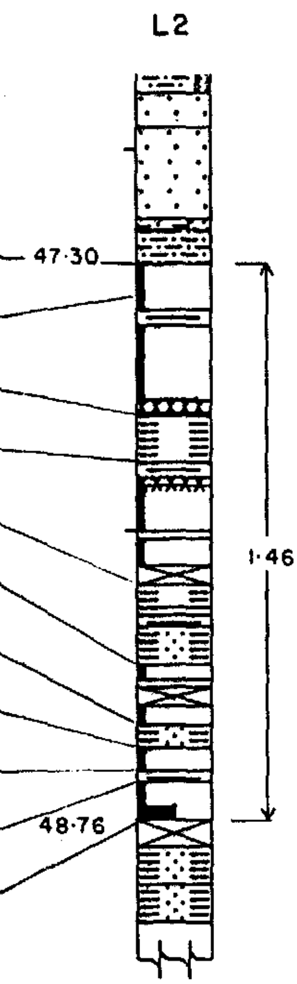
120

650260

GY 157

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

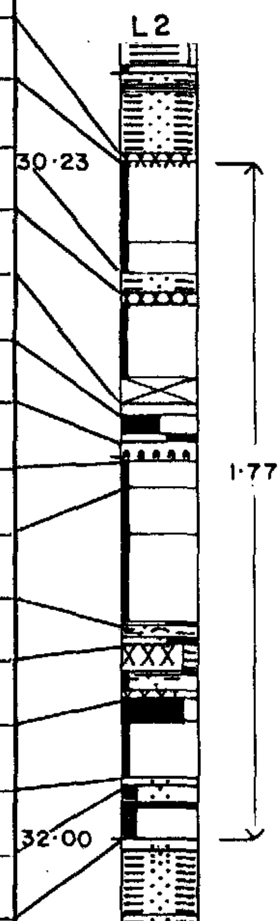
CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						33.1	1.66	0.07	81
						38.4	1.73	0.33	82
						78.4	2.36	0.12	83
						48.1	1.84	0.32	84
						75.4	2.28	0.21	85
						61.1	2.01	0.16	86
						79.2	2.38	0.06	87
						51.5	1.90	0.06	88
						49.2	1.87	0.03	89
						35.7	1.69	0.10	90
						MINEABLE SEAM COMPOSITE			
						55.6	1.95	1.46	81-90



Drg 2800

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						69.0	2.18	0.02	61
52.6	13.7	63.6	16.8	69.5	18.8	42.6	1.78	0.29	62
						75.7	2.28	0.05	63
						30.1	1.64	0.29	64
						74.5	2.26	0.03	65
						32.2	1.66	0.07	66
						82.5	2.49	0.05	67
						28.3	1.62	0.07	68
						14.3	1.46	0.35	69
						67.8	2.14	0.06	70
						40.9	1.74	0.14	71
						16.5	1.48	0.21	72
						75.7	2.27	0.02	73
						8.4	1.39	0.14	74
						MINEABLE SEAM COMPOSITE			
						34.9	1.67	1.77	62-74

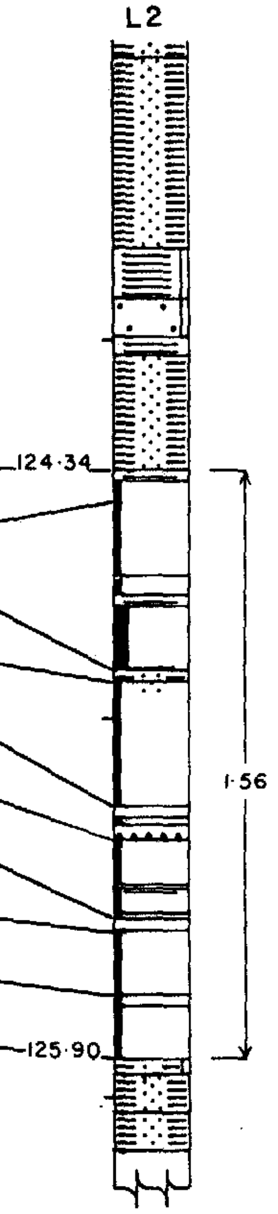


122

650262
GY 168

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						21.3	1.53	0.09	81
						28.9	1.61	0.44	82
						68.2	2.14	0.03	83
						27.5	1.60	0.33	84
49.5	16.6	68.3	20.4	77.0	22.6	71.8	2.18	0.09	85
						31.2	1.64	0.21	86
						78.5	2.32	0.03	87
						23.8	1.57	0.20	88
						30.4	1.64	0.14	89
						MINEABLE SEAM COMPOSITE			
						33.6	1.66	1.56	1-10

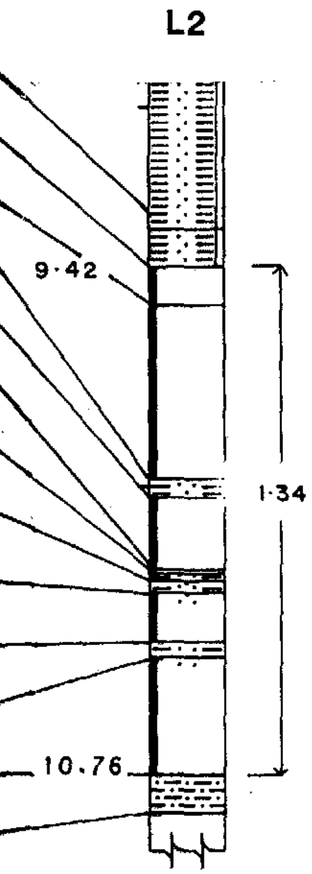


650263

GY 173

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						85.2	2.35	0.15	11
						31.8	1.64	0.10	1
						31.4	1.65	0.46	2
53.4	24.7	72.5	29.2	85.0	31.9	76.0	2.19	0.05	3
						40.2	1.69	0.19	4
						78.4	2.22	0.01	5
						62.5	2.05	0.02	6
						77.5	2.25	0.03	7
						59.7	1.99	0.13	8
						77.0	2.34	0.04	9
						36.3	1.64	0.31	10
						89.8	2.73	0.10	12
						MINEABLE SEAM COMPOSITE			
						43.0	1.74	1.34	1-10



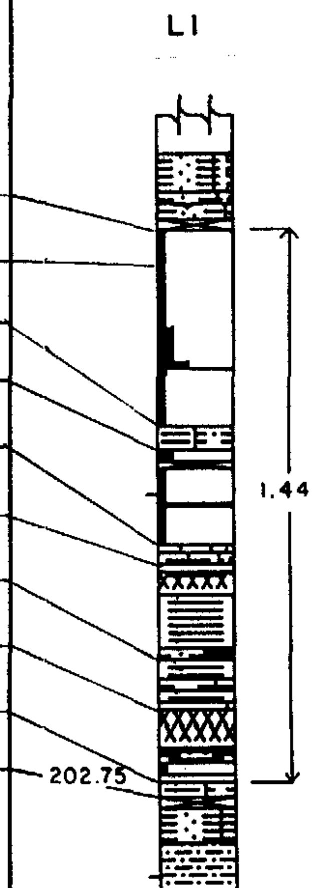
124

650264

GY 119

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						40.7	1.73	0.08	41
						17.2	1.49	0.43	42
						65.4	2.09	0.06	43
51.5	15.2	61.4	18.1	71.2	21.6	19.8	1.52	0.25	44
						62.4	2.02	0.06	45
						36.3	1.68	0.24	46
						58.7	1.99	0.13	47
						31.6	1.66	0.19	48
						55.7	1.94	0.04	49
						MINEABLE SEAM COMPOSITE			
						33.5	1.65	1.44	41-48

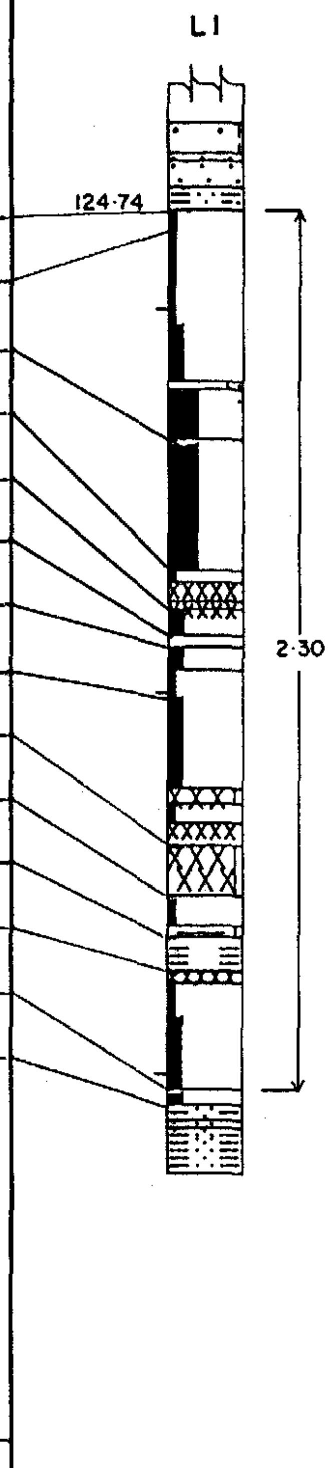


Drg 2800

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

GY 123

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						27.1	1.59	0.05	63
						23.9	1.47	0.55	64
						24.2	1.54	0.34	65
						58.9	1.95	0.10	66
40.2	14.8	50.3	18.3	61.4	22.2	43.7	1.75	0.07	67
						81.8	2.38	0.03	68
						56.2	1.92	0.13	69
						46.7	1.79	0.39	70
						66.4	2.09	0.14	71
						37.9	1.71	0.10	72
						78.4	2.29	0.09	73
						31.3	1.63	0.31	74
						54.1	1.89	0.04	75
						38.4	1.68	1.90	63–72
						49.4	1.78	0.40	73–74
						MINEABLE SEAM COMPOSITE			
						39.6	1.70	2.30	63–74

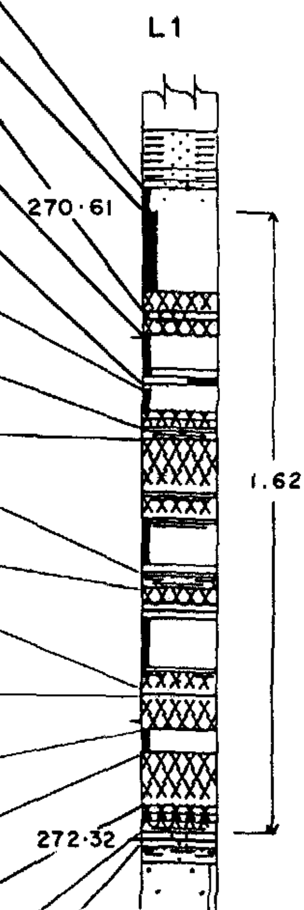


126

650266
GY 132

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

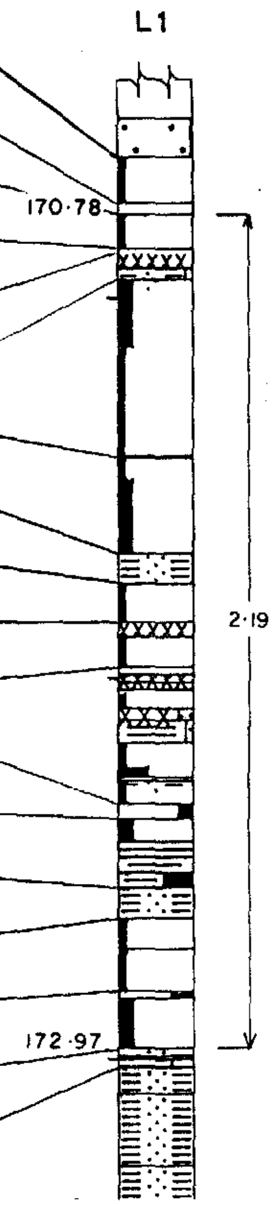
CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						49.1	1.86	0.06	41
						24.4	1.57	0.26	42
						59.6	2.01	0.06	43
						41.0	1.73	0.13	44
						77.2	2.31	0.01	45
						42.2	1.76	0.10	46
						77.7	2.30	0.03	47
						37.3	1.70	0.35	48
						51.8	1.87	0.04	49
						45.4	1.78	0.28	50
						83.2	2.54	0.01	51
						39.2	1.72	0.08	52
						68.7	2.14	0.06	53
						52.2	1.91	0.14	54
						15.1	1.47	0.07	55
						65.6	2.08	0.03	56
						MINEABLE SEAM COMPOSITE			
						42.6	1.76	1.62	42-55



Drg 2800

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						63.7	2.06	0.12	61
						79.0	2.36	0.03	62
						43.7	1.77	0.09	63
						77.3	2.30	0.01	64
						56.4	1.94	0.07	65
						18.4	1.51	0.46	66
						14.2	1.45	0.26	67
						70.1	2.21	0.08	68
47.4	11.9	58.7	15.4	66.7	18.4	17.6	1.50	0.10	69
						33.4	1.67	0.12	70
						46.1	1.82	0.36	71
						78.1	2.33	0.04	72
						43.9	1.78	0.18	73
						69.5	2.18	0.08	74
						37.3	1.71	0.21	75
						12.1	1.42	0.13	76
						60.1	2.10	0.05	77
						MINEABLE SEAM COMPOSITE			
						36.6	1.69	2.19	63-76

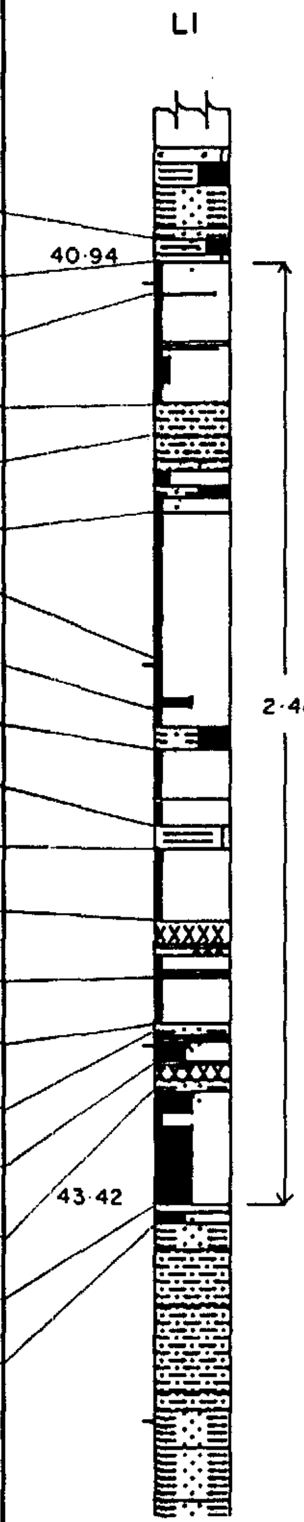


128

650268
GY 157

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						66.5	2.11	0.09	61
50.2	12.2	58.1	14.8	64.6	17.4	21.6	1.53	0.08	62
						11.5	1.42	0.29	63
						74.4	2.26	0.09	64
						58.4	1.98	0.21	65
						14.8	1.47	0.37	66
						14.6	1.45	0.18	67
						54.7	1.93	0.06	68
						25.3	1.58	0.20	69
						64.2	2.07	0.06	70
						36.3	1.70	0.19	71
						60.4	2.02	0.15	72
						24.2	1.57	0.12	73
						82.1	2.48	0.03	74
						18.1	1.50	0.07	75
						73.7	2.24	0.08	76
						27.0	1.61	0.30	77
						63.3	2.03	0.05	78
						MINEABLE SEAM COMPOSITE			
						35.9	1.68	2.48	62-77



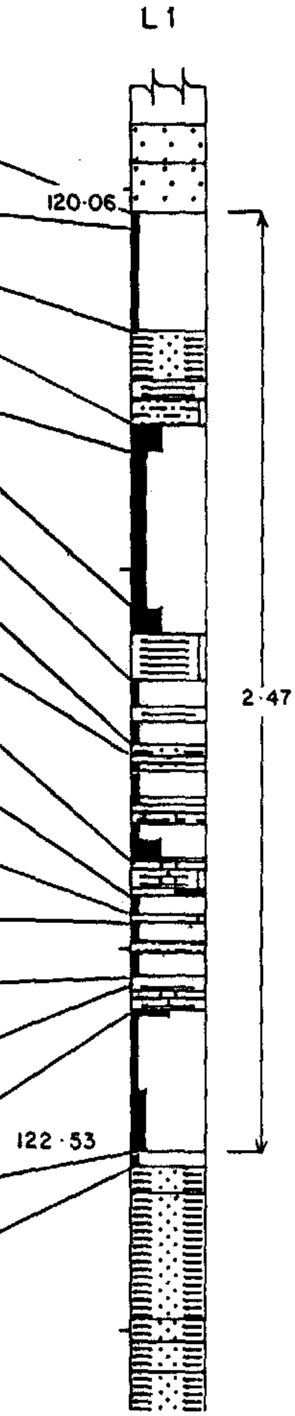
129

650269

GY 168

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						13.1	1.44	0.04	61
						17.8	1.50	0.27	62
						60.3	2.01	0.25	63
						23.4	1.56	0.07	64
						11.2	1.42	0.48	65
						45.0	1.78	0.12	66
						23.6	1.57	0.17	67
48.1	12.2	58.7	15.8	66.1	18.7	62.2	2.04	0.03	68
						35.8	1.68	0.27	69
						62.8	2.06	0.10	70
						36.9	1.70	0.05	71
						74.4	2.26	0.02	72
						43.0	1.75	0.14	73
						82.0	2.42	0.01	74
						72.3	2.22	0.08	75
						28.6	1.63	0.37	76
						50.7	1.86	0.04	77
						MINEABLE SEAM COMPOSITE			
						35.1	1.68	2.47	61-76

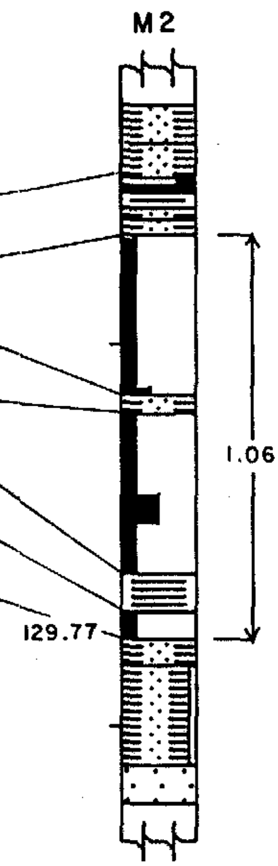


130

650270
GY 119

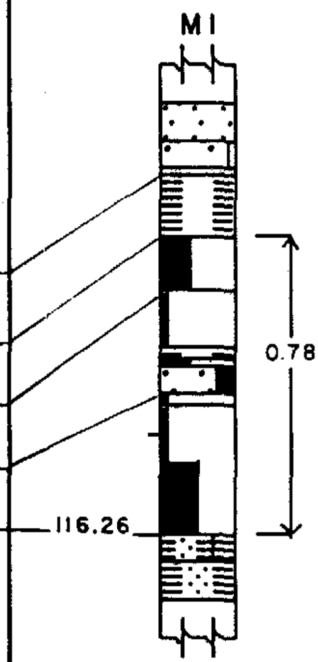
EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						60.7	2.01	0.13	21
						16.0	1.48	0.42	22
						84.1	2.46	0.05	23
75.0	10.1	76.8	10.7	80.2	12.1	11.6	1.41	0.42	24
						53.6	1.93	0.10	25
						18.2	1.50	0.07	26
						MINEABLE SEAM COMPOSITE			
						24.1	1.54	1.06	22-26



EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						71.7	2.21	0.18	1
						17.6	1.48	0.14	2
62.4	16.7	66.7	17.8	68.8	18.7	55.0	1.94	0.27	3
						26.0	1.58	0.37	4
						MINEABLE SEAM COMPOSITE			
						36.3	1.69	0.78	2-4

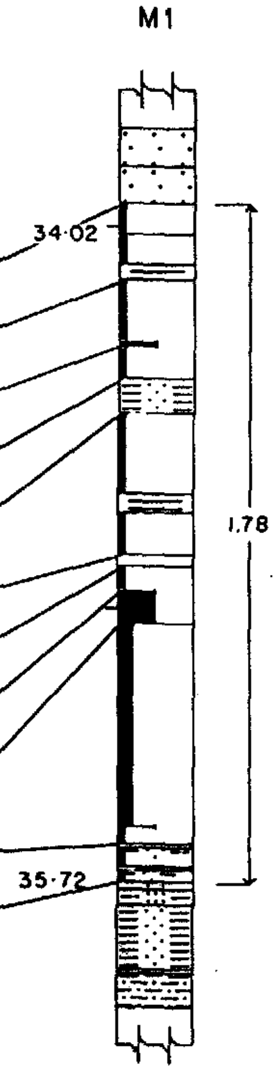


Drg 2800

650272
GY 123

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
77.5	15.4	81.2	16.3	83.2	16.9	16.8	1.46	0.20	1
						21.1	1.50	0.16	2
						19.8	1.50	0.10	3
						71.8	2.07	0.09	4
						18.4	1.47	0.37	5
						80.8	2.34	0.03	6
						24.8	1.56	0.06	7
						10.7	1.41	0.09	8
						21.1	1.52	0.58	9
						44.6	1.67	0.10	10
						MINEABLE SEAM COMPOSITE			
						26.1	1.55	1.78	1-10

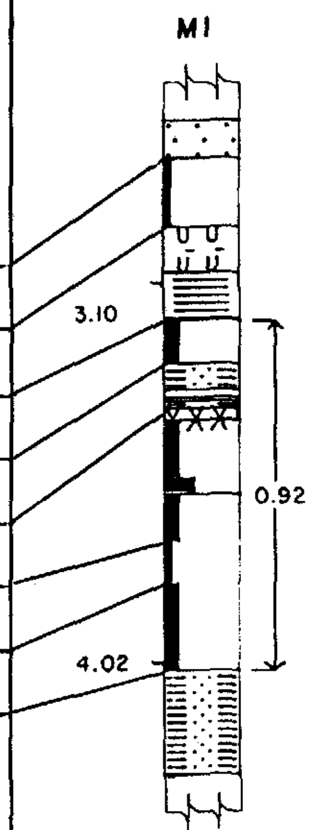


- 135

650273
GY 124

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						47.5	1.78	0.18	01
						76.9	2.28	0.24	02
						23.1	1.51	0.11	03
42.7	15.3	50.1	17.8	54.4	19.5	69.2	2.14	0.12	04
						22.2	1.49	0.35	05
						15.8	1.44	0.11	06
						28.1	1.56	0.23	07
						44.3	1.74	1.34	1-7
						MINEABLE SEAM COMPOSITE			
						31.3	1.59	0.92	3-7



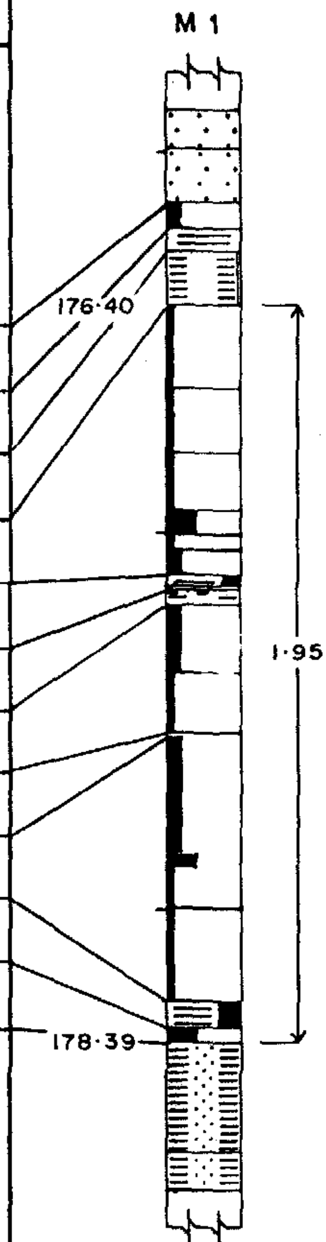
Drg 2800

650274

GY 132

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						44.8	1.78	0.07	1
						42.7	1.75	0.06	2
						79.3	2.37	0.14	3
75.7	15.4	82.3	17.1	86.1	18.4	20.7	1.53	0.71	4
						50.4	1.86	0.04	5
						79.2	2.39	0.04	6
						20.1	1.52	0.34	7
						52.3	1.89	0.01	8
						18.0	1.50	0.70	9
						58.7	2.01	0.07	10
						31.9	1.64	0.04	11
						MINEABLE SEAM COMPOSITE			
						24.4	1.56	1.95	4-11



Drg 3800

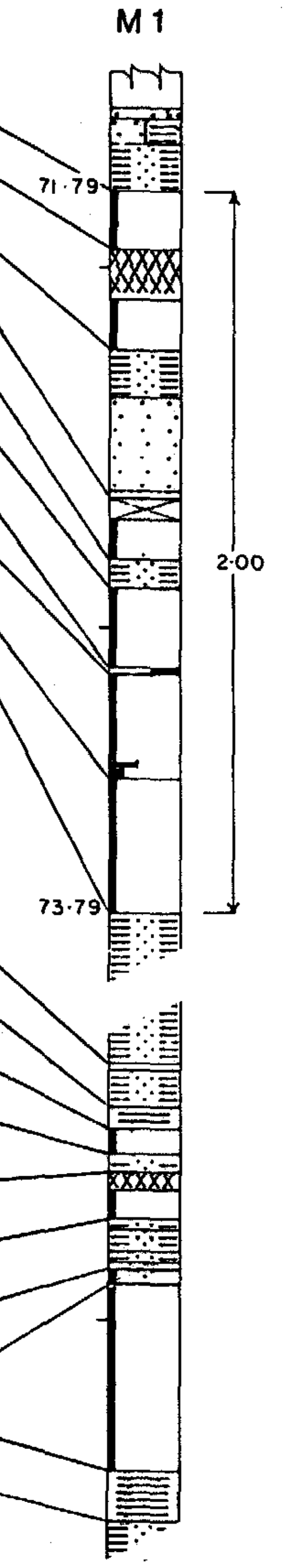
135

650275

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

GY 151

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						22.9	1.55	0.16	1
						35.6	1.71	0.28	2
As Analysed:						85.0	2.40	0.41	*
64.1	14.2	72.3	16.2	76.3	17.5	23.8	1.58	0.17	3
(excludes 0.41 band) By Calculation:						80.6	2.40	0.08	4
46.5	14.2	52.4	16.2	55.3	17.5	22.5	1.56	0.22	5
(includes 0.41 band)						68.5	2.16	0.02	6
						19.1	1.53	0.29	7
						17.9	1.52	0.37	8
						73.1	2.24	0.12	9
						60.5	1.99	0.06	10
						15.4	1.46	0.07	11
						72.3	2.21	0.05	12
						30.3	1.64	0.13	13
						74.6	2.28	0.14	14
82.3	15.4	89.3	16.8	91.9	17.5	34.3	1.67	0.07	15
						20.5	1.53	0.51	16
						44.3	1.78	0.41	17
						MINEABLE SEAM COMPOSITE			
						44.2	1.78	2.00	1–8



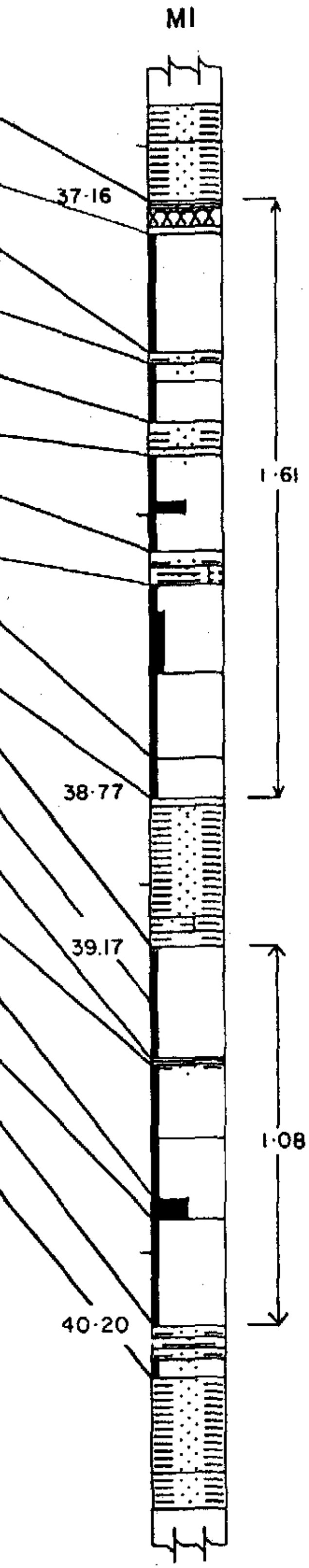
*Not sampled
-assumed analysis.

650276

GY 167

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						28.1	1.61	0.08	1
						17.2	1.49	0.32	2
						64.1	2.07	0.03	3
						17.0	1.50	0.17	4
73.0	14.1	77.1	15.1	79.8	16.1	76.7	2.29	0.08	5
						26.6	1.59	0.38	6
						63.7	2.04	0.09	7
						28.2	1.47	0.47	8
						26.5	1.58	0.11	9
						85,0	2,40	0,40	*
						17.4	1.48	0.14	10
						22.6	1.55	0.16	11
80.4	13.8	86.9	15.4	90.3	16.3	75.0	2.27	0.02	12
						24.1	1.56	0.36	13
						12.9	1.44	0.06	14
						15.2	1.46	0.29	15
						47.2	1.84	0.14	16
						21,4	1.53	1.03	10-15
						36,6	1,68	3.04	1-15
						MINEABLE SEAM COMPOSITE			
						27.8	1.59	1.61	1-9



* Not sampled
\- assumed analysis

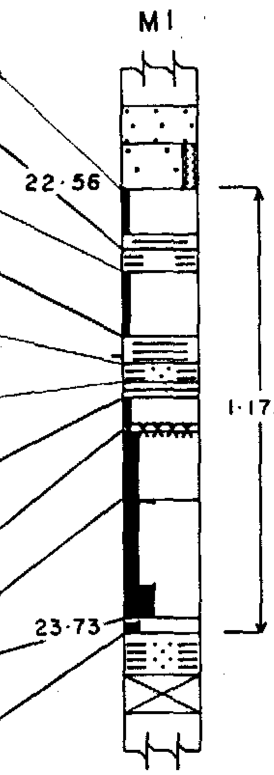
137

650277

GY 168

EL 5/61 GRAY MOUNT NICHOLAS WASHABILITY RESULTS

CUMULATIVE %						RAW ASH%	RELATIVE DENSITY	THICKNESS (m)	SAMPLE NO.
FLOATS 1.60		FLOATS 1.70		FLOATS 1.80					
MASS	ASH	MASS	ASH	MASS	ASH				
						26.9	1.59	0.16	1
						78.7	2.36	0.06	2
						22.4	1.55	0.17	3
						45.7	1.80	0.07	4
64.1	16.0	73.1	18.0	78.4	19.8	71.4	2.19	0.05	5
						68.0	2.14	0.04	6
						31.1	1.64	0.09	7
						13.5	1.45	0.19	8
						17.0	1.48	0.30	9
						29.6	1.63	0.04	10
						MINEABLE SEAM COMPOSITE			
						31.9	1.63	1.17	1-10



THE SHELL COMPANY OF AUSTRALIA LIMITED
(Incorporated in Victoria)

AND

INDUSTRIAL AND MINING INVESTIGATIONS PTY. LIMITED
(Incorporated in the A.C.T.)

EL 5/61 GRAY
- TASMANIA -

MOUNT NICHOLAS GEOLOGICAL REPORT

VOLUME 3

ENCLOSURES

C.L. Patterson
B. Ward

CEPR 31/82

November 1982

TCD:RP9:J:12

139

650279

CONTENTS VOLUME 3

LIST OF ENCLOSURES

Enclosure No.	Title	Drawing No.
34	L1 & L2 Seam Reserves	2711
35	M1 & M2 Seam Reserves	2709
	Drill Hole Lithogies with Expanded Seam Sections	
36	Reference Legend for Enclosures 37 - 66	2777a
37	GY106	2777
38	GY108	2777
39	GY109	2777
40	GY116	2777
41	GY117	2777
42	GY119	2777
43	GY120	2777
44	GY121	2777
45	GY122	2777
46	GY123	2777
47	GY124	2777
48	GY127	2777
49	GY129	2777
50	GY130	2777
51	GY132	2777
52	GY135	2777
53	GY136	2777
54	GY137	2777
55	GY138	2777
56	GY141	2777
57	GY142	2777
58	GY143	2777
59	GY146	2777
60	GY151	2777
61	GY157	2777
62	GY164	2777
63	GY166	2777
64	GY157	2777
65	GY168	2777
66	GY173	2777

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37	GY106	2777
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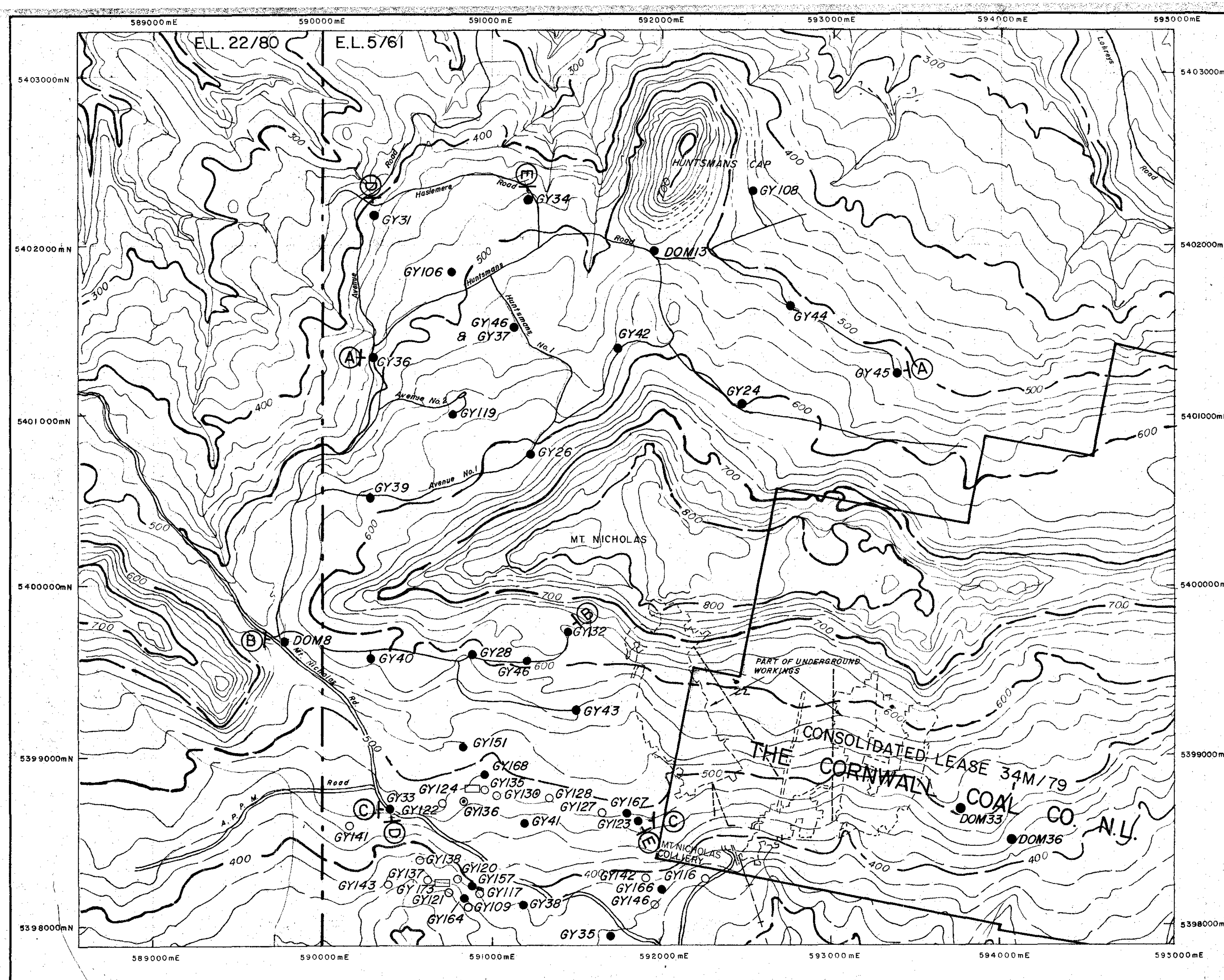
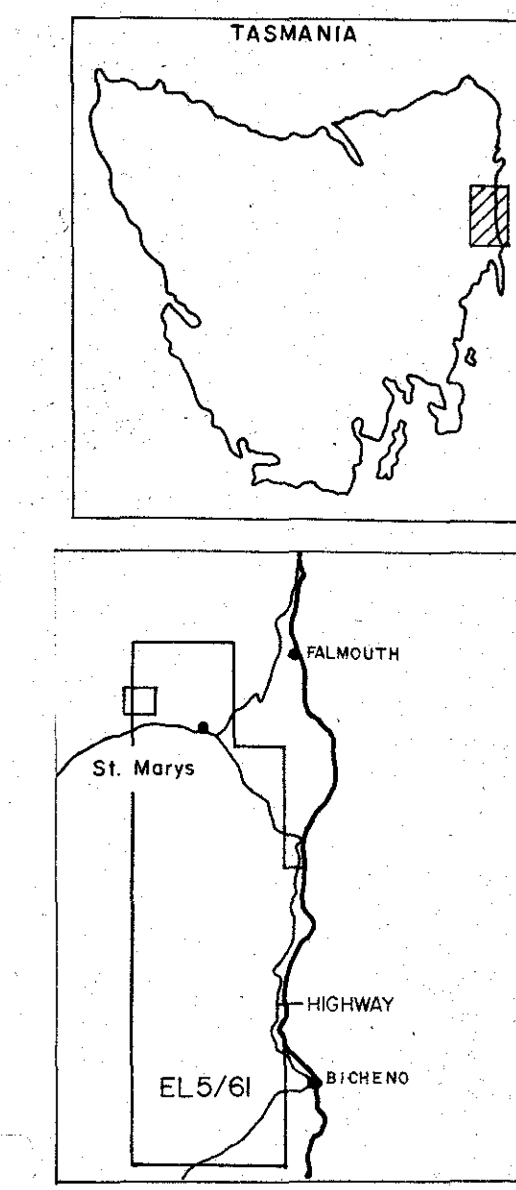
40	GY116	2777
41	GY117	2777
42	GY119	2777
43	GY120	2777
44	GY121	2777
45	GY122	2777
46	GY123	2777
47	GY124	2777
48	GY127	2777
49	GY129	2777
50	GY130	2777
51	GY132	2777
52	GY135	2777
53	GY136	2777
54	GY137	2777
55	GY138	2777
56	GY141	2777
57	GY142	2777
58	GY143	2777
59	GY146	2777
60	GY151	2777
61	GY157	2777
62	GY164	2777
63	GY166	2777
64	GY157	2777
65	GY168	2777
66	GY173	2777

CONTENTS VOLUME 3

LIST OF ENCLOSURES





5 cm

LEGEND

- ● Cored Borehole Existing
- ○ Non Cored Borehole Existing
- ▭ Shaft
- Ⓐ⊢ Cross Section Location

650283

SCALE

0 500 1000 1500m

THE SHELL COMPANY OF AUSTRALIA LTD.

83-1896

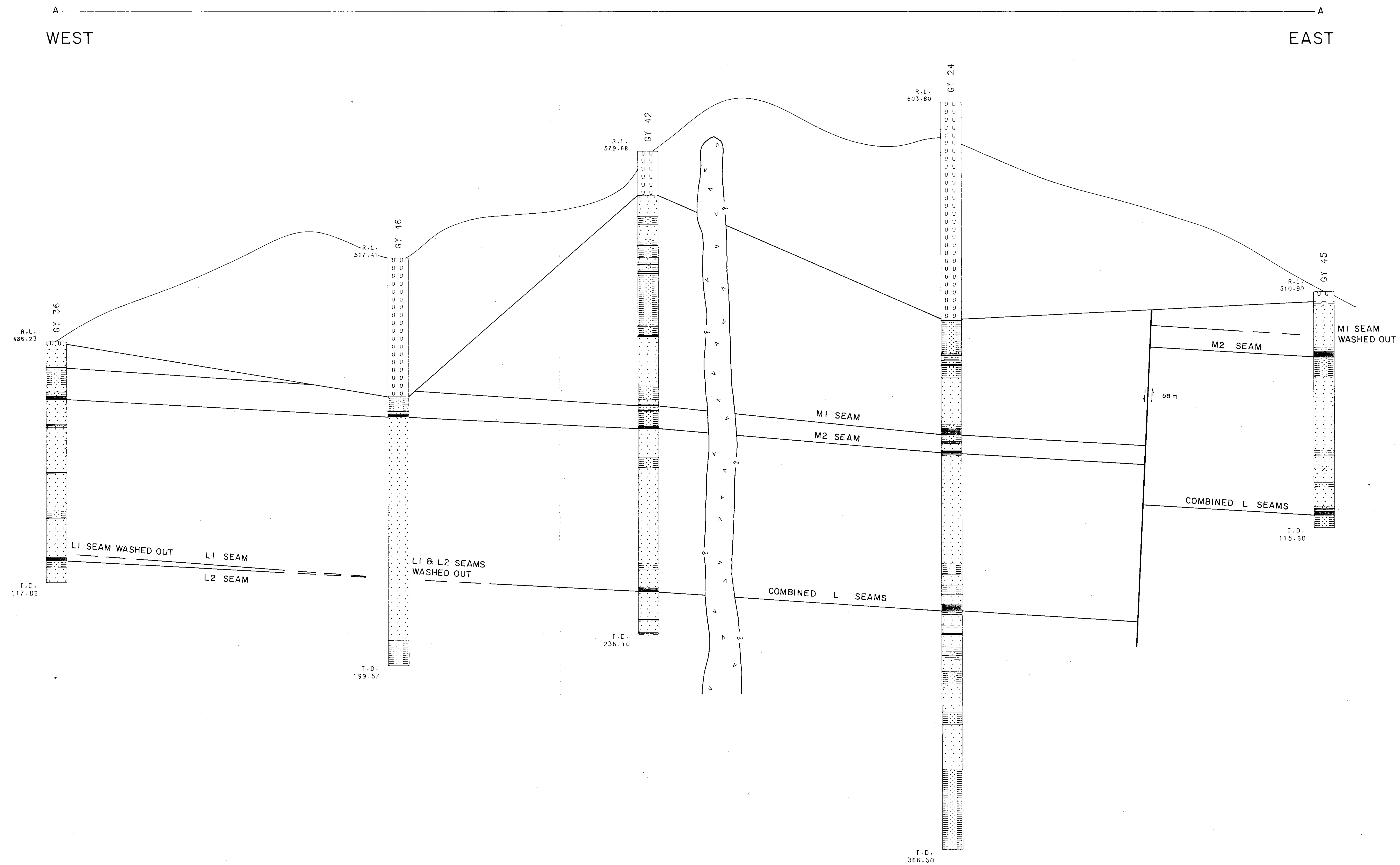
TASMANIA - GRAY EL 5/61
MT NICHOLAS AREA

TOPOGRAPHIC MAP
WITH BOREHOLE AND CROSS SECTION
LOCATIONS

Scale 1:20 000

141

Author: COAL DIVISION	Date: November 1982	Encl. 1
Report No: CEPR 31/82	Drawing No: 1925	



LEGEND

LITHOLOGY REFERENCE

- COLLUVIUM
- SANDSTONE
- COAL
- DOLERITE
- MUDSTONE
- CARBONACEOUS MUDSTONE
- SILTSTONE

HORIZONTAL SCALE
1: 5000

100 50 0 50 100 150 200 250 300 350 400 450 500

VERTICAL SCALE
1: 1000

20.0 10.0 0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0

5 cm

650284

For location see Encl. 1

83-1896

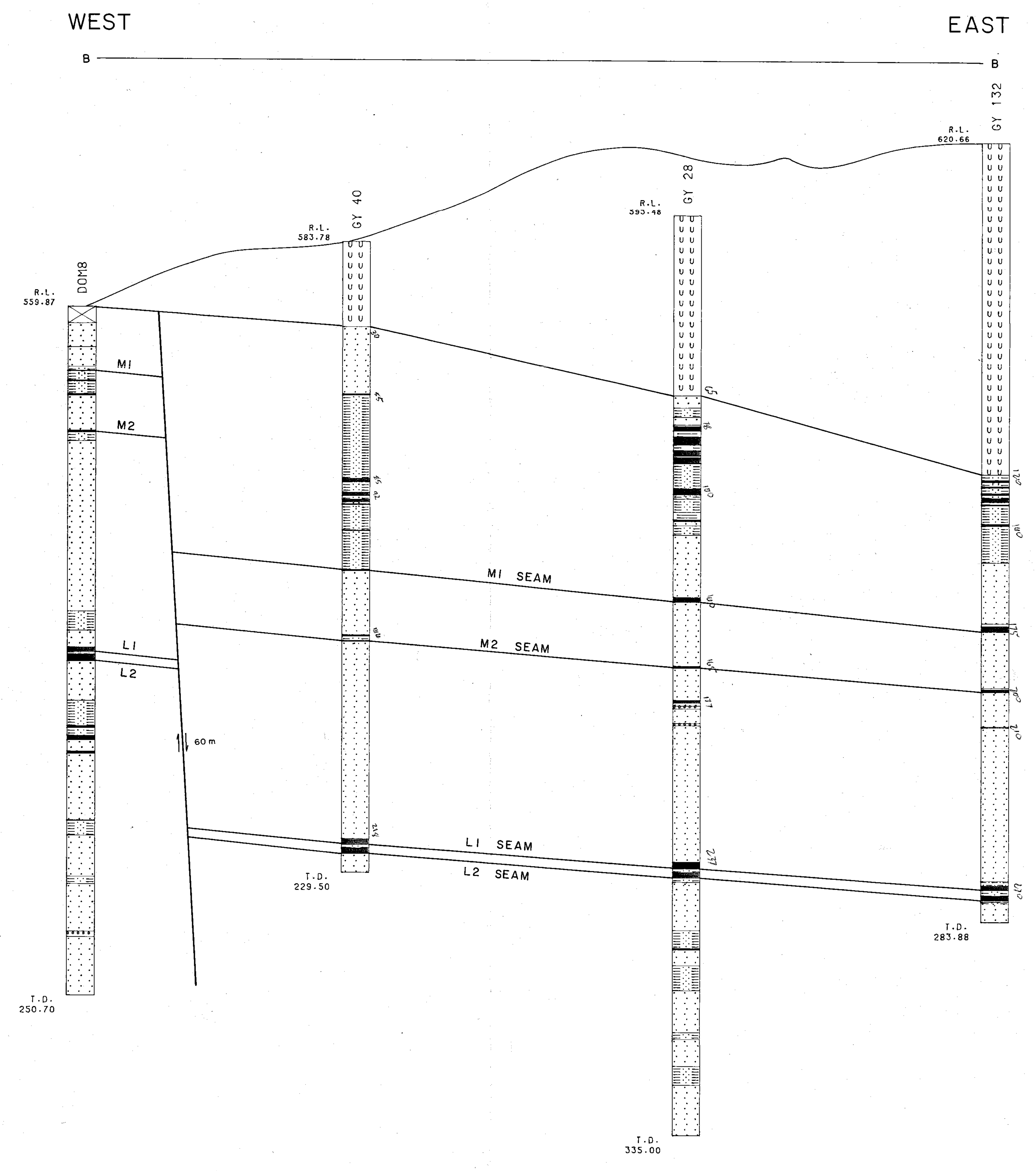
THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION

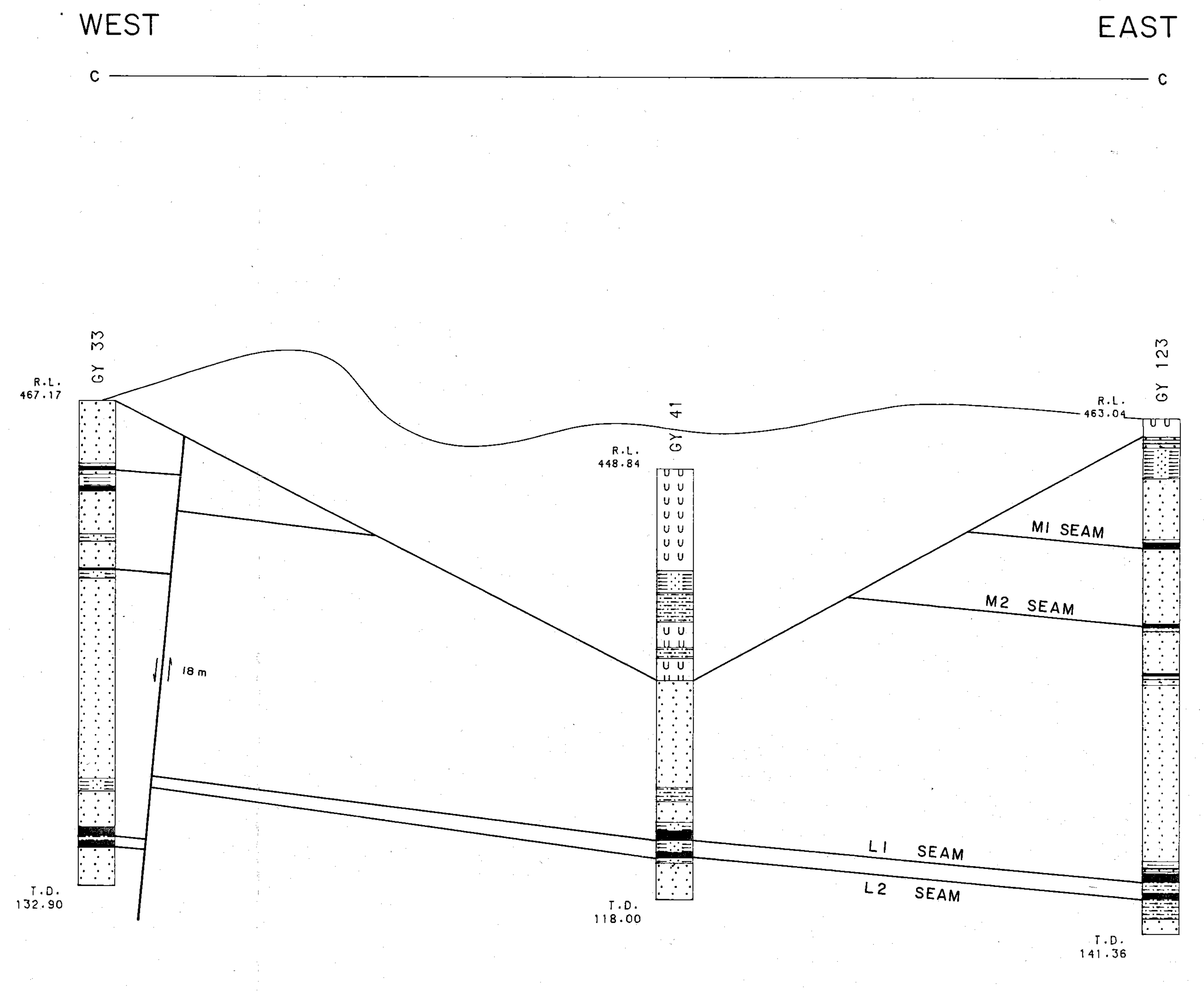
TASMANIA E.L. 5/61 GRAY
MT. NICHOLAS AREA

142

CROSS SECTION A - A
(WEST - EAST)

AUTHOR: Coal Division	DATE: November 1982	ENCL. 2
REPORT NO: CEPR 31/82	DRAWING NO: 2740	





LEGEND

LITHOLOGY REFERENCE

- SANDSTONE
- MUDSTONE
- CARBONACEOUS MUDSTONE
- SILTSTONE
- COAL
- COLLUVIUM
- CONGLOMERATE
- NOT CORED/CORE LOSS

HORIZONTAL SCALE
1: 5000

100 50 0 50 100 150 200 250 300 350 400 450 500

VERTICAL SCALE
1: 1000

20.0 10.0 0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0

5 cm

C50285

For location see Encl. 1

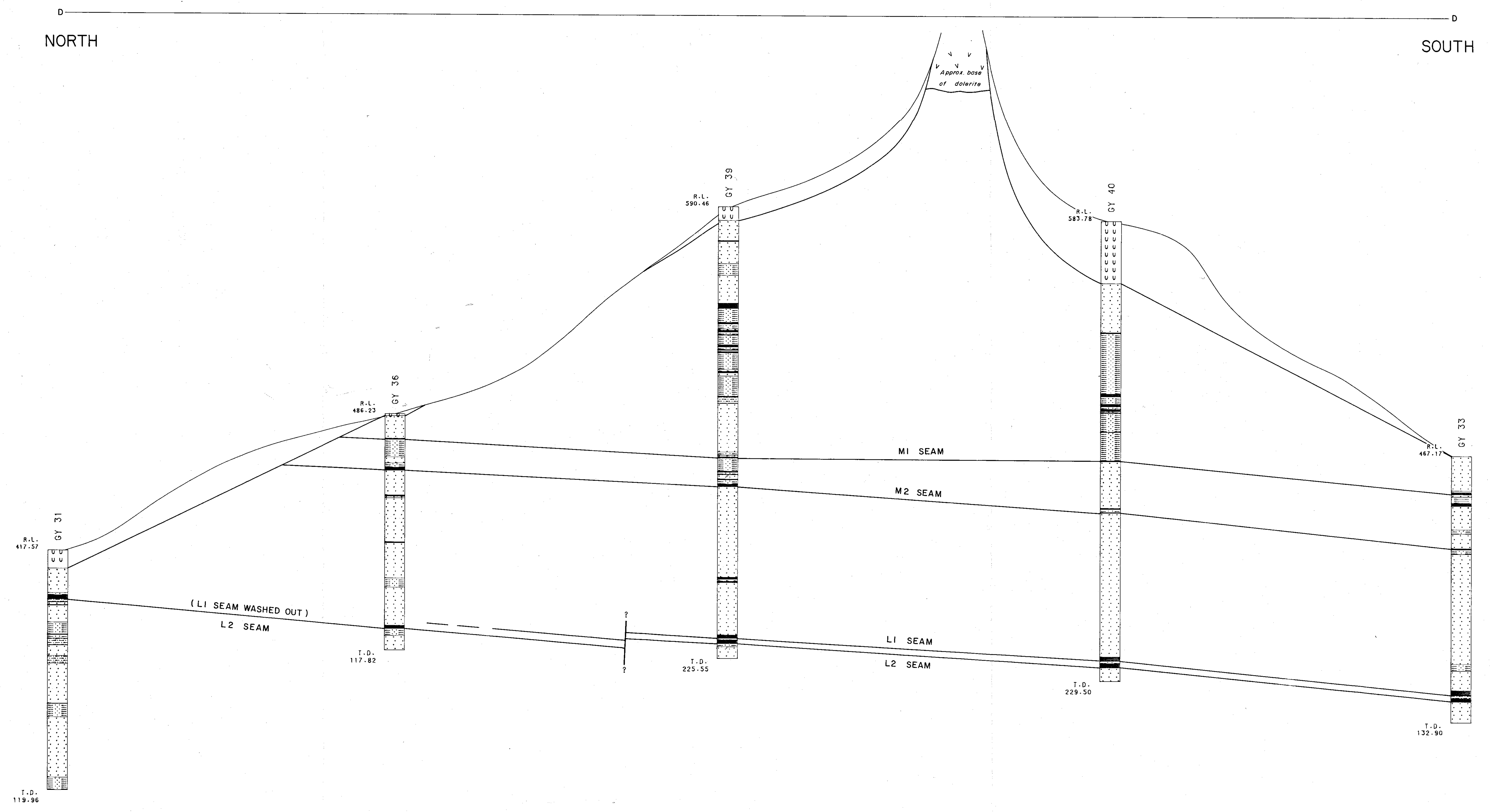
83-1096

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION

TASMANIA E.L. 5/61 GRAY
.143
MT. NICHOLAS AREA

CROSS SECTIONS B-B and C-C (WEST-EAST)

AUTHOR: Coal Division	DATE: November 1982	ENCL. 3
REPORT NO: CEPR 31/82	DRAWING NO: 2741	



LEGEND

LITHOLOGY REFERENCE

- COLLUVIUM
- SANDSTONE
- MUDSTONE
- COAL
- SILTSTONE
- CARBONACEOUS MUDSTONE

HORIZONTAL SCALE
1: 5000

100 50 0 50 100 150 200 250 300 350 400 450 500

VERTICAL SCALE
1: 1000

20.0 10.0 0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0

5 cm

For location see Encl. I

— BASE OF TRIASSIC — — —

83-1896

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION

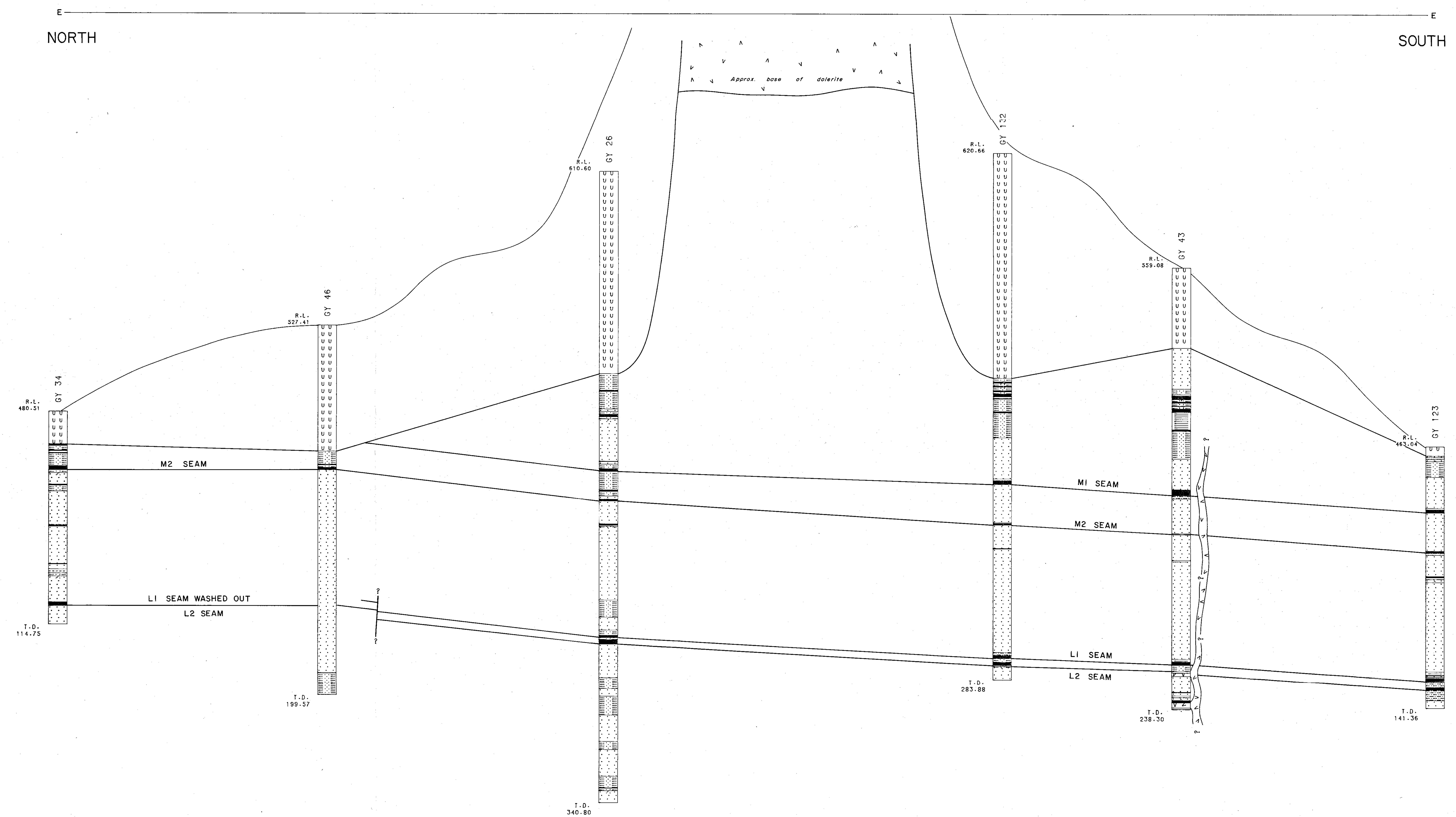
TASMANIA E.L. 5/61 GRAY
MT. NICHOLAS AREA

CROSS SECTION D - D (NORTH - SOUTH)

144

650286

AUTHOR: Coal Division	DATE: November 1982	ENCL. 4
REPORT NO: CEPR 31/82	DRAWING NO: 2742	



LEGEND

LITHOLOGY REFERENCE

- COLLUVIUM
- COAL
- MUDSTONE
- SANDSTONE
- CONGLOMERATE
- SHALE
- CARBONACEOUS MUDSTONE
- DOLERITE
- SILTSTONE

HORIZONTAL SCALE
1 : 5000

100 50 0 50 100 150 200 250 300 350 400 450 500

VERTICAL SCALE
1 : 1000

20.0 10.0 0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0

5 cm

For location see Encl. 1

83-1896

THE SHELL COMPANY OF AUSTRALIA LTD
COAL DIVISION

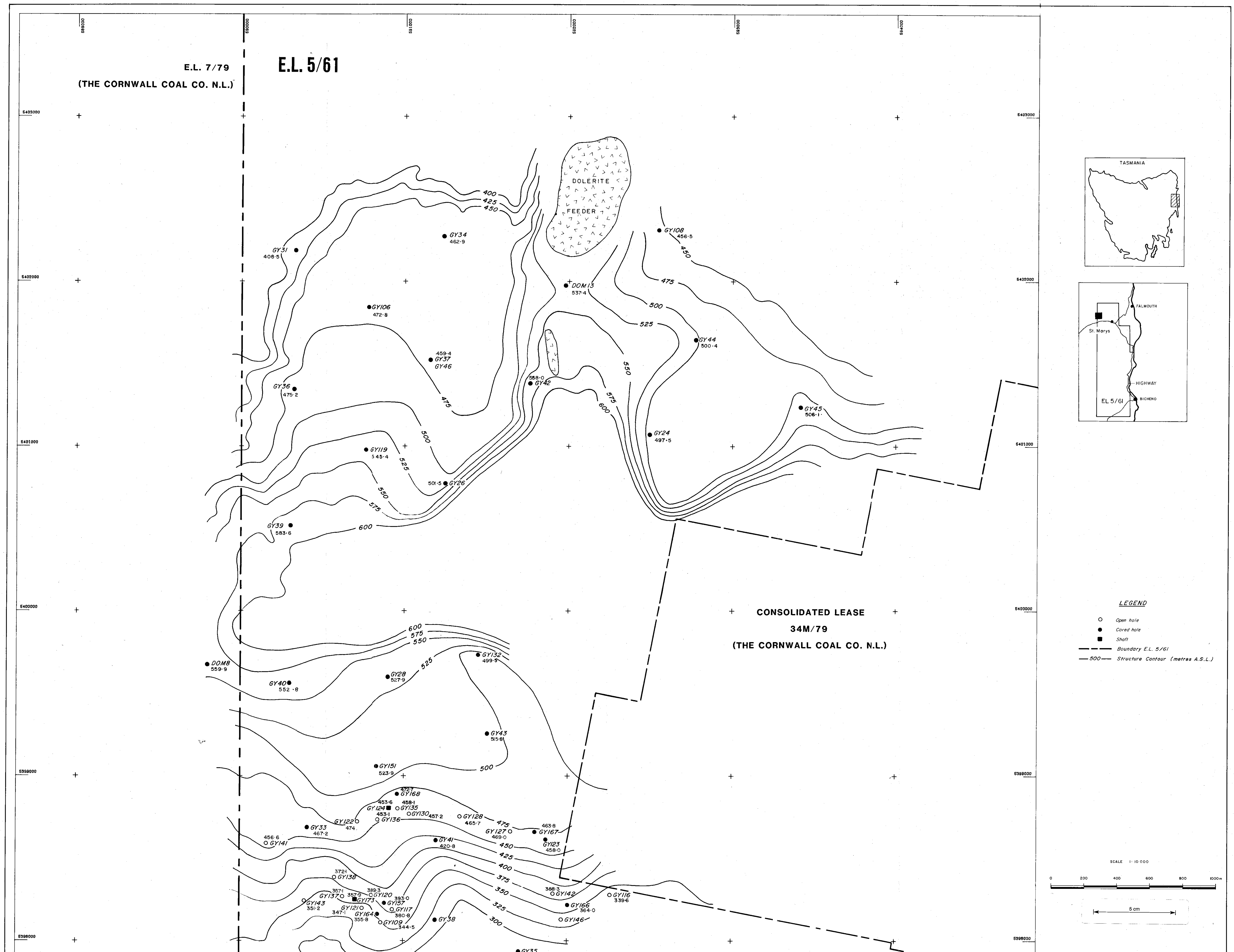
TASMANIA E.L. 5/61 GRAY
MT. NICHOLAS AREA

145

CROSS SECTION E - E
(NORTH - SOUTH)

AUTHOR: Coal Division	DATE: November 1982	ENCL. 5
REPORT NO: CEPR 31/82	DRAWING NO: 2743	

650287



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61 146

MT NICHOLAS AREA

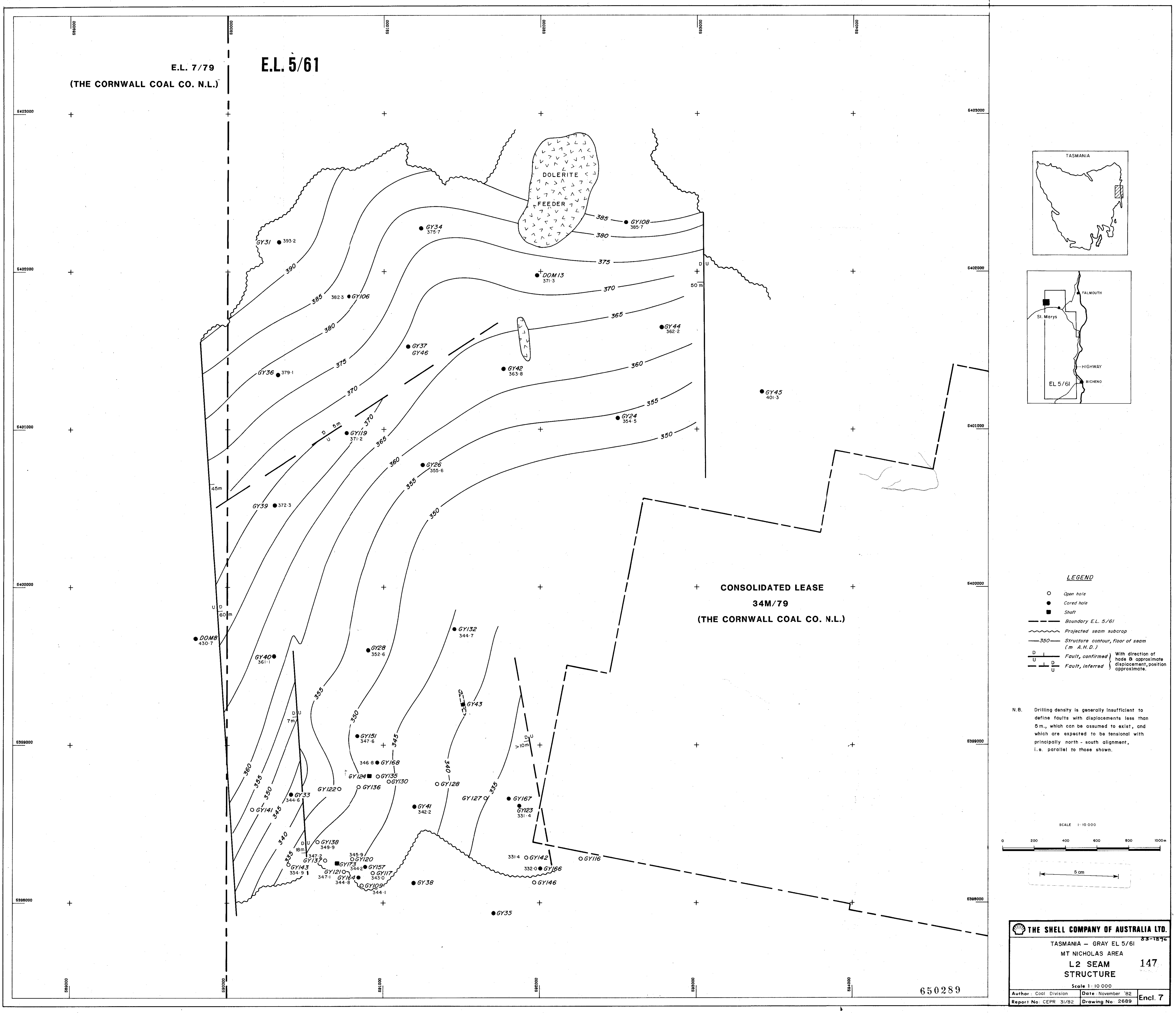
STRUCTURE – BASE OF COLLUVIUM

(Surface of Coal Measures)

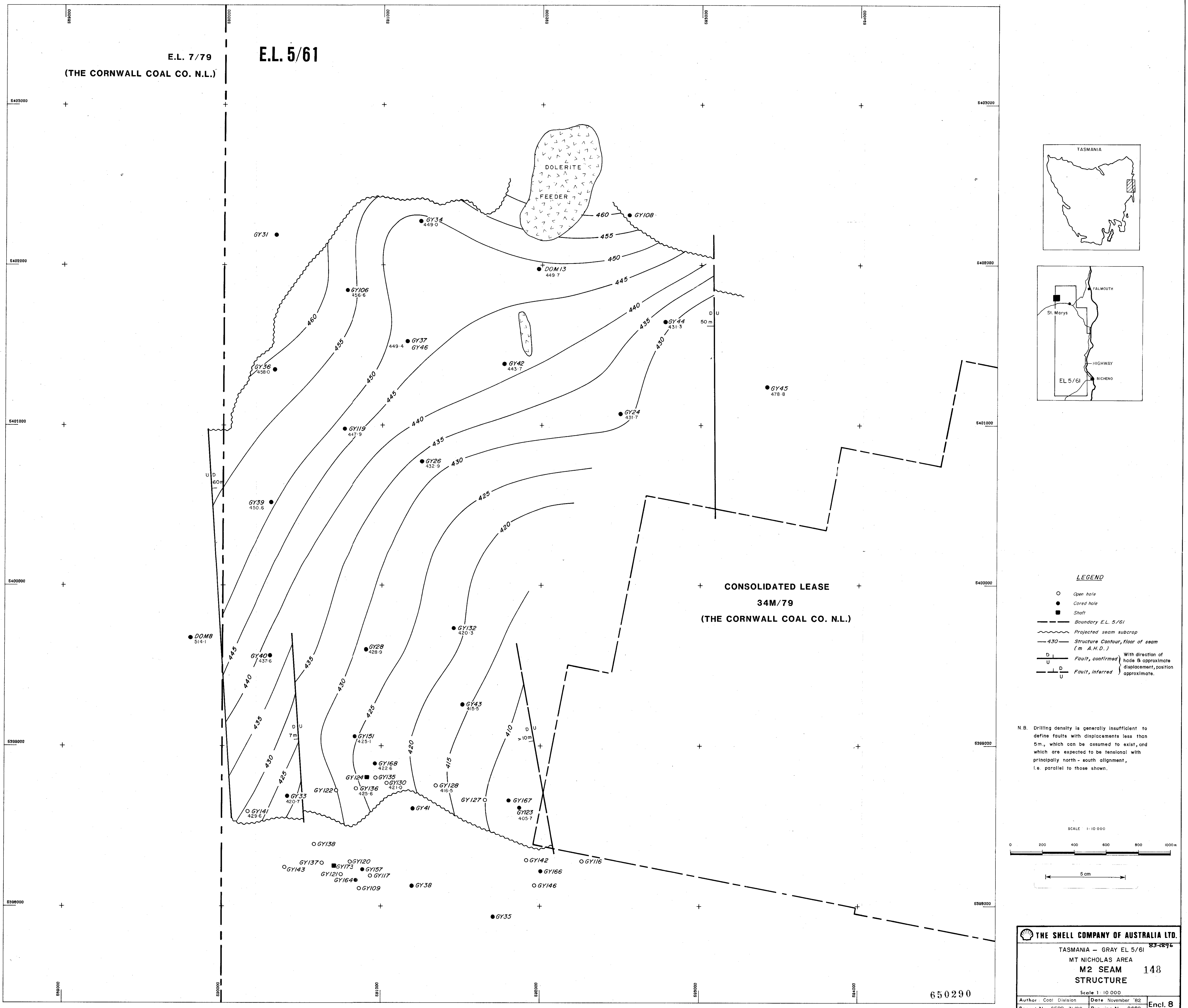
Scale 1 : 10 000

Author: Coal Division	Date: November '82	Encl. 6
Report No: CEPR 31/82	Drawing No: 2718	

650288



E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected seam subcrop
350 Structure contour, floor of seam (m A.H.D.)
Fault, confirmed
Fault, inferred
With direction of hade & approximate displacement, position approximate.
N.B. Drilling density is generally insufficient to define faults with displacements less than 5 m., which can be assumed to exist, and which are expected to be tensional with principally north - south alignment, i.e. parallel to those shown.
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
83-1896
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
L2 SEAM
STRUCTURE
147
Scale 1 : 10 000
Author : Coal Division
Date : November '82
Report No : CEPR 31/82
Drawing No : 2689
Encl. 7
650289



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61 83-1896

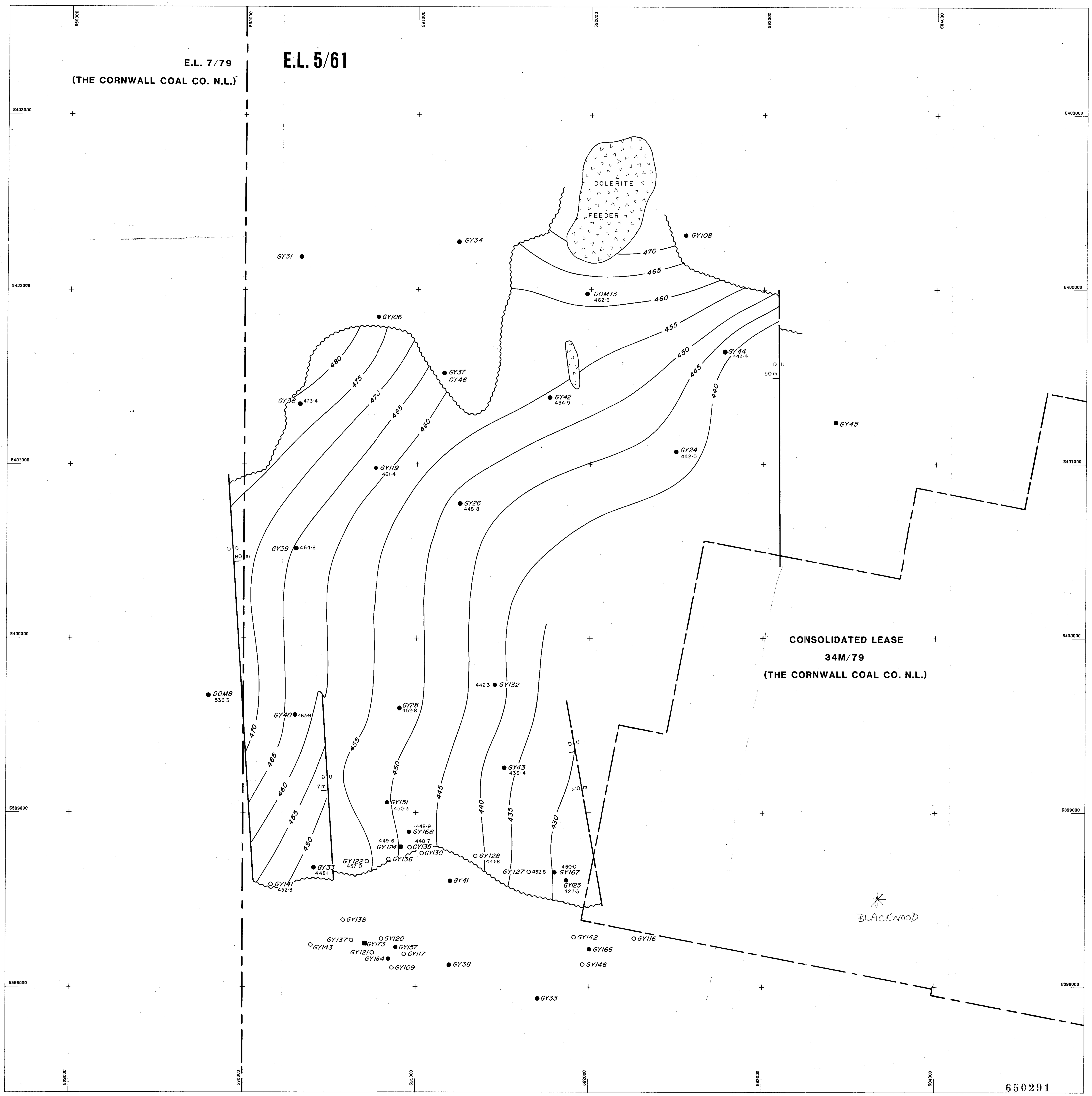
MT NICHOLAS AREA

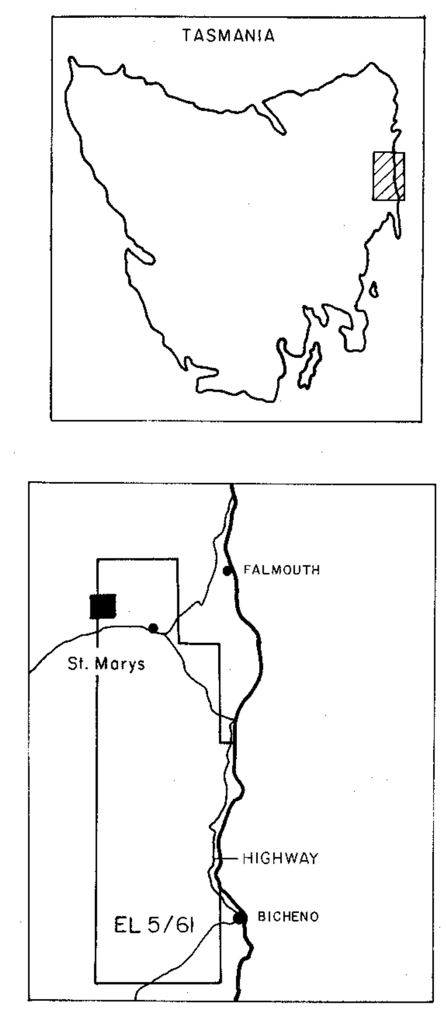
M2 SEAM 148

STRUCTURE

Scale 1:10 000

Author Coal Division	Date November '82	Encl. 8
Report No CEPR 31/82	Drawing No 2688	





LEGEND

- Open hole
- Cored hole
- Shaft
- Boundary E.L. 5/61
- Projected seam subcrop
- 450 Structure Contour, floor of seam (m A.H.D.)
- Fault, confirmed
- Fault, inferred

With direction of hade & approximate displacement, position approximate.

N.B. Drilling density is generally insufficient to define faults with displacements less than 5 m., which can be assumed to exist, and which are expected to be tensional with principally north - south alignment, i.e. parallel to those shown.

SCALE 1:10 000

0 200 400 600 800 1000 m

5 cm

THE SHELL COMPANY OF AUSTRALIA LTD.

83-1896

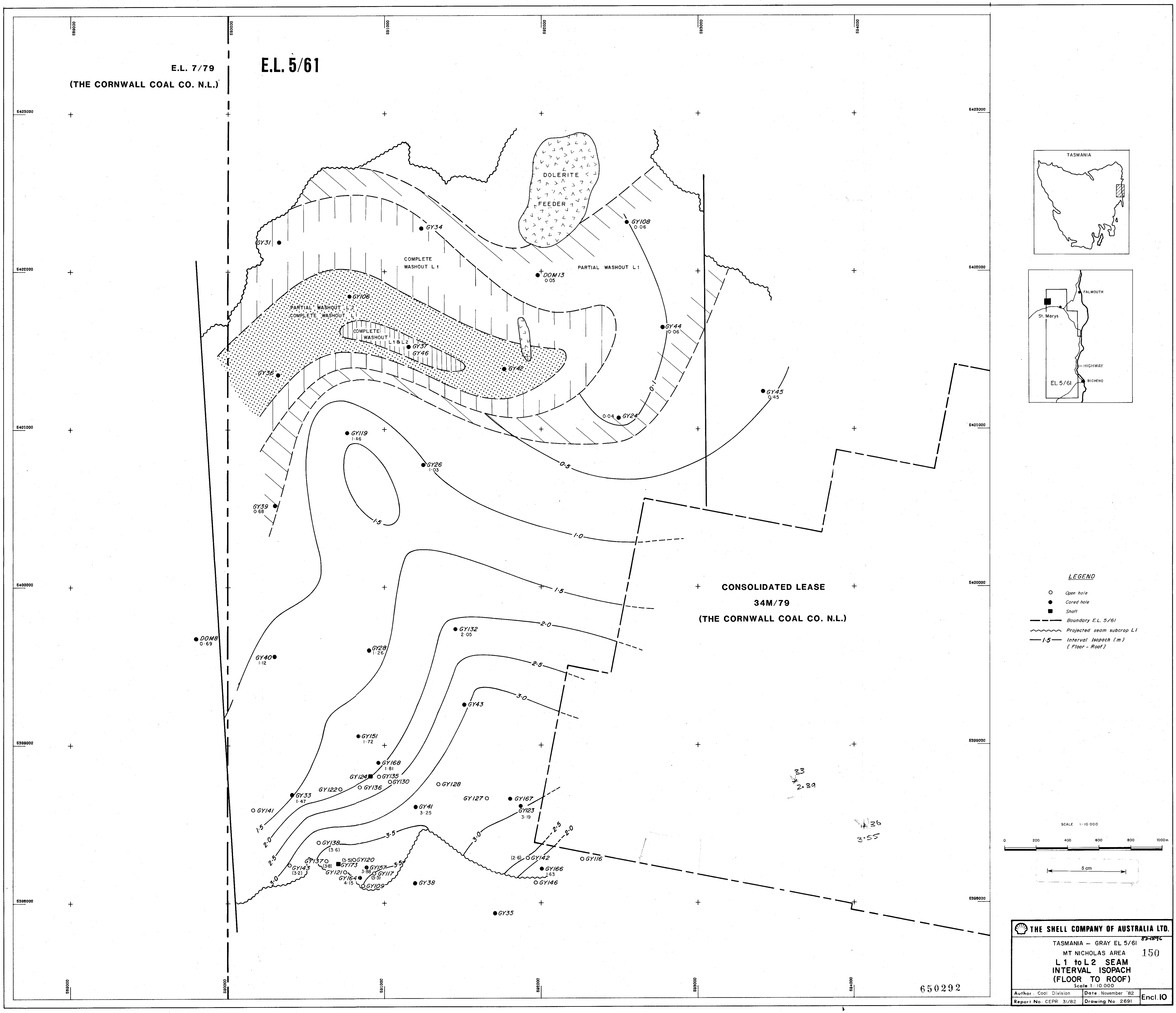
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA

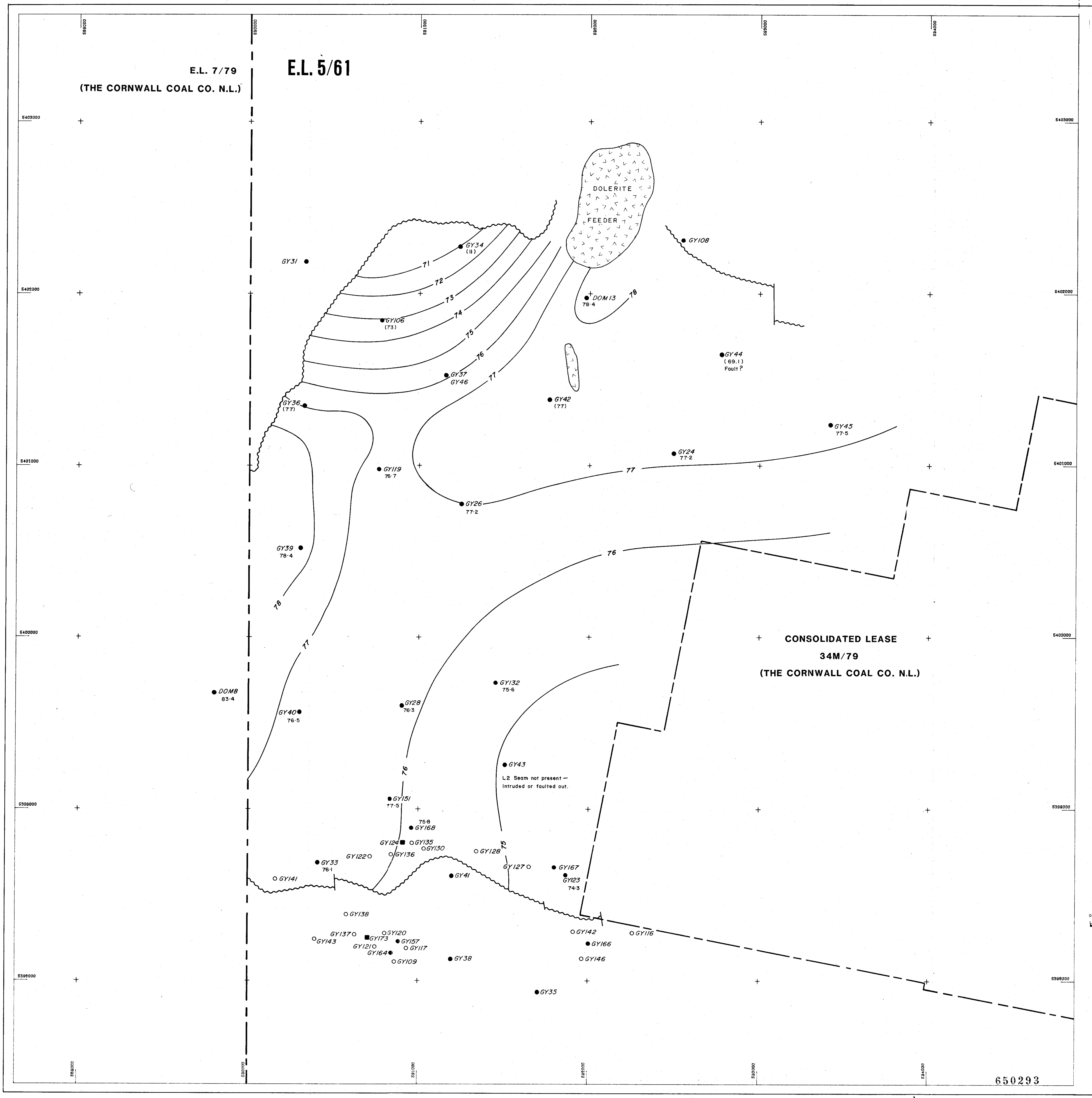
M1 SEAM STRUCTURE

149

Scale 1:10 000

Author: Coal Division	Date: November '82	Encl. 9
Report No: CEPR 31/82	Drawing No: 2687	


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
COMPLETE
WASHOUT L1
PARTIAL WASHOUT L1
PARTIAL WASHOUT L2
COMPLETE WASHOUT L1
COMPLETE
WASHOUT
L1 & L2
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected seam subcrop L1
Interval Isopach (m) (Floor - Roof)
SCALE 1:10 000
0 200 400 600 800 1000m
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
150
L1 to L2 SEAM
INTERVAL ISOPACH
(FLOOR TO ROOF)
Scale 1:10 000
Author: Coal Division
Date November '82
Report No. CEPR 31/82
Drawing No 2691
Encl. 10
650292



650293

THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61

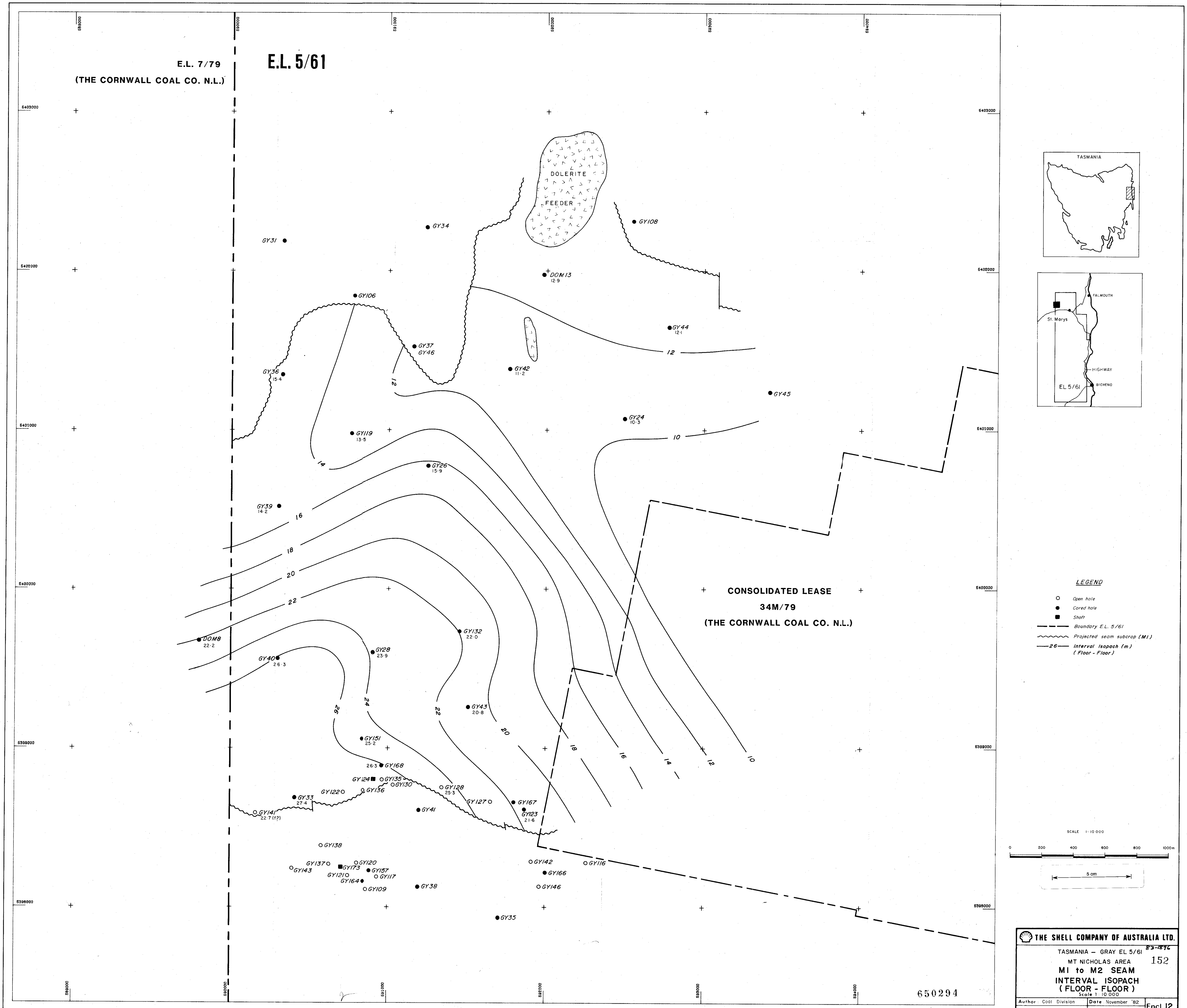
MT NICHOLAS AREA

M2 to L2 SEAM INTERVAL ISOPACH (FLOOR - FLOOR)

Scale 1:10 000

Author Coal Division	Date November '82	Encl. 11
Report No CEPR 31/82	Drawing No. 2692	

151



THE SHELL COMPANY OF AUSTRALIA LTD.

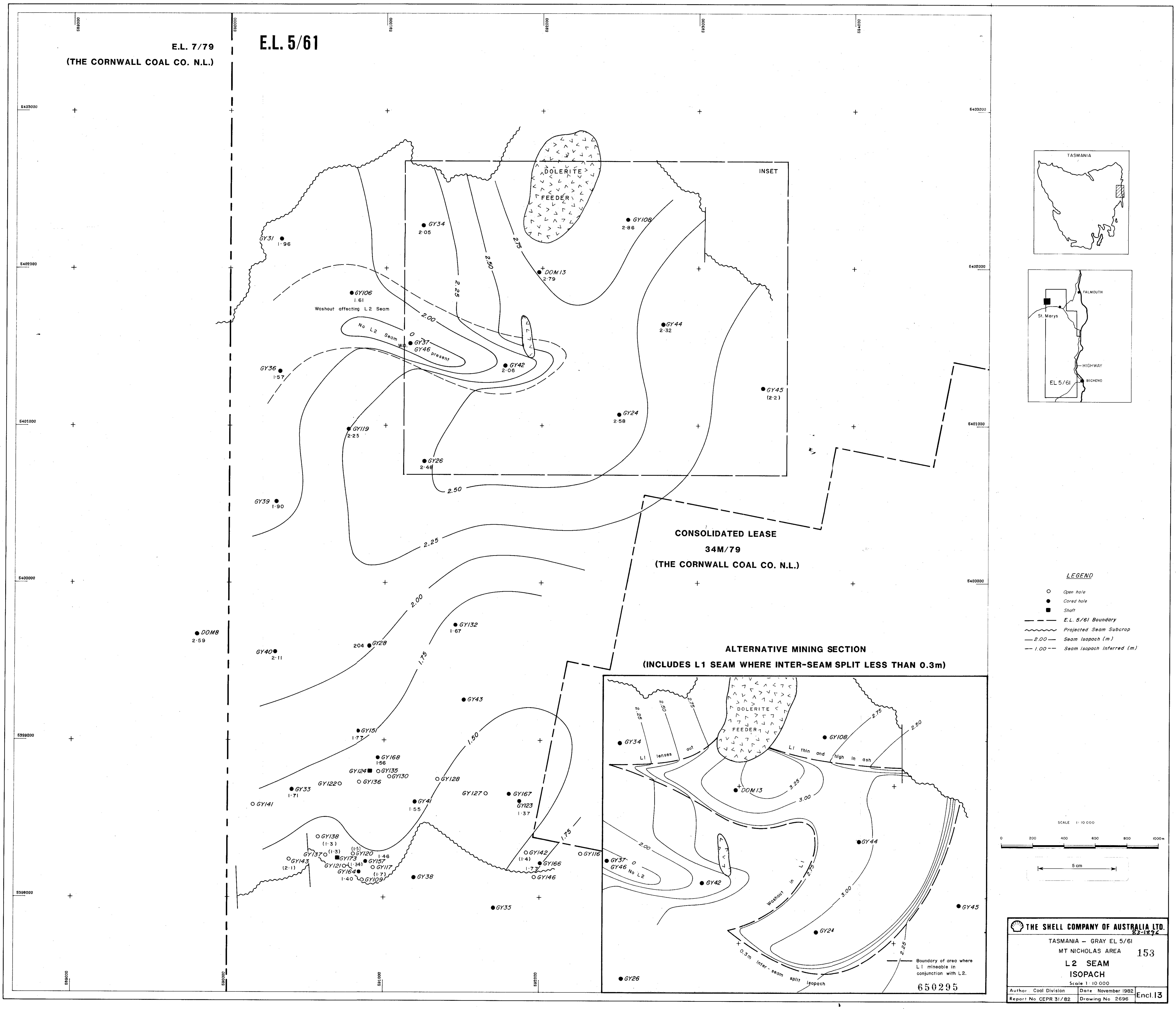
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
M1 to M2 SEAM
INTERVAL ISOPACH
(FLOOR - FLOOR)
Scale 1:10 000

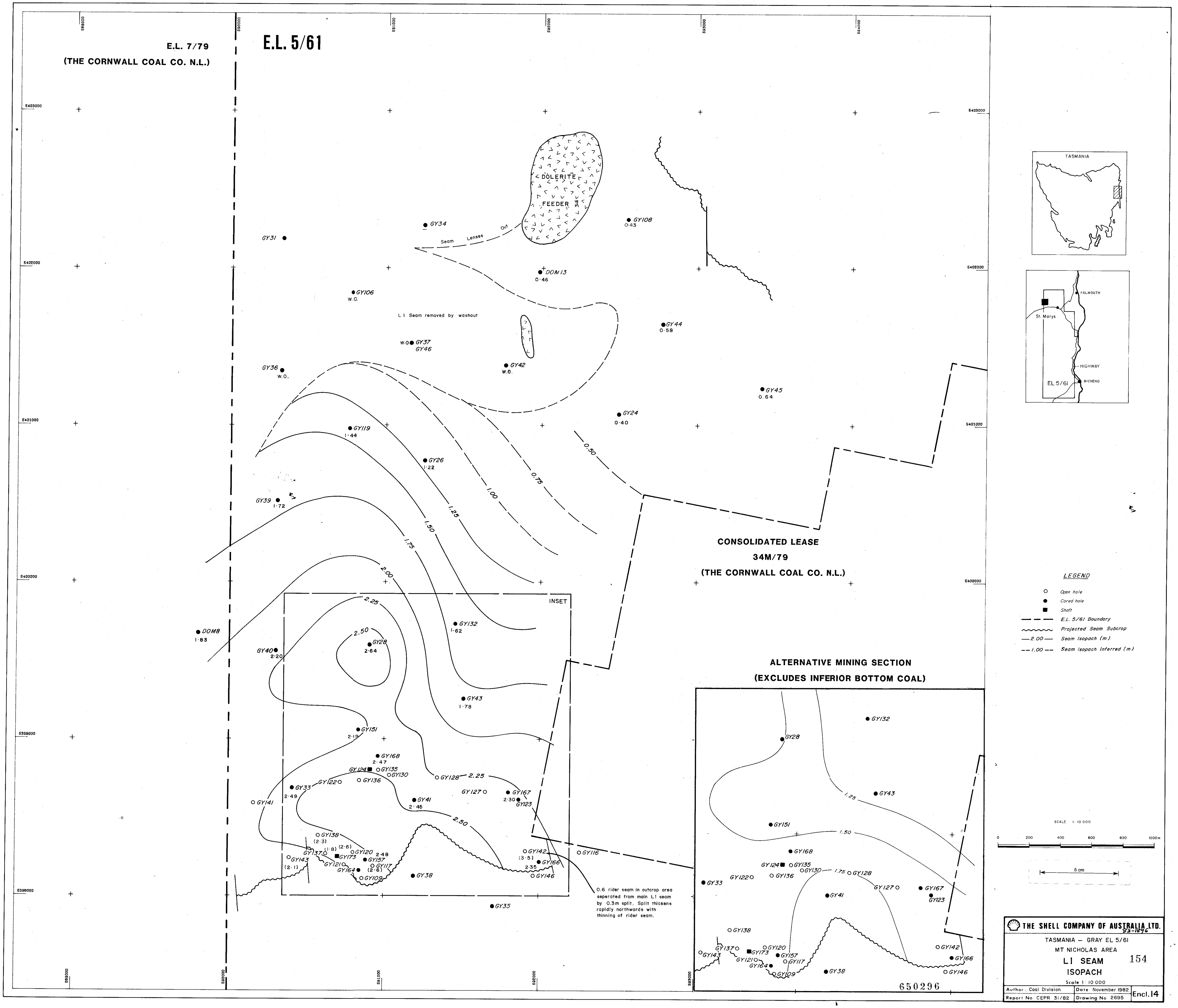
Author: Coal Division	Date: November '82
Report No: CEPR 31/82	Drawing No: 2690

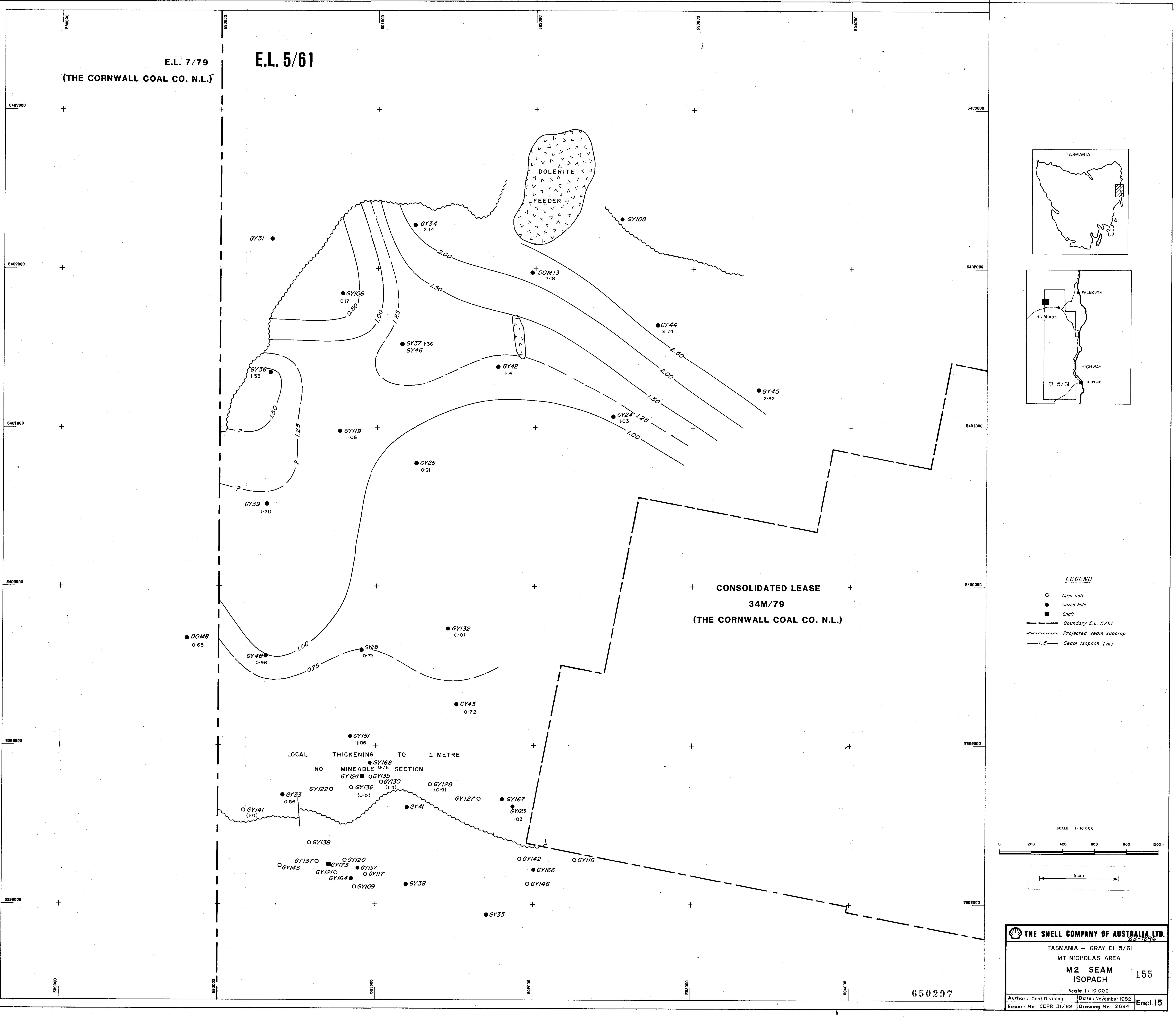
Encl. 12

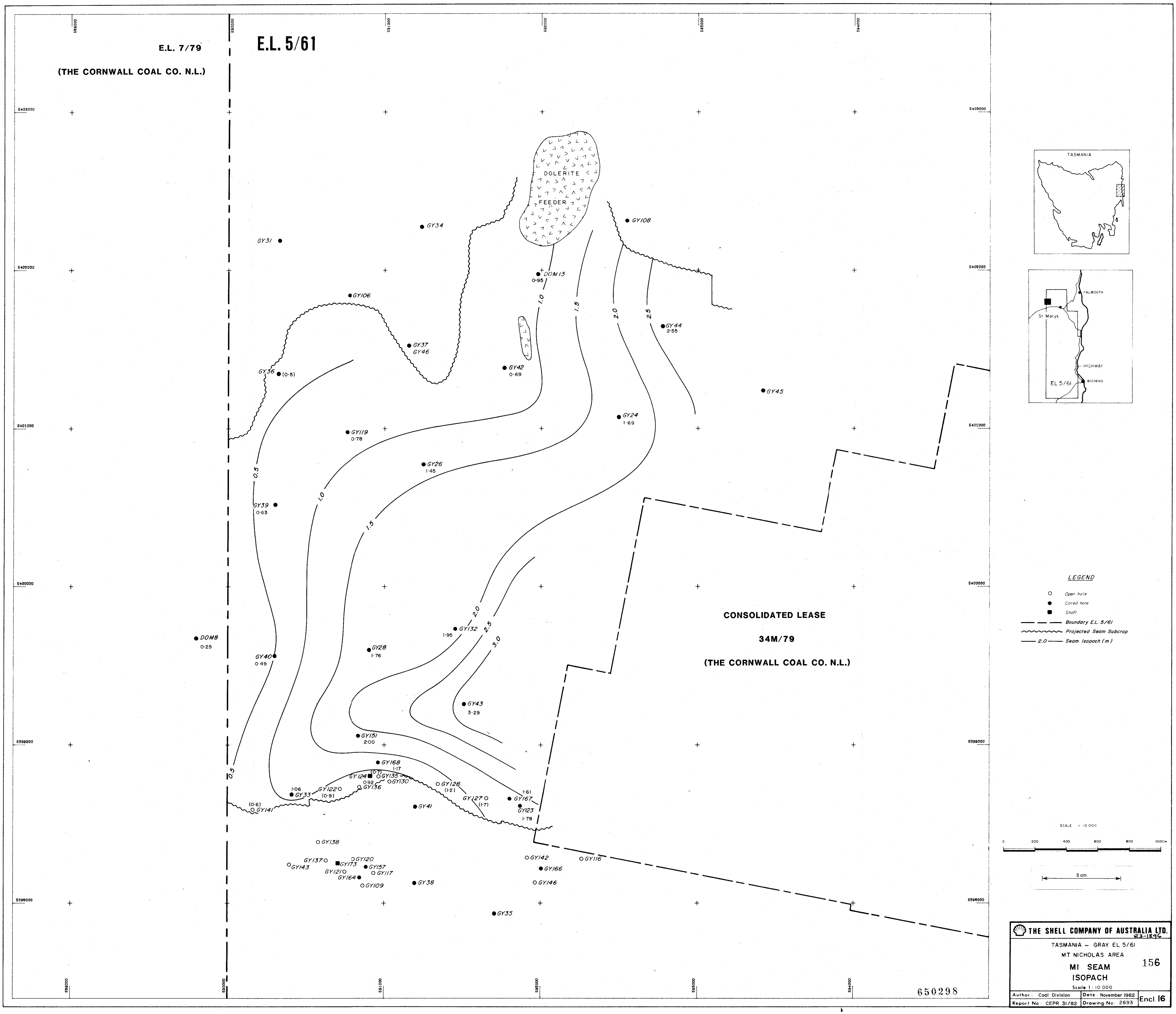
152

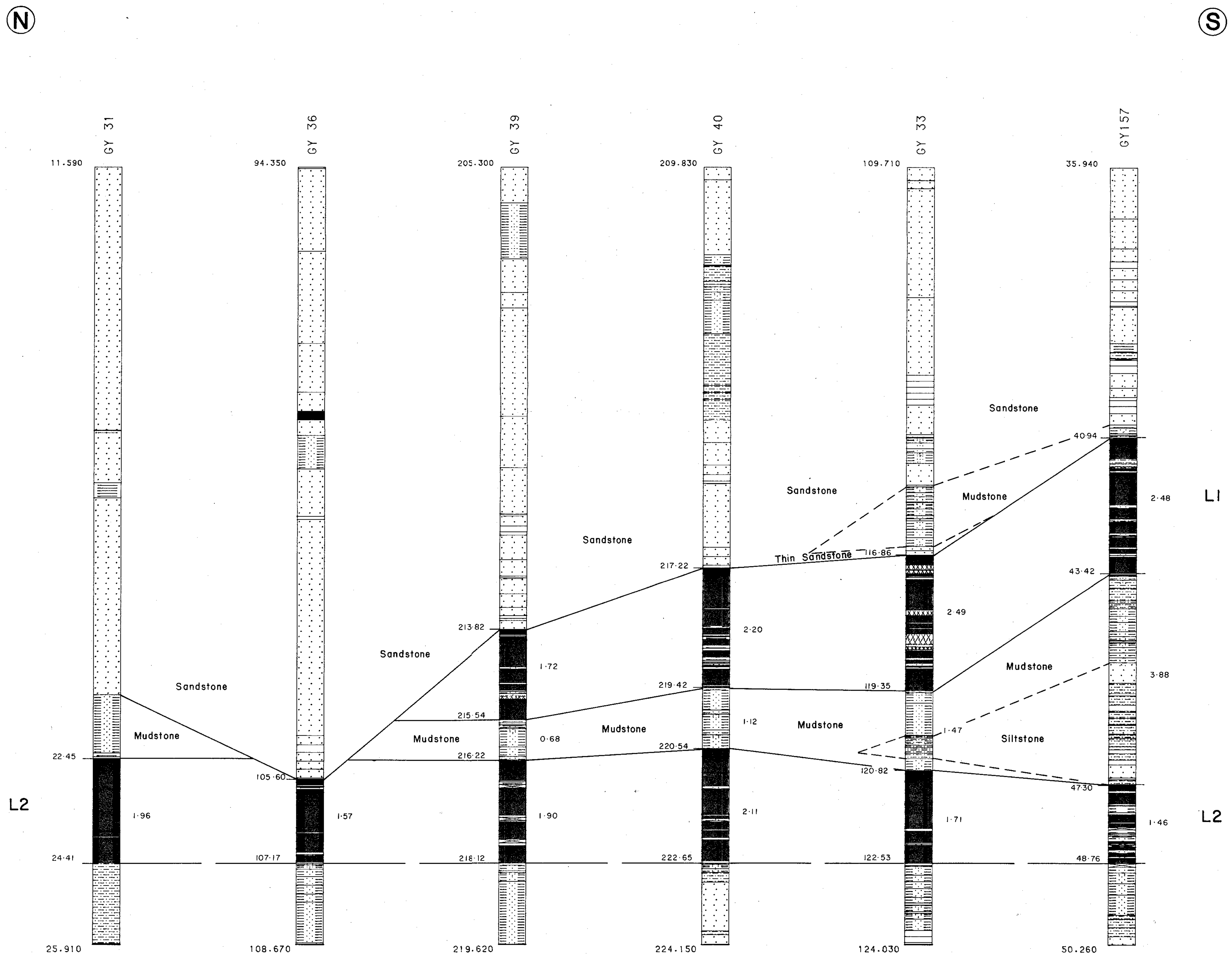
650294


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
INSET
DOLERITE
FEEDER
Washout affecting L2 Seam
No L2 Seam present
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
ALTERNATIVE MINING SECTION
(INCLUDES L1 SEAM WHERE INTER-SEAM SPLIT LESS THAN 0.3m)
L1 lenses out
L1 thin and high in ash
Washout in L1
0.3m inter-seam split isopach
Boundary of area where L1 mineable in conjunction with L2.
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
E.L. 5/61 Boundary
Projected Seam Subcrop
Seam Isopach (m)
Seam Isopach Inferred (m)
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
83-1896
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
153
L2 SEAM
ISOPACH
Scale 1:10 000
Author Coal Division
Date November 1982
Report No CEPR 31/82
Drawing No 2696
Encl. 13
650295


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE FEEDER
Seam Lenses Out
L1 Seam removed by washout
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
INSET
ALTERNATIVE MINING SECTION
(EXCLUDES INFERIOR BOTTOM COAL)
0.6 rider seam in outcrop area seperated from main L1 seam by 0.3m split. Split thickens rapidly northwards with thinning of rider seam.
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
E.L. 5/61 Boundary
Projected Seam Subcrop
—2.00— Seam Isopach (m)
--1.00-- Seam Isopach Inferred (m)
SCALE 1:10 000
0 200 400 600 800 1000m
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
L1 SEAM
ISOPACH
154
Scale 1:10 000
Author: Coal Division
Date: November 1982
Report No CEPR 31/82
Drawing No 2695
Encl. 14
650296


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
LOCAL THICKENING TO 1 METRE
NO MINEABLE SECTION
GY31
GY34 2·14
GY108
DOM13 2·18
GY106 0·17
GY44 2·74
GY37 1·36
GY46
GY42 1·14
GY36 1·53
GY45 2·82
GY24 1·03
GY119 1·06
GY26 0·91
GY39 1·20
GY132 (1·0)
DOM8 0·68
GY40 0·96
GY28 0·75
GY43 0·72
GY151 1·05
GY168 0·76
GY124
GY135
GY136 (0·5)
GY130 (1·4)
GY128 (0·9)
GY122
GY33 0·56
GY127
GY167
GY123 1·03
GY41
GY141 (1·0)
GY138
GY137
GY120
GY143
GY173
GY157
GY121
GY117
GY164
GY109
GY38
GY142
GY116
GY166
GY146
GY35
2.50
2.00
1.50
1.25
1.00
0.75
0.50
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected seam subcrop
1.5 Seam isopach (m)
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA — GRAY EL 5/61
MT NICHOLAS AREA
M2 SEAM
ISOPACH
155
Scale 1:10 000
Author: Coal Division
Date: November 1982
Report No. CEPR 31/82
Drawing No. 2694
Encl. 15
650297


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected Seam Subcrop
2.0 Seam Isopach (m)
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
MI SEAM
ISOPACH
Scale 1:10 000
Author: Coal Division
Date: November 1982
Report No: CEPR 31/82
Drawing No: 2693
Encl. 16
156
650298



LEGEND

LITHOLOGY REFERENCE

- BASIC INTRUSIVE
- MUDSTONE
- SANDSTONE
- CARBONACEOUS MUDSTONE
- COAL
- TONSTEIN
- SILTSTONE
- COAL STONY
- CLAY
- SOIL
- CLAYSTONE
- COAL (UNDIFF)
- NOT CORED/CORE LOSS

40·94 (DEPTH) 2·48 (THICKNESS)

VERTICAL SCALE
1 : 50

1.0 0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

HORIZONTAL NOT TO SCALE

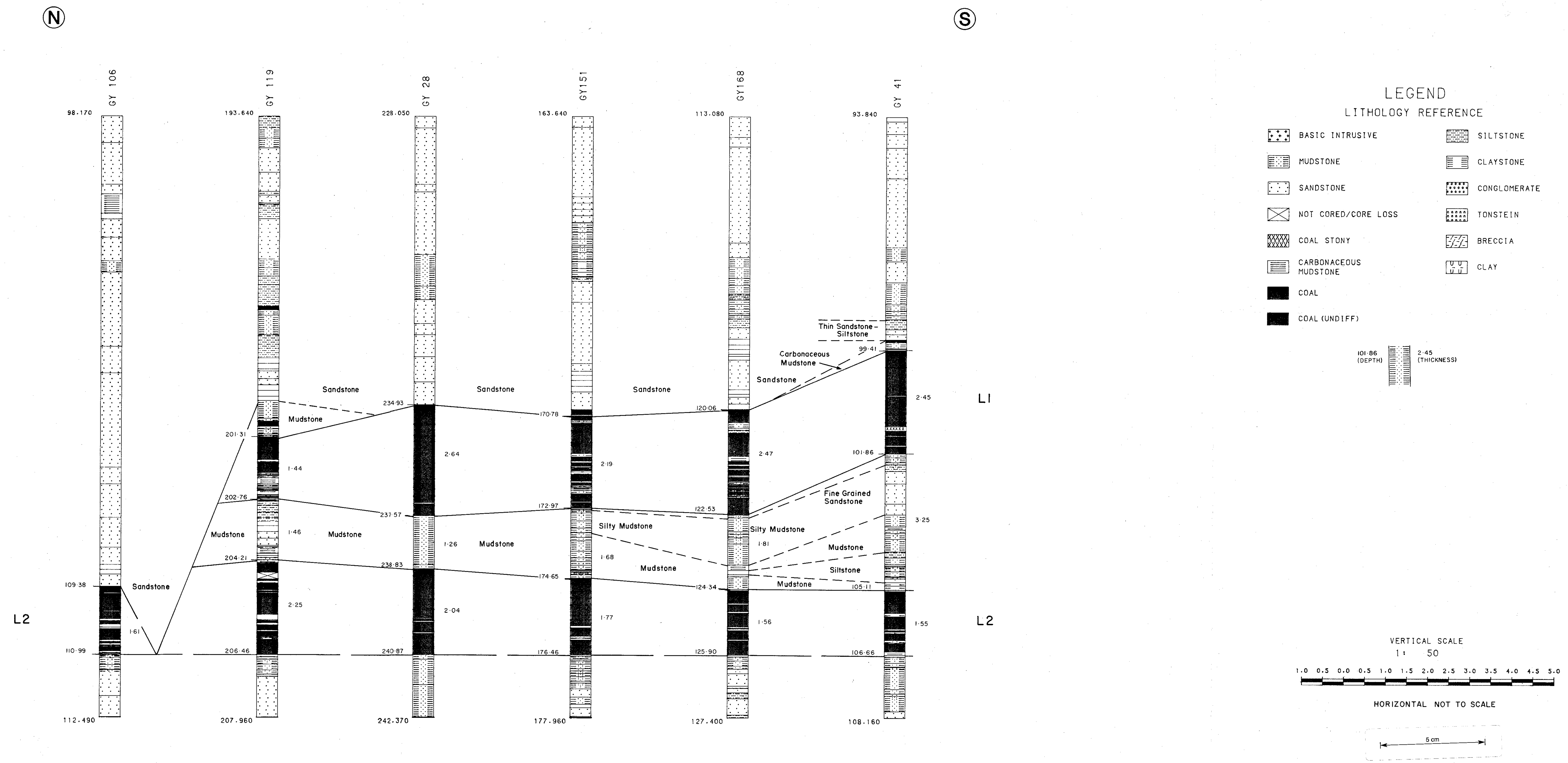
5 cm

650299

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION 83-1896
MT. NICHOLAS — E.L. 5/61
TASMANIA
157

GY31 - GY157
DIAGRAMMATIC ROOF & FLOOR SECTION
L1 & L2 SEAMS

AUTHOR: Coal Division	DATE: November 1982	ENCL. 17
REPORT NO: CEPR 31/82	DRAWING NO: 2736	



THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION 83-1896

MT NICHOLAS — E.L. 5/61
TASMANIA

158

GY106 - GY41
DIAGRAMMATIC ROOF & FLOOR SECTION
L1 & L2 SEAMS

650300

AUTHOR: Coal Division	DATE: November 1982	ENCL. 18
REPORT NO: CEPR 31/82	DRAWING NO: 2737	

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION 83-1896

MT NICHOLAS — E.L. 5/61
TASMANIA

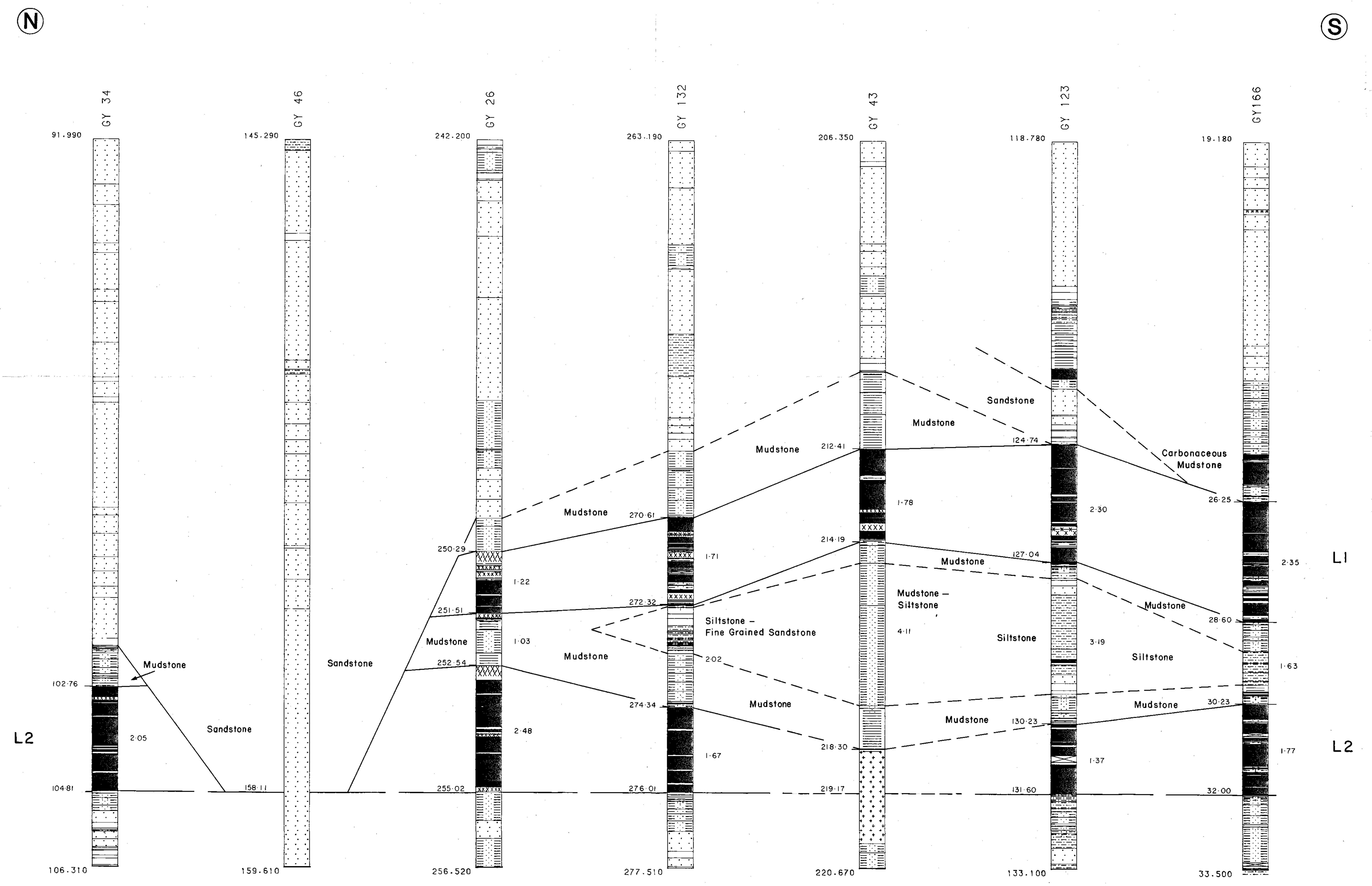
159

GY34 - GY166

DIAGRAMMATIC ROOF & FLOOR SECTION
L1 & L2 SEAMS

AUTHOR: Coal Division	DATE: November 1982	ENCL. 19
REPORT NO: CEPR 31/82	DRAWING NO: 2738	

650301



LEGEND

LITHOLOGY REFERENCE

- BASIC INTRUSIVE
- MUDSTONE
- COAL
- COAL (UNDIFF)
- CARBONACEOUS MUDSTONE
- CLAY
- SILTSTONE
- SANDSTONE
- NOT CORED/CORE LOSS
- TONSTEIN
- CONGLOMERATE
- COAL STONY
- SHALE
- CLAYSTONE

28.60 (DEPTH) 1.63 (THICKNESS)

VERTICAL SCALE
1 : 50

1.0 0.5 0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0

HORIZONTAL NOT TO SCALE

5 cm

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION 82-1896

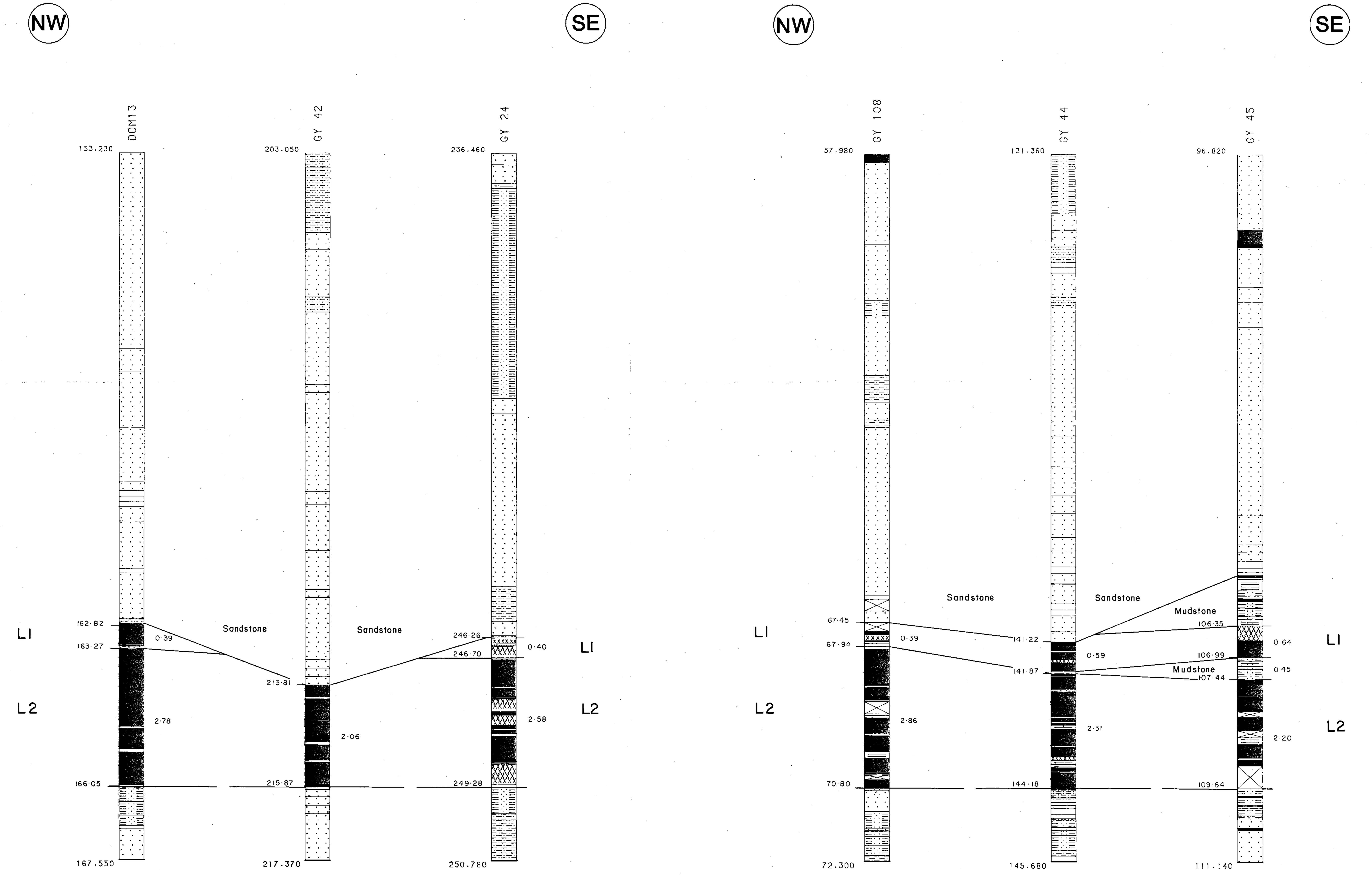
MT NICHOLAS — E.L. 5/61
TASMANIA

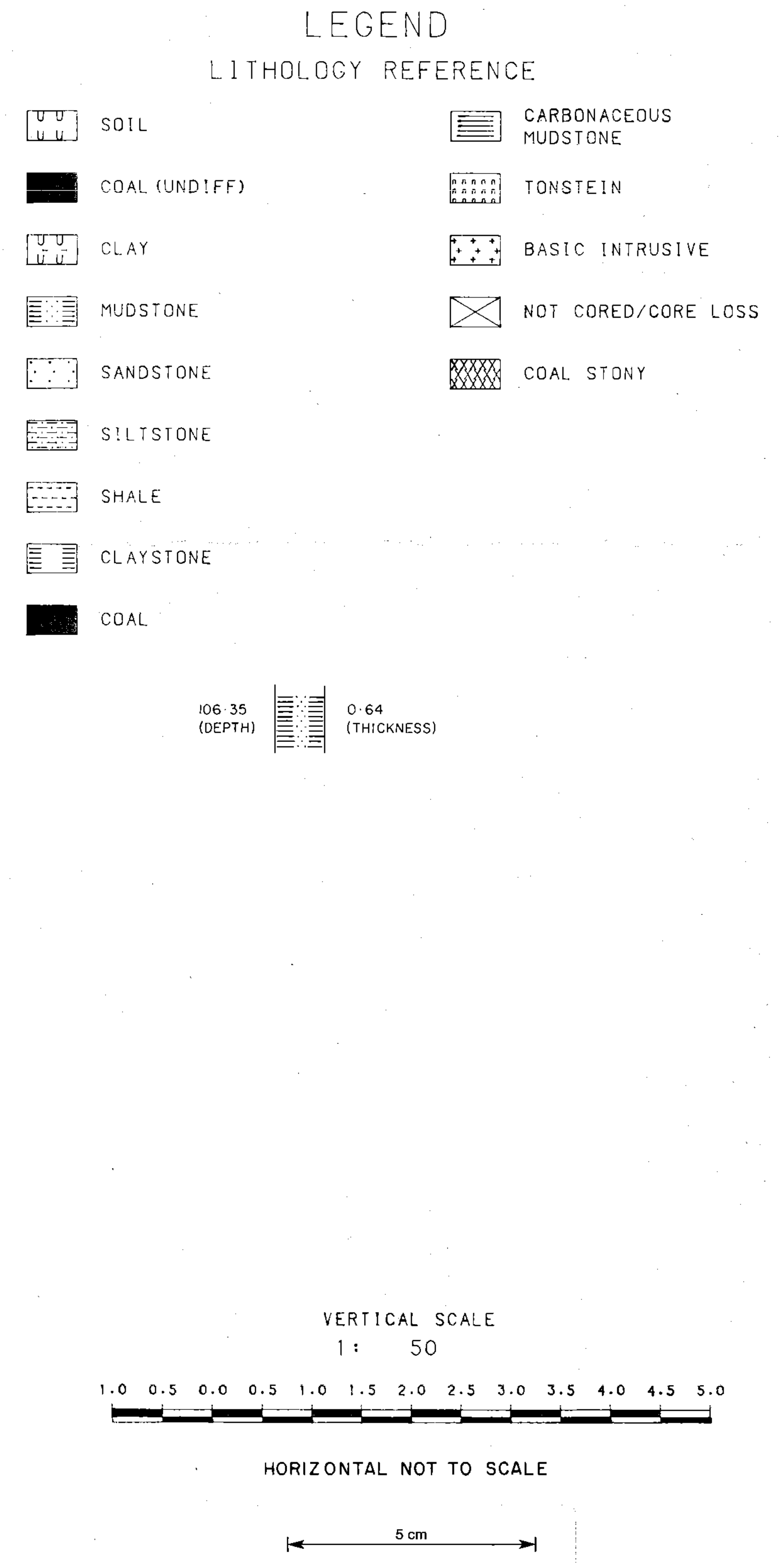
159

GY34 – GY166
DIAGRAMMATIC ROOF & FLOOR SECTION L1 & L2 SEAMS

650301

AUTHOR: Coal Division	DATE: November 1982	ENCL. 19
REPORT NO: CEPR 31/82	DRAWING NO: 2738	





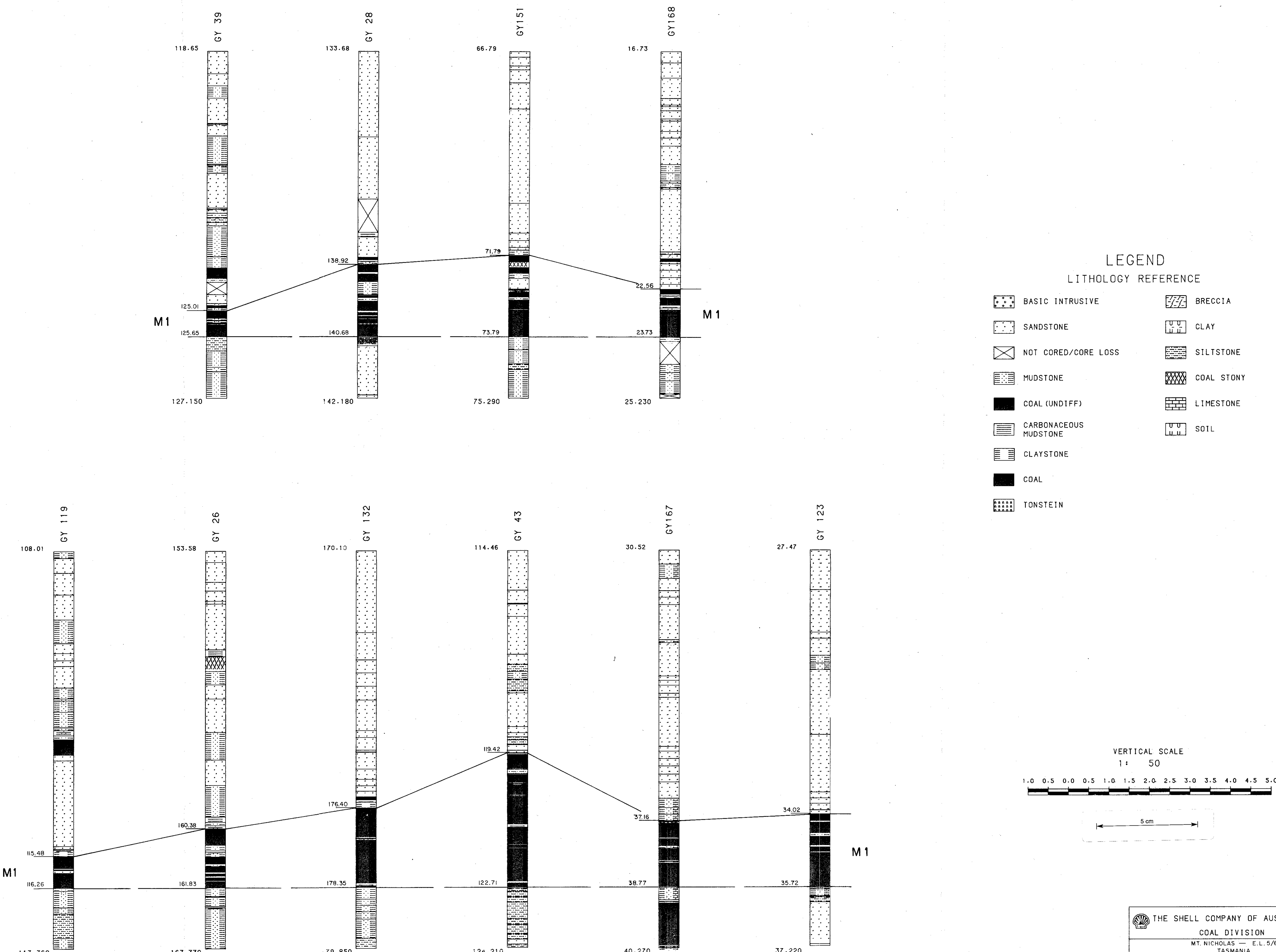
650302

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION 83-1896

MT NICHOLAS — E.L. 5/61
TASMANIA
160

DOM13 – GY24 & GY108 – GY45
DIAGRAMMATIC ROOF & FLOOR SECTION
L1 & L2 SEAMS

AUTHOR: Coal Division	DATE: November 1982	ENCL 20
REPORT NO: CEPR 31/82	DRAWING NO: 2739	



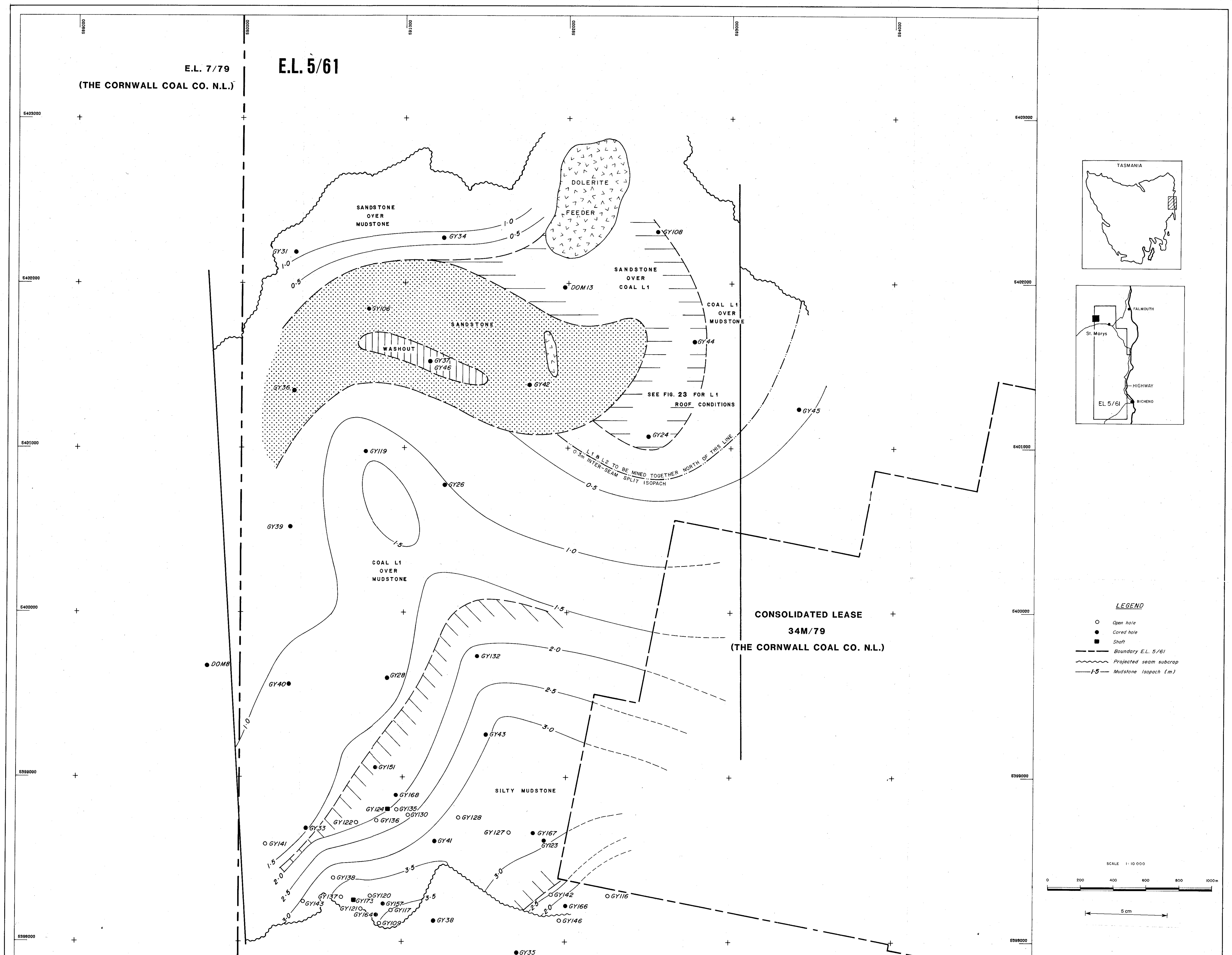
650303

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION 83-1896
MT. NICHOLAS — E.L. 5/61
TASMANIA
161

GY 39 - GY 168 & GY 119 - GY 123
DIAGRAMMATIC ROOF & FLOOR SECTION
M1 SEAM

AUTHOR: Coal Division	DATE: November 1982
REPORT NO: CEPR 31/82	DRAWING NO: 2712

ENCL. 21



THE SHELL COMPANY OF AUSTRALIA LTD.

83-1896

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

162

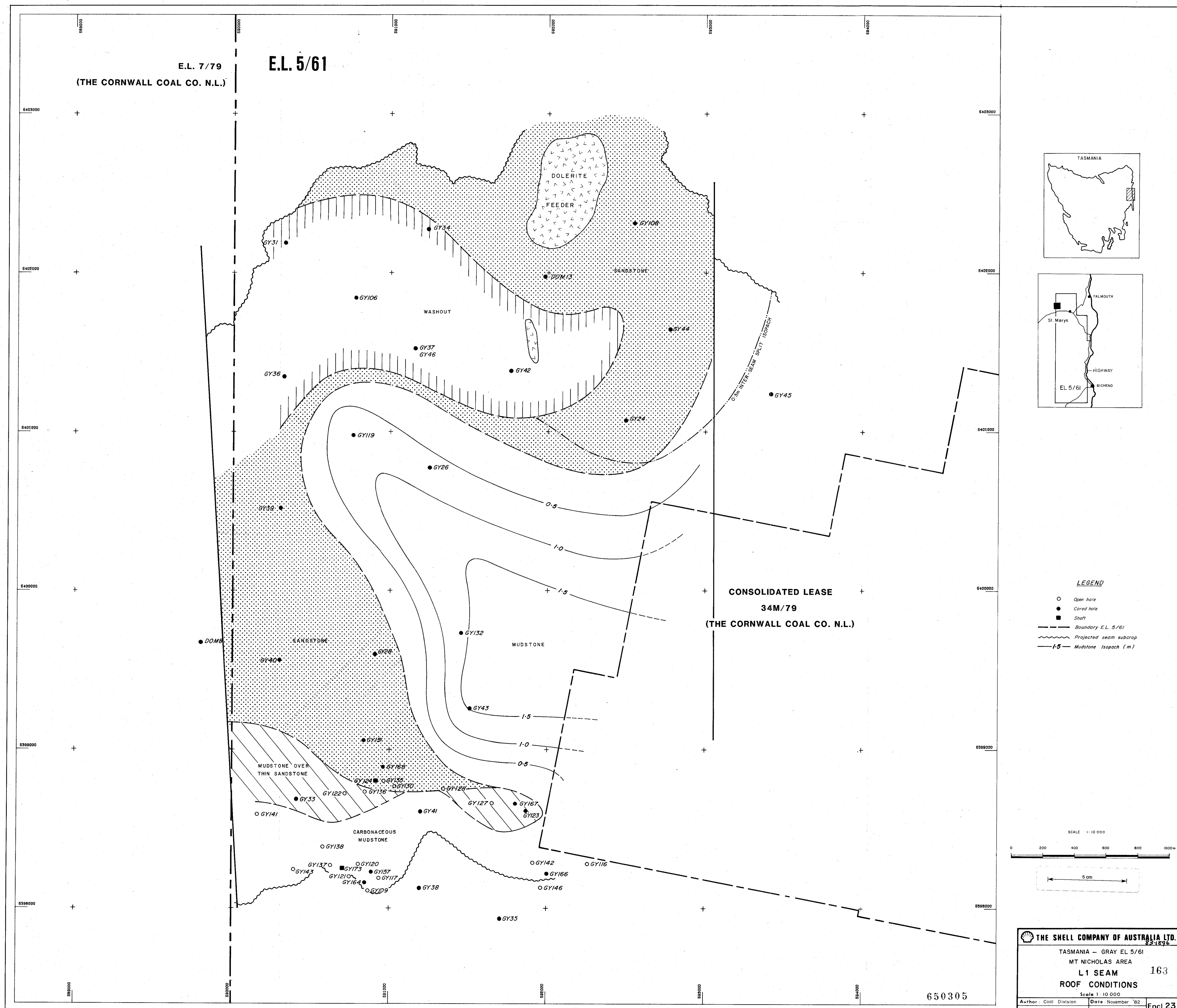
L2 SEAM

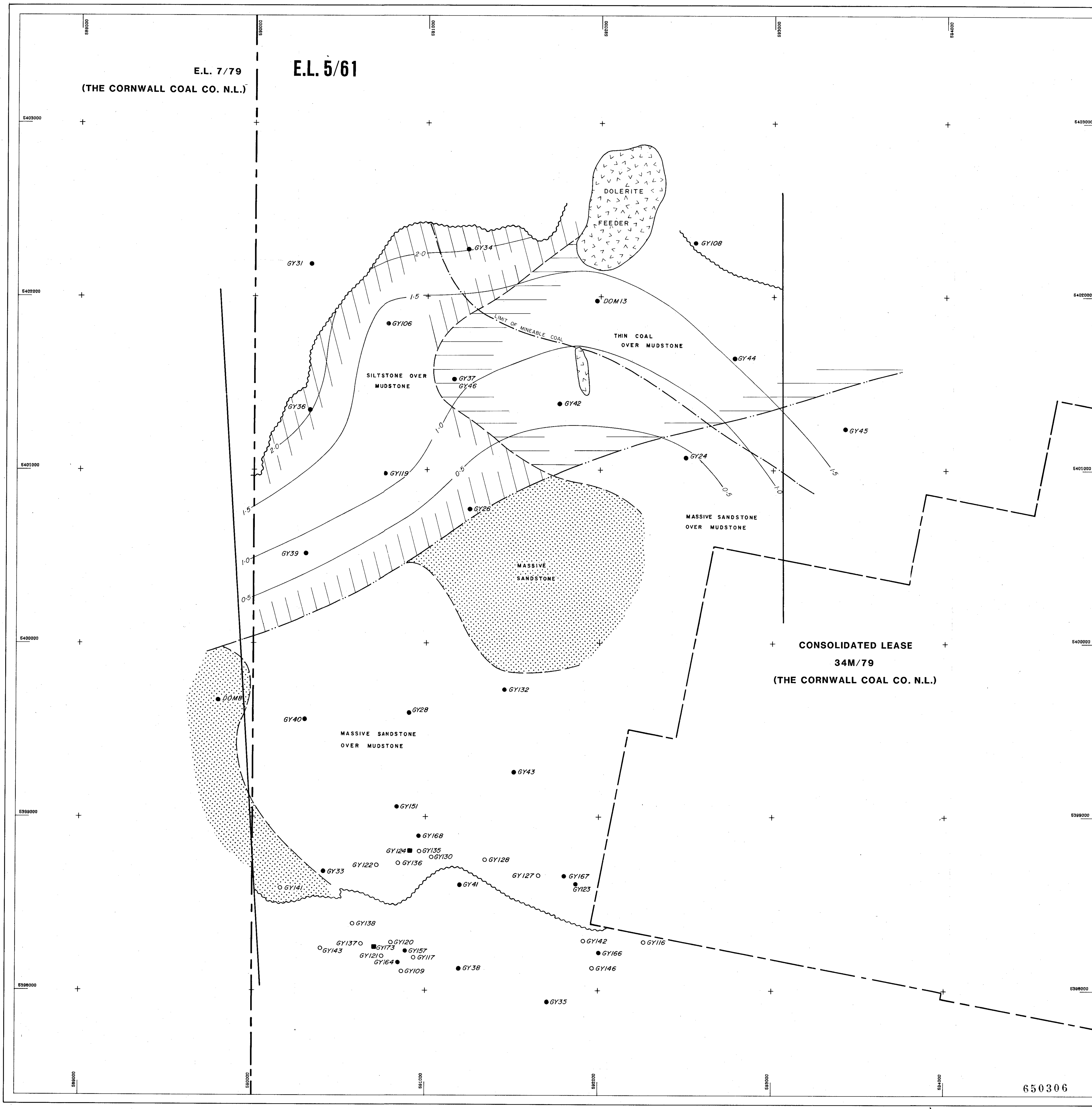
ROOF CONDITIONS

Scale 1:10 000

Author: Coal Division	Date: November '82	Encl 22
Report No. CEPR 31/82	Drawing No. 2732	

650304


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
SANDSTONE
WASHOUT
0.5m INTER-SEAM SPLIT ISOPACH
MUDSTONE
SANDSTONE
MUDSTONE OVER
THIN SANDSTONE
CARBONACEOUS
MUDSTONE
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected seam subcrop
1·5 Mudstone Isopach (m)
SCALE 1:10 000
0 200 400 600 800 1000m
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
83-1896
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
L1 SEAM
ROOF CONDITIONS
Scale 1:10 000
163
Author: Coal Division
Date: November '82
Report No: CEPR 31/82
Drawing No 2733
Encl. 23
650305



THE SHELL COMPANY OF AUSTRALIA LTD.

83-1896

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

M2 SEAM

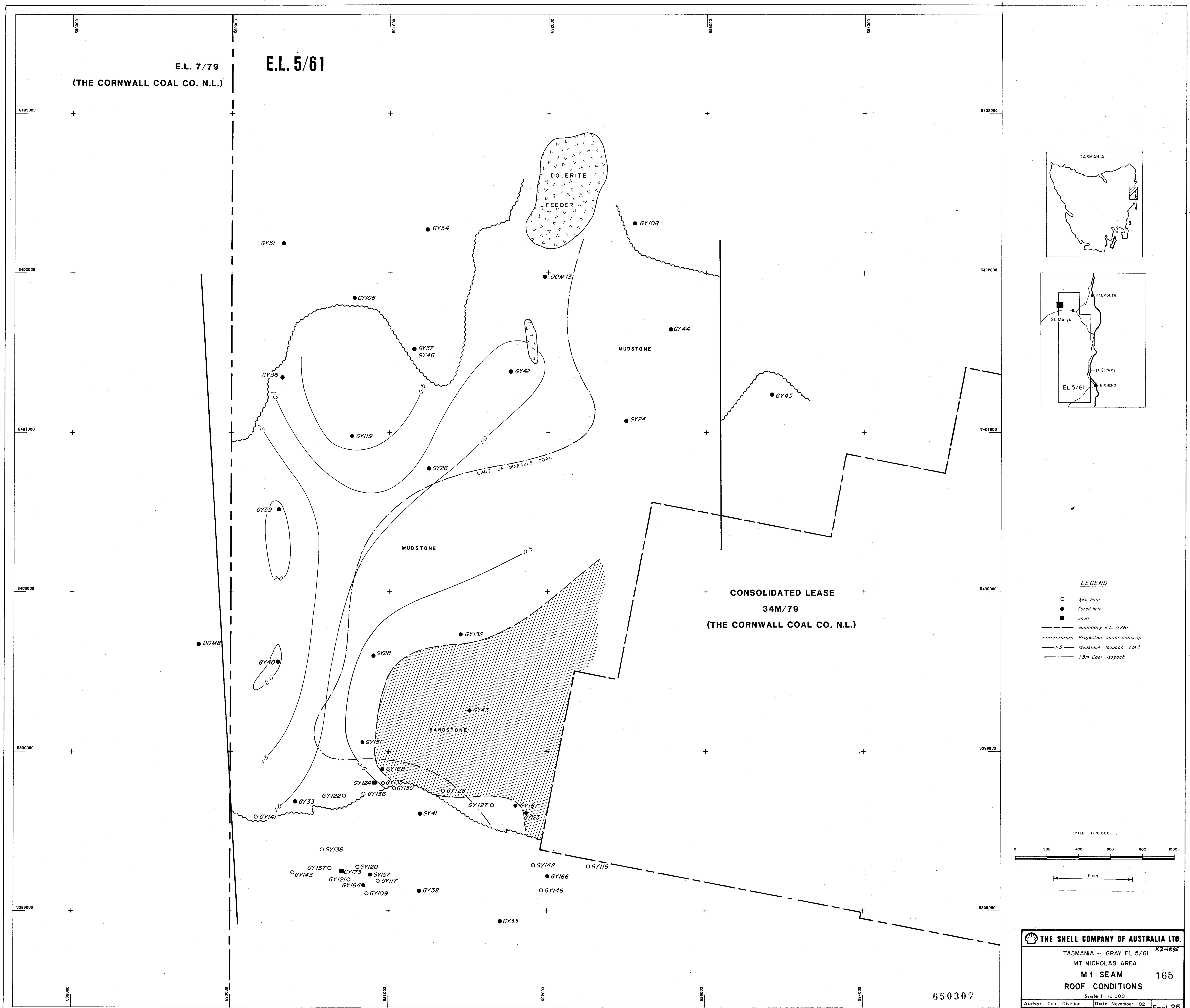
ROOF CONDITIONS

Scale 1:10 000

164

Author: Coal Division	Date: November '82	Encl. 24
Report No: CEPR 31/82	Drawing No. 2734	

650306



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

M1 SEAM

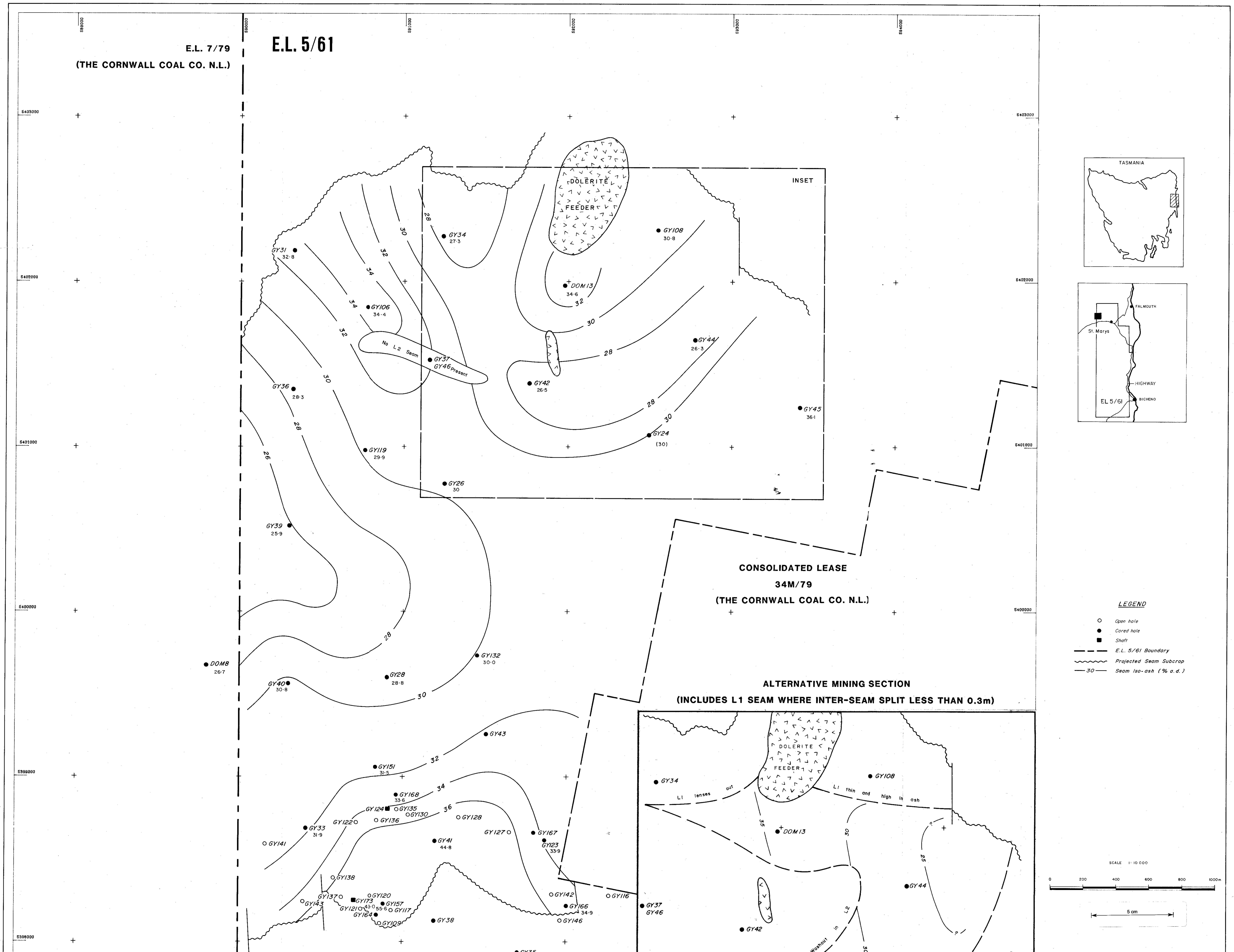
ROOF CONDITIONS

Scale 1:10 000

Author: Coal Division | Date: November '82 | Report No: CEPR 31/82 | Drawing No: 2735 | Encl. 25

83-1896 165

650307



THE SHELL COMPANY OF AUSTRALIA LTD.

83-1896

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

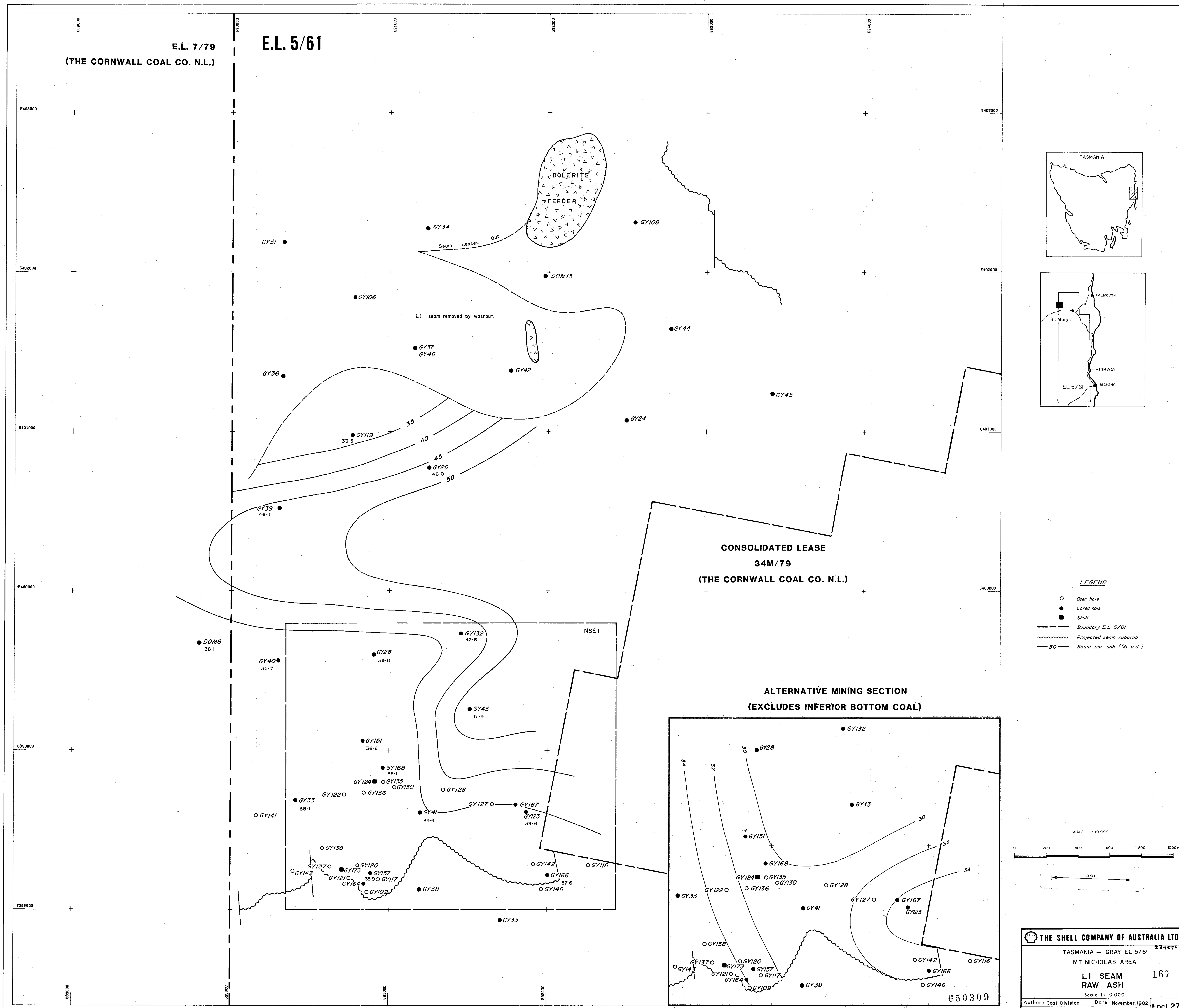
L2 SEAM 166

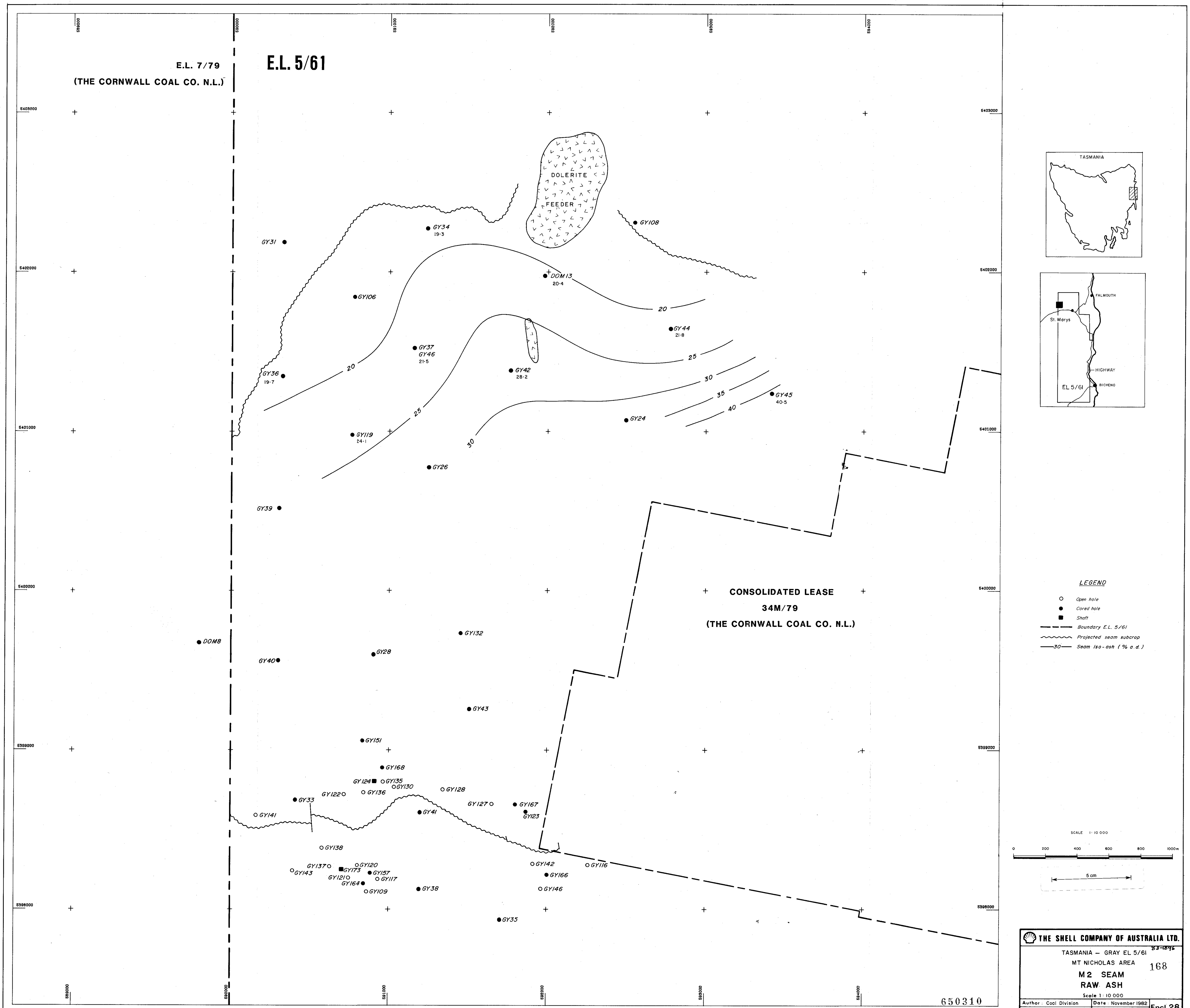
RAW ASH

Scale 1:10 000

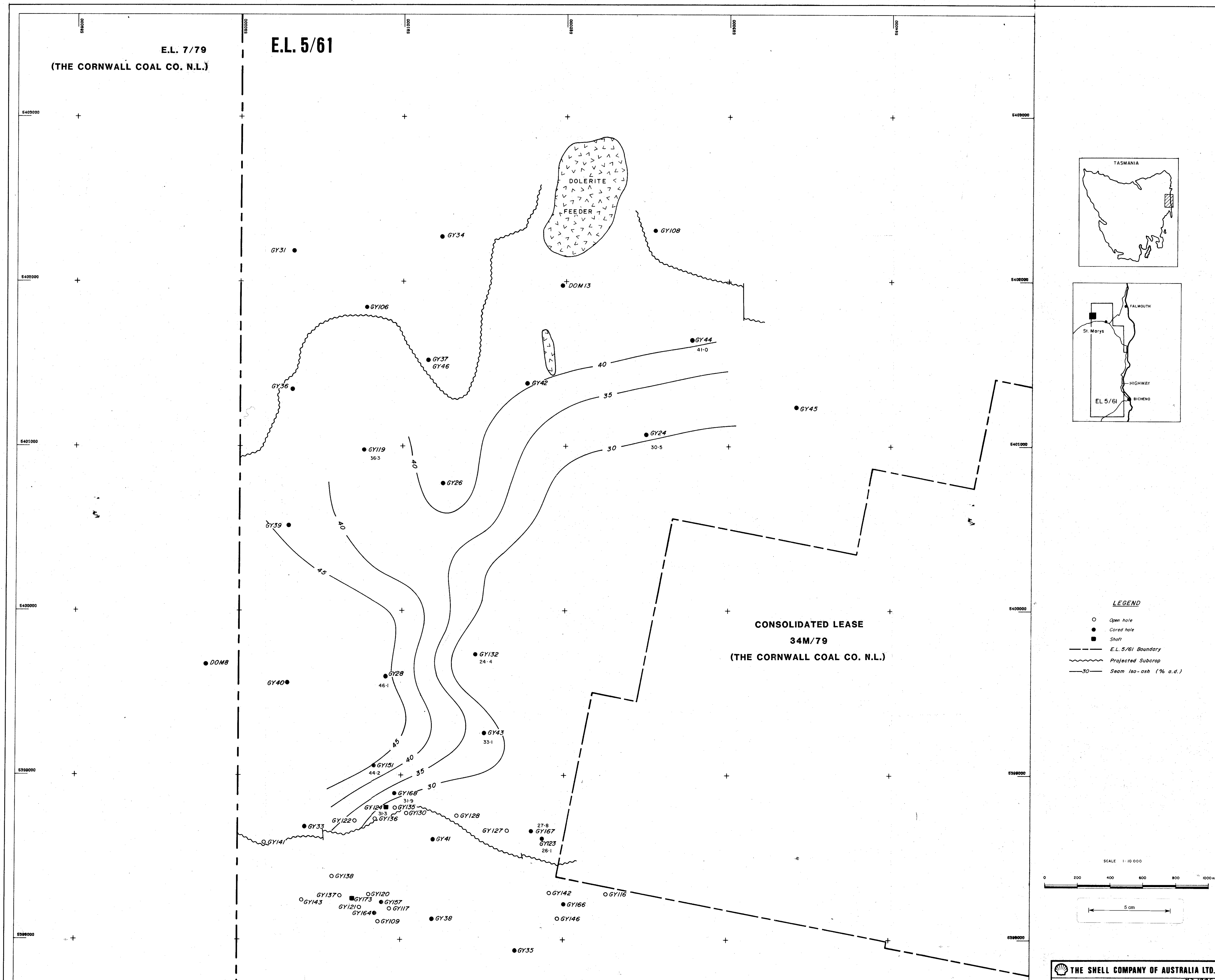
Author: Coal Division	Date: November 1982	Encl. 26
Report No: CEPR 31/82	Drawing No 2700	

650308


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
Seam Lenses Out
L1 seam removed by washout.
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
INSET
ALTERNATIVE MINING SECTION
(EXCLUDES INFERIOR BOTTOM COAL)
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected seam subcrop
Seam iso-ash (% a.d.)
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
L1 SEAM
RAW ASH
Scale 1:10 000
167
Author: Coal Division
Date: November 1982
Report No. CEPR 31/82
Drawing No 2699
Encl. 27
650309



E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
GY31
GY34
19·3
GY108
DOM13
20·4
GY106
GY44
21·8
GY37
GY46
21·5
GY36
19·7
GY42
28·2
GY45
40·5
GY24
GY119
24·1
GY26
GY39
DOM8
GY40
GY28
GY132
GY43
GY151
GY168
GY124
GY135
GY130
GY136
GY122
GY33
GY128
GY127
GY167
GY123
GY41
GY141
GY138
GY137
GY120
GY143
GY173
GY157
GY121
GY117
GY164
GY109
GY38
GY142
GY116
GY166
GY146
GY35
20
25
30
35
40
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
RICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Projected seam subcrop
Seam Iso-ash (% a.d.)
SCALE 1:10 000
0
200
400
600
800
1000m
5 cm
650310
THE SHELL COMPANY OF AUSTRALIA LTD.
83-1896
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
168
M2 SEAM
RAW ASH
Scale 1: 10 000
Author : Coal Division
Date : November 1982
Encl.28
Report No: CEPR 31/82
Drawing No: 2698



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

M1 SEAM

RAW ASH

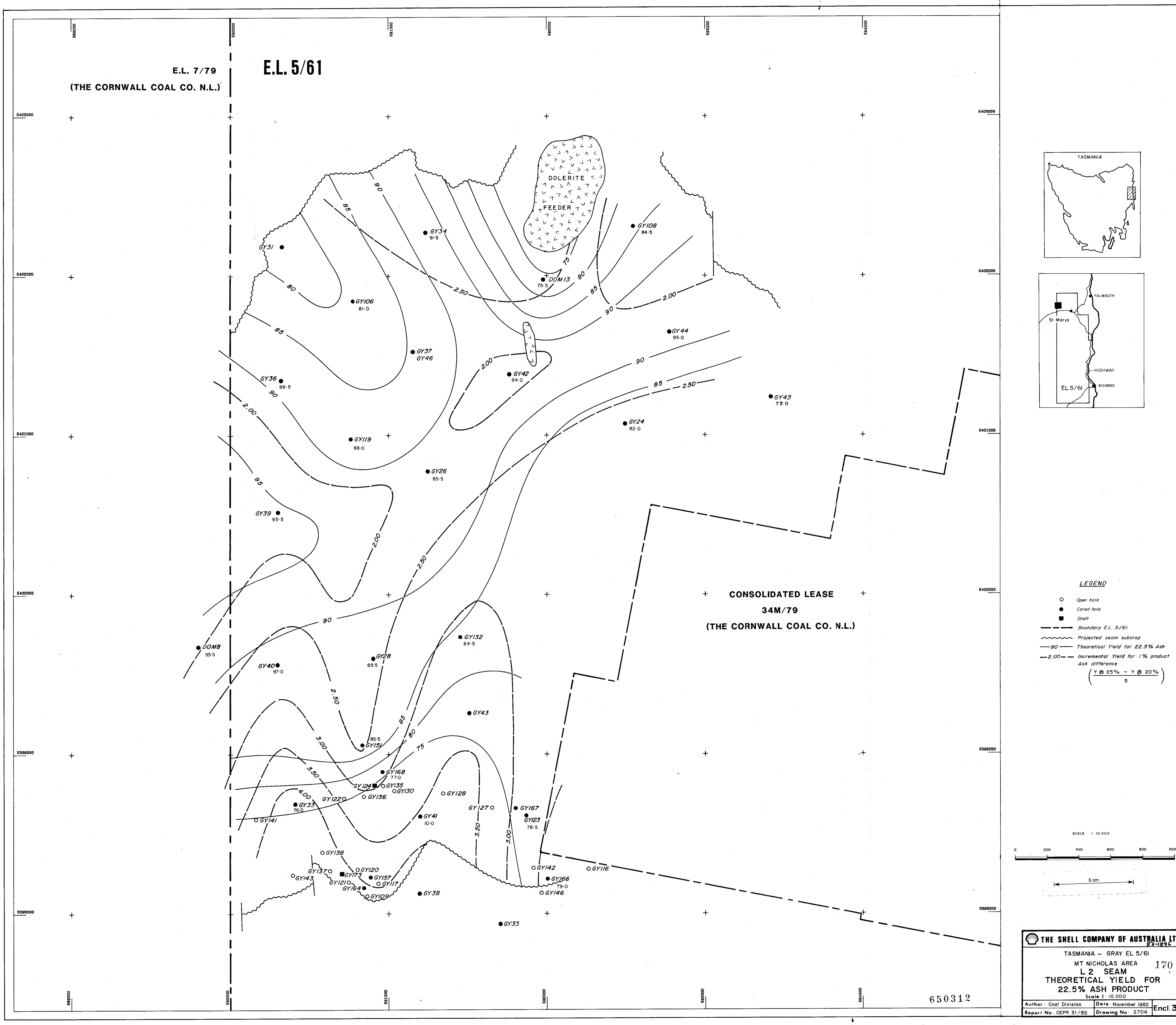
Scale 1:10 000

Author: Coal Division	Date: November 1982
Report No: CEPR 31/82	Drawing No: 2697

Encl. 29

169

650311



THE SHELL COMPANY OF AUSTRALIA LTD.

82-1896

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

170

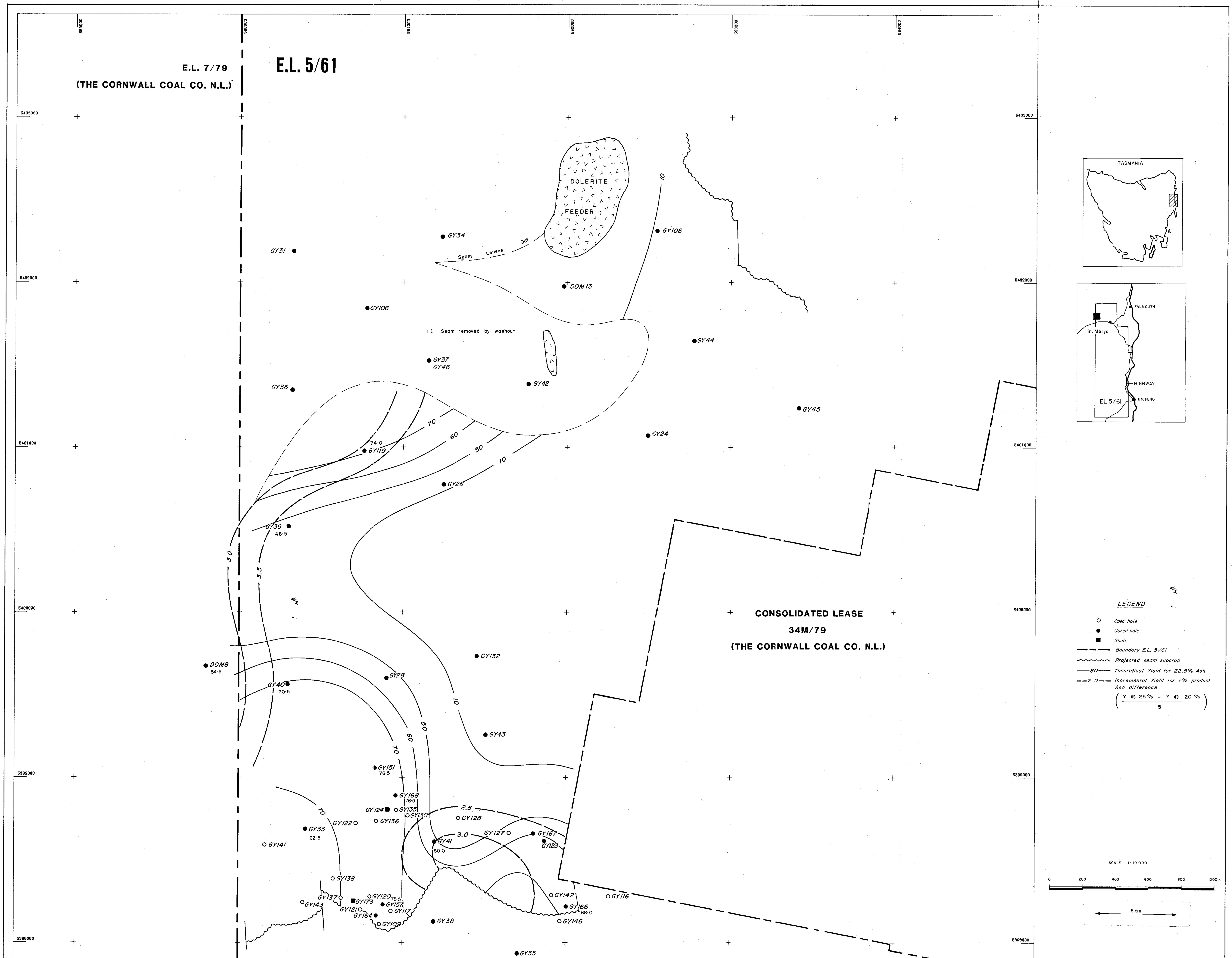
L 2 SEAM

THEORETICAL YIELD FOR

22.5% ASH PRODUCT

Scale 1: 10 000

Author: Coal Division	Date: November 1982	Encl. 30
Report No: CEPR 31/82	Drawing No: 2704	



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61

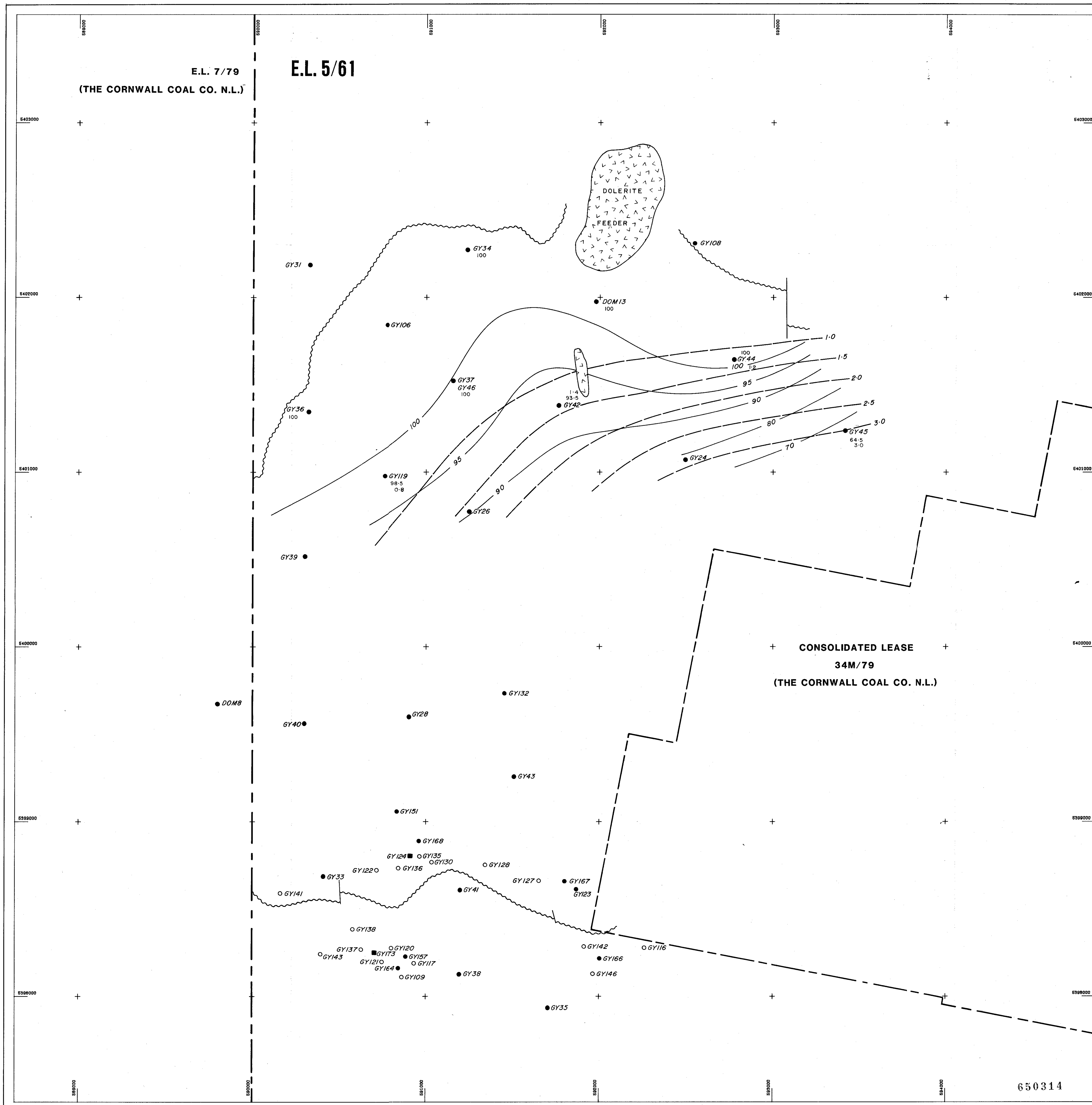
MT NICHOLAS AREA

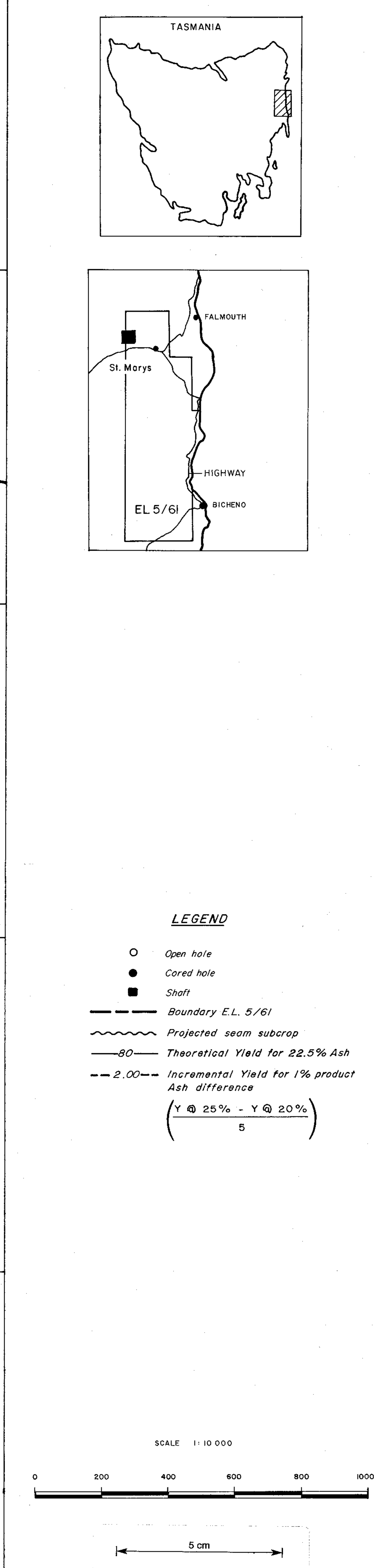
171

L1 SEAM THEORETICAL YIELD FOR 22.5% ASH PRODUCT

Scale 1:10 000

Author: Coal Division	Date: November 1982	Encl. 31
Report No: CEPR 31/82	Drawing No 2703	





THE SHELL COMPANY OF AUSTRALIA LTD.

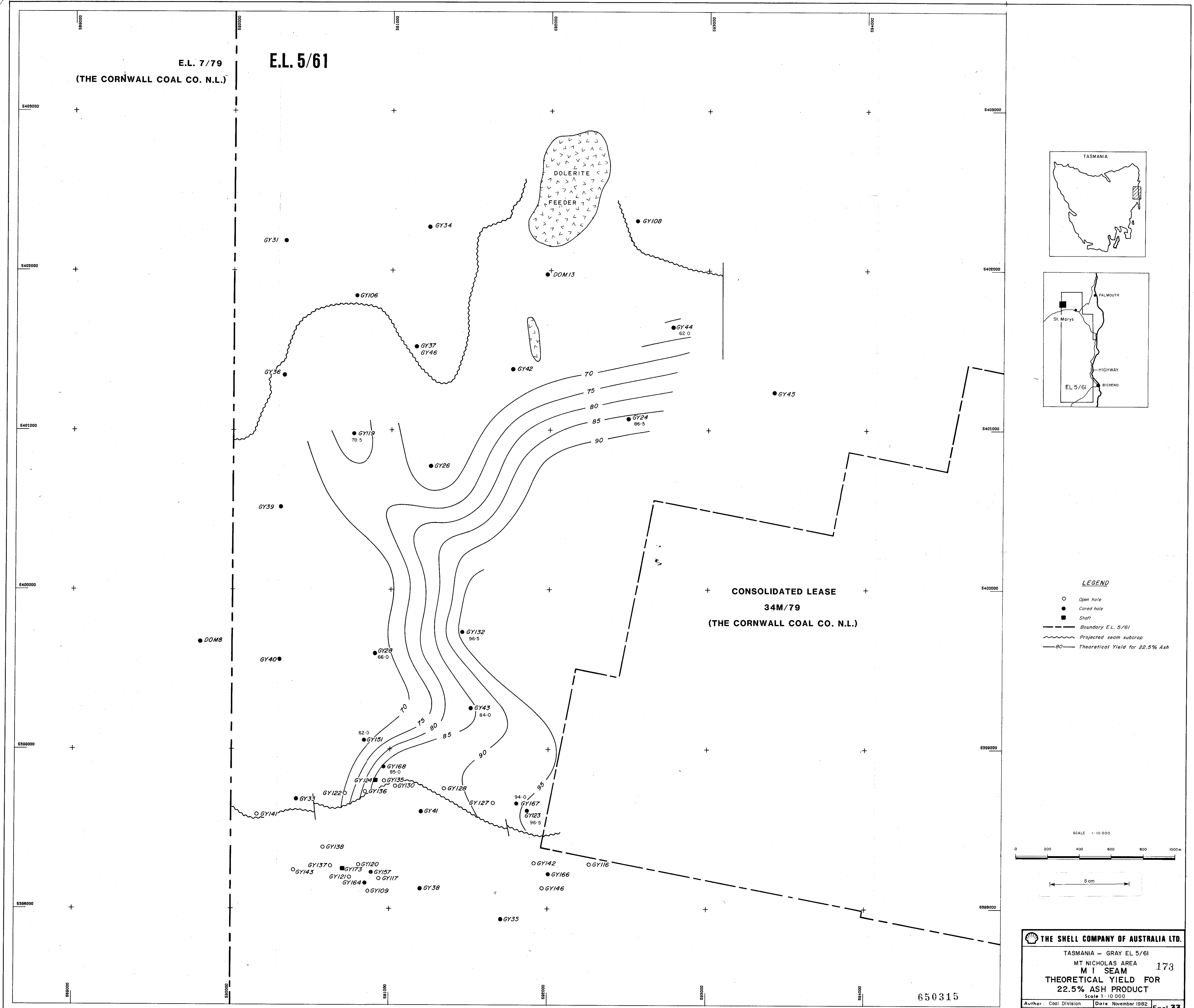
TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA 172

M2 SEAM
THEORETICAL YIELD FOR
22.5% ASH PRODUCT

Scale 1:10 000

Author: Coal Division	Date: November 1982	Encl. 32
Report No: CEPR 31/82	Drawing No: 2702	



THE SHELL COMPANY OF AUSTRALIA LTD.

TASMANIA – GRAY EL 5/61

MT NICHOLAS AREA

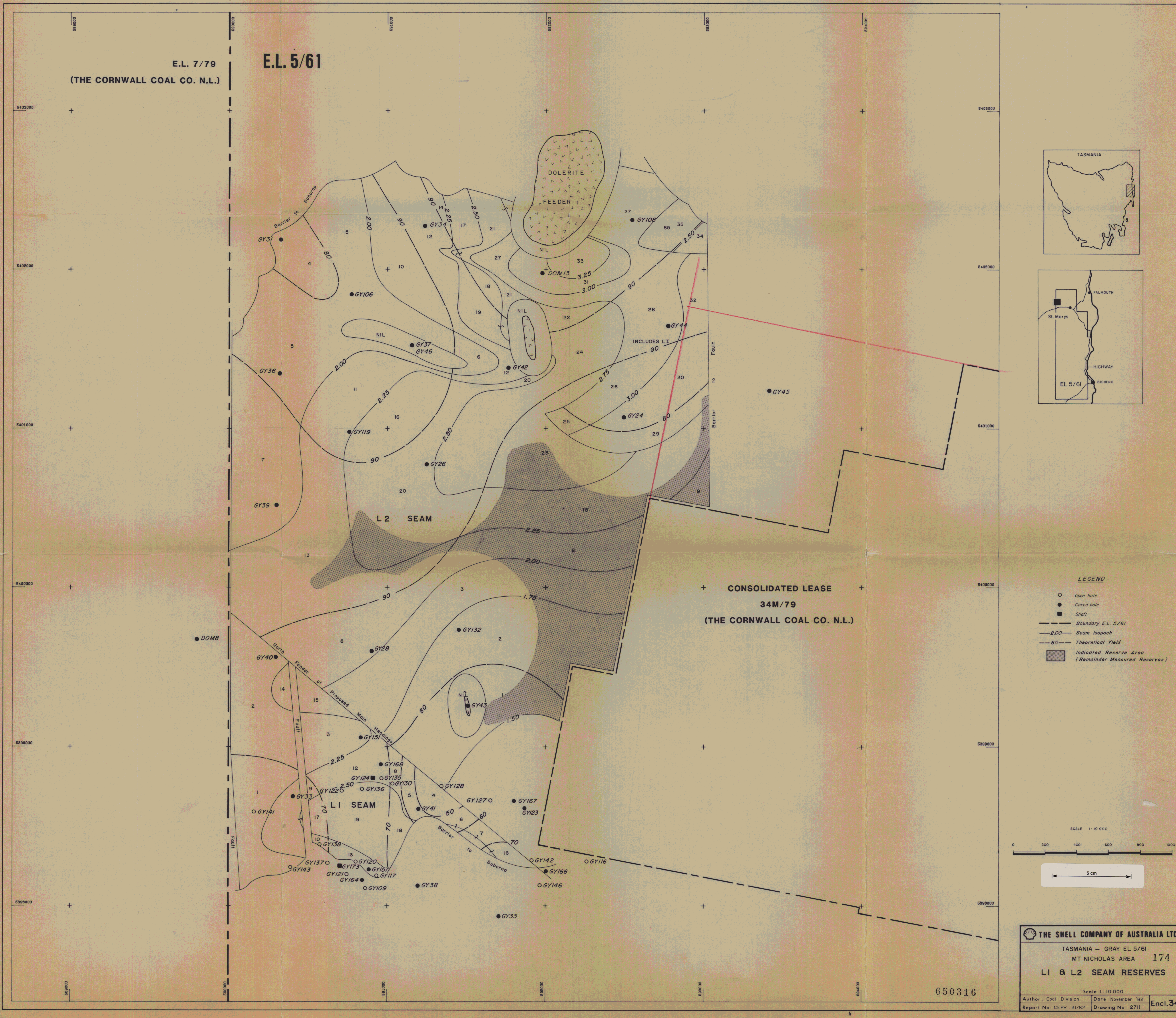
M I SEAM

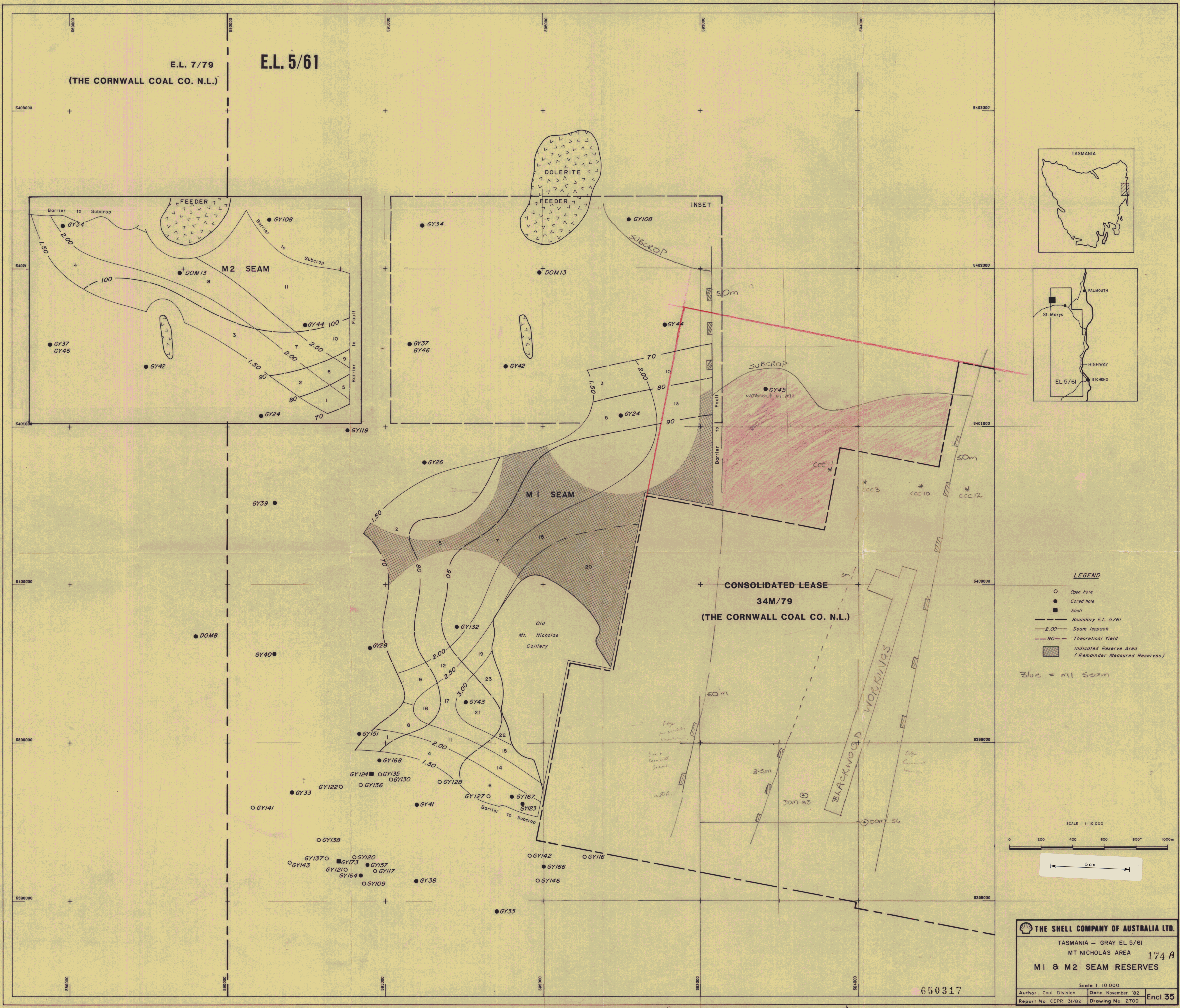
THEORETICAL YIELD FOR 22.5% ASH PRODUCT

Scale 1:10 000

173

Author: Coal Division	Date: November 1982	Encl. 33
Report No. CEPR 31/82	Drawing No. 2701	


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
NIL
INCLUDES L1
L2 SEAM
L1 SEAM
Barrier to Subcrop
North Fender of Proposed Main Headings
Barrier to Fault
Barrier to Subcrop
Fault
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
2.00 Seam Isopach
80 Theoretical Yield
Indicated Reserve Area
(Remainder Measured Reserves)
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
174
L1 & L2 SEAM RESERVES
Scale 1:10 000
Author Coal Division
Date November '82
Report No CEPR 31/82
Drawing No 2711
Encl. 34
650316


E.L. 7/79
(THE CORNWALL COAL CO. N.L.)
E.L. 5/61
DOLERITE
FEEDER
INSET
M2 SEAM
M1 SEAM
Barrier to Subcrop
Barrier to Fault
SUBCROP
GY45 Washout in M1
50m
CONSOLIDATED LEASE
34M/79
(THE CORNWALL COAL CO. N.L.)
Old Mt. Nicholas Colliery
BLACKWOOD WORKINGS
TASMANIA
FALMOUTH
St. Marys
HIGHWAY
BICHENO
EL 5/61
LEGEND
Open hole
Cored hole
Shaft
Boundary E.L. 5/61
Seam Isopach
Theoretical Yield
Indicated Reserve Area (Remainder Measured Reserves)
Blue = M1 Seam
SCALE 1:10 000
5 cm
THE SHELL COMPANY OF AUSTRALIA LTD.
TASMANIA – GRAY EL 5/61
MT NICHOLAS AREA
174 A
M1 & M2 SEAM RESERVES
Scale 1:10 000
Author Coal Division
Date November '82
Report No. CEPR 31/82
Drawing No. 2709
Encl. 35
650317

176

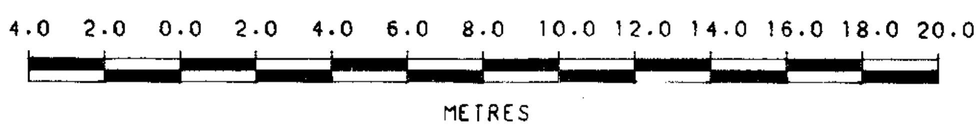
LEGEND
BRIGHTNESS PROFILE REFERENCE

- COAL - BRIGHT
- COAL - BRIGHT WITH DULL BANDS
- COAL - INTERBANDED DULL AND BRIGHT
- COAL - MAINLY DULL, FREQ. BRIGHT BANDS
- COAL - DULL WITH MINOR BRIGHT BANDS
- COAL - DULL
- COAL STONY
- COAL - UNDIFFERENTIATED
- COAL - WEATHERED
- COAL - CINDERED
- TONSTEIN
- NOT CORED / CORE LOST

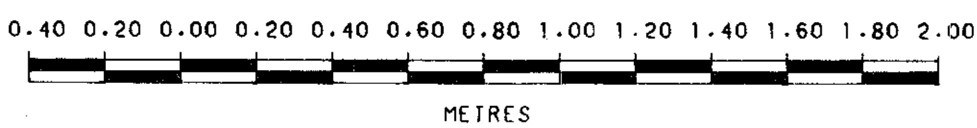
LEGEND
LITHOLOGY REFERENCE

- SOIL
- DOLERITE SCREE
- COAL
- COAL STONY
- NOT CORED / CORE LOST
- BRECCIA
- SANDSTONE
- MUDSTONE
- CARBONACEOUS MUDSTONE
- CLAYSTONE
- INTERBEDDED SEDIMENTS (SANDST / MUDST 50:50)

VERTICAL SCALE
1:200



SEAM SECTION
1:20



650318

5 cm

THE SHELL COMPANY OF AUSTRALIA LTD.
COAL DIVISION

REFERENCE LEGEND
(FOR ENCLOSURES 37-66)

AUTHOR: Coal Division	DATE: November 1982	ENCL. 36
REPORT NO: CEPR 31/82	DRAWING NO: 2777 a	

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61

TASMANIA

175

GY 106

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

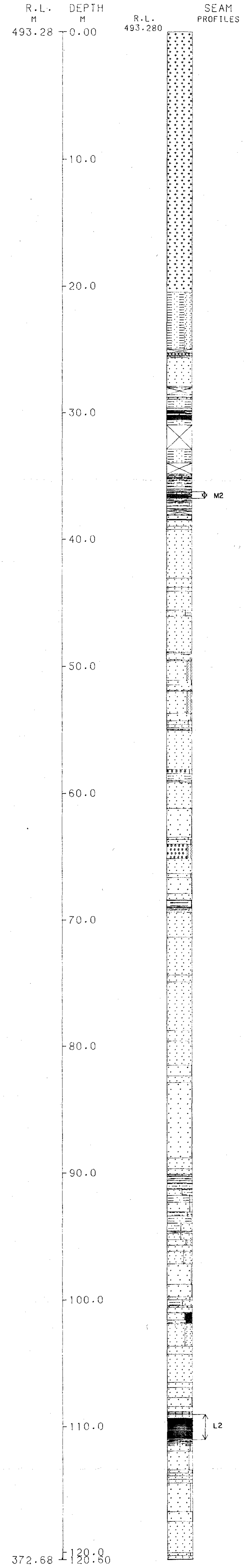
Author Coal Division	Date: November '82	Encl. 37
Report No CEPR 31/82	Drawing No: 2777	

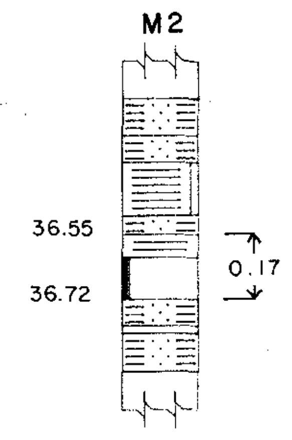
See Encl. 36 for Legend Reference and Scales

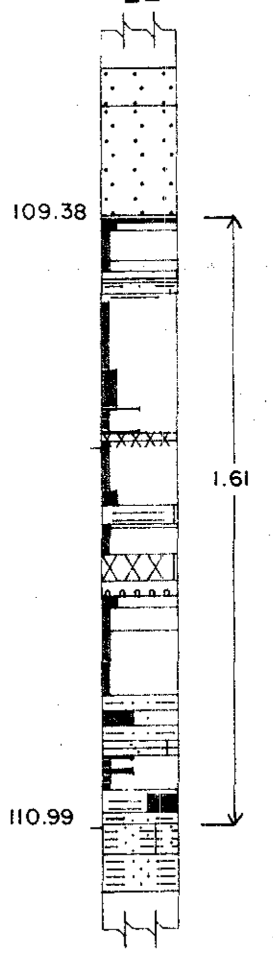
5 cm

650319

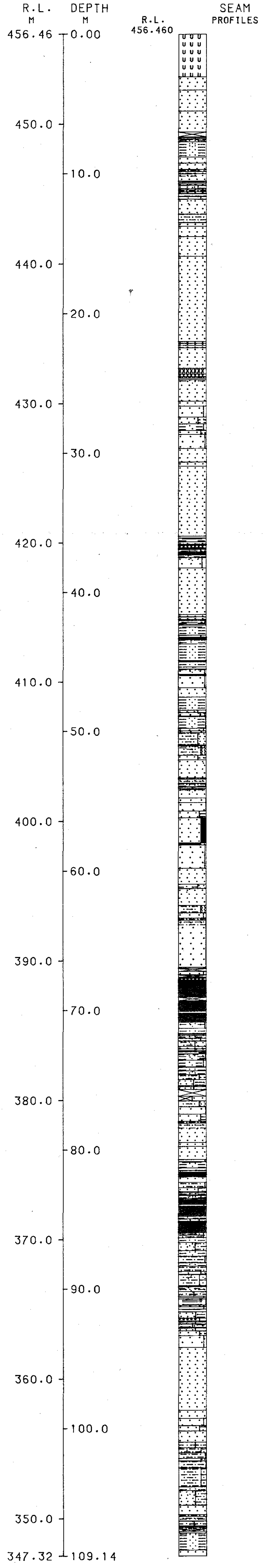
GY 106







GY 108



THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L.5/61
TASMANIA

188

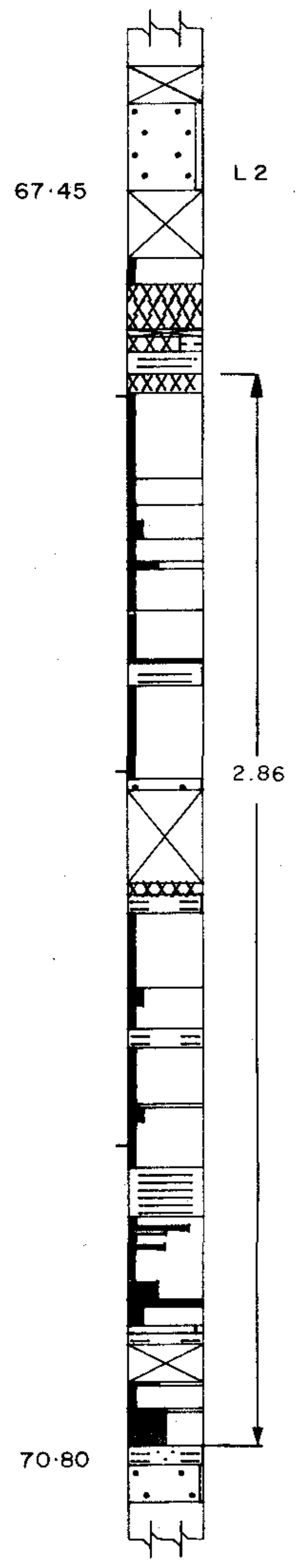
GY 108
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

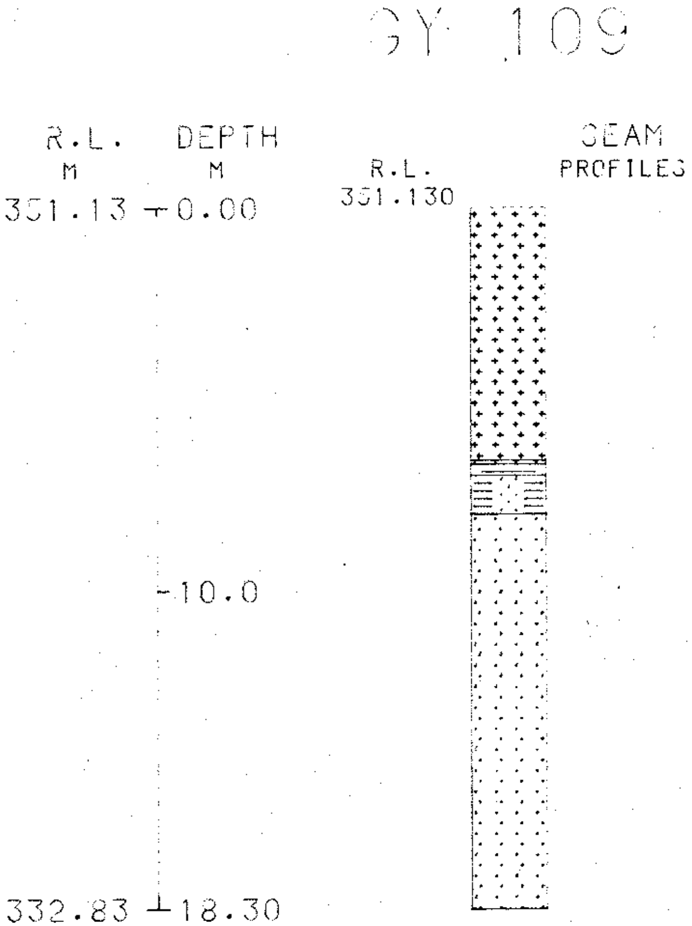
Author Coal Division	Date November '82	Encl.38
Report No CEPR 31/82	Drawing No 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650320





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MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 109

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

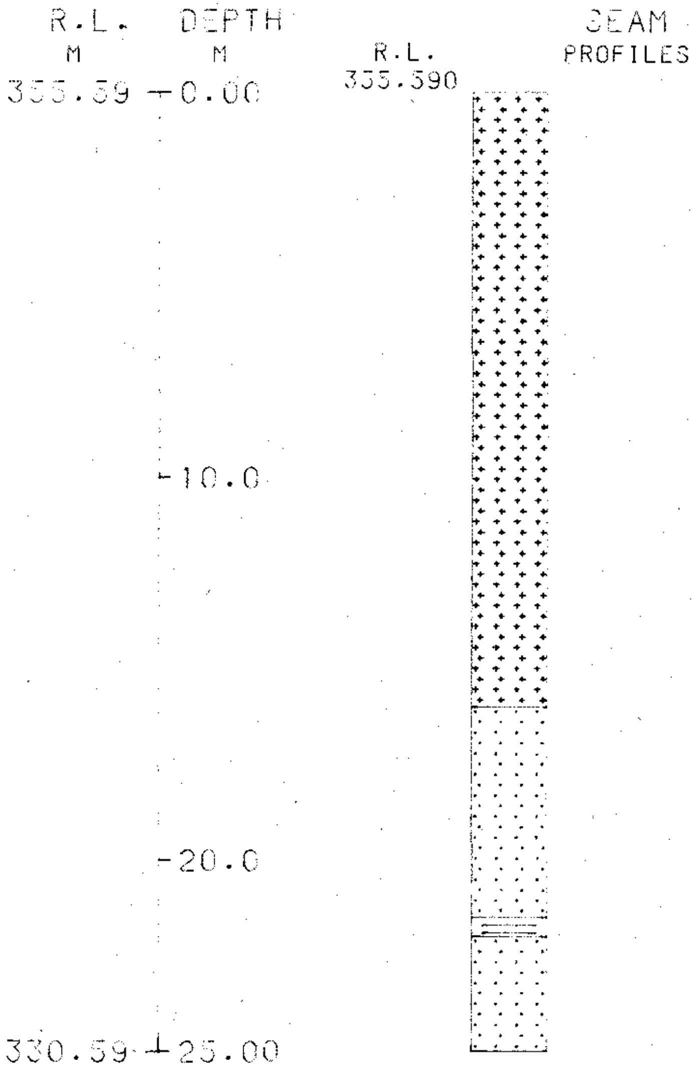
Author Coal Division	Date: November '82	Encl. 39
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650321

GY 116



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MT. NICHOLAS — E.L. 5/61
TASMANIA

GY116
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date November '82	Encl. 40
Report No CEPR 31/82	Drawing No 2777	

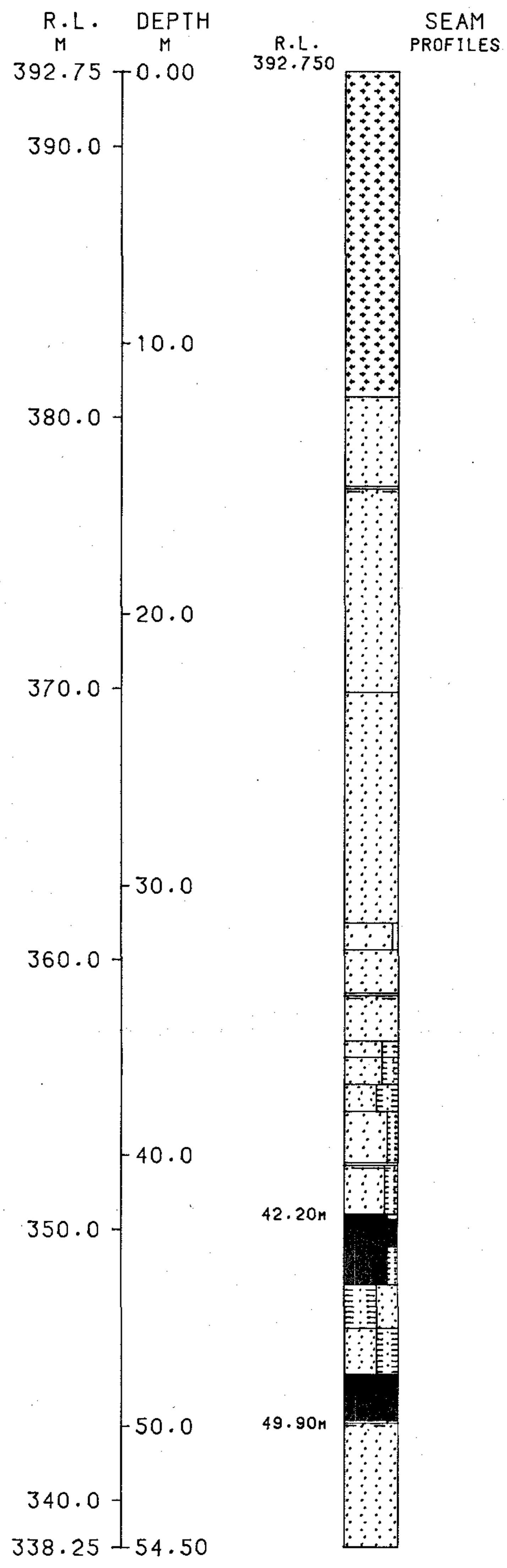
See Encl. 36 for Legend Reference and Scales

5 cm

650322

178

GY 117



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MT. NICHOLAS — E.L. 5/61
TASMANIA

189

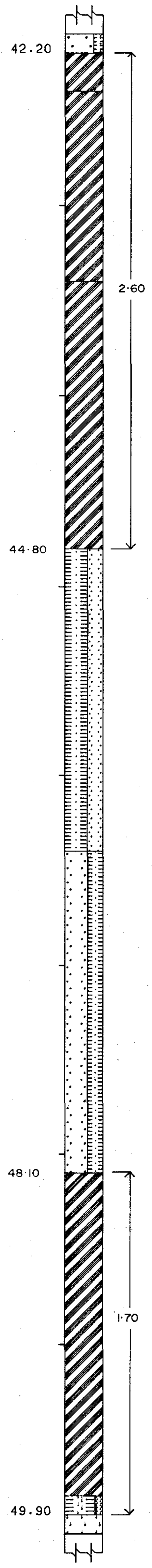
GY 117
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl. 41
Report No. CEPR 31/82	Drawing No. 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650323



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MT. NICHOLAS — E.L. 5/61
TASMANIA

190

GY 119
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl. 42
Report No: CEPR 31/82	Drawing No: 2777	

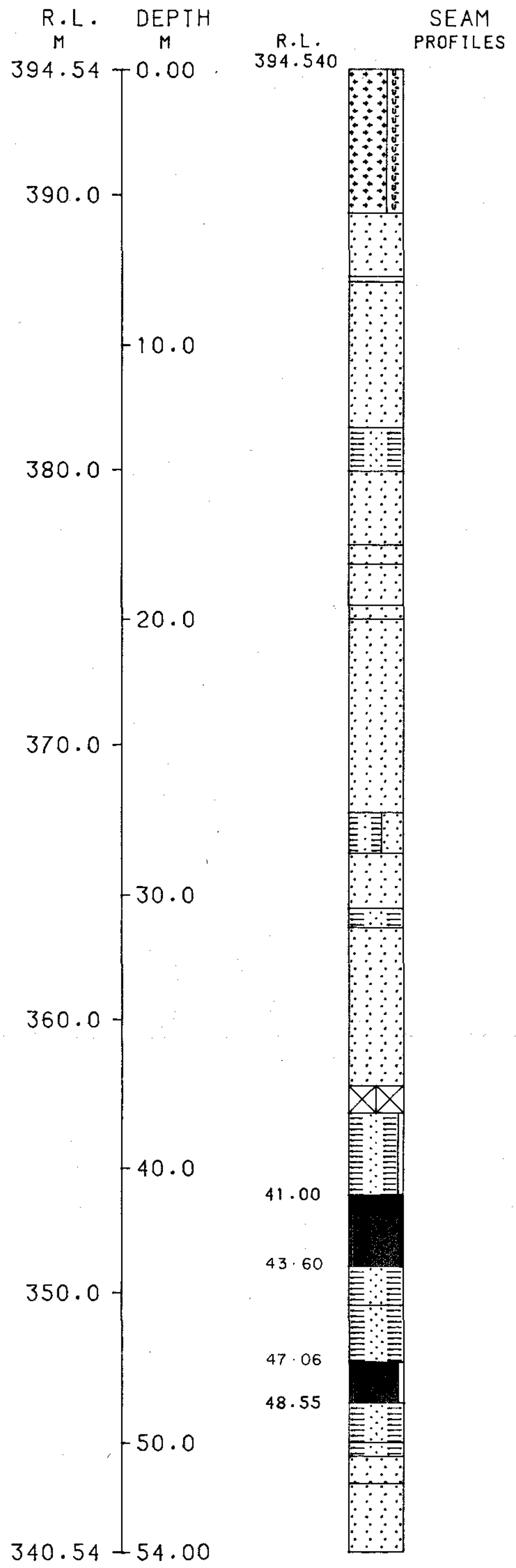
See Encl. 36 for Legend Reference and Scales

5 cm

650324

190

GY 120



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MT NICHOLAS — E.L. 5/61
TASMANIA

191

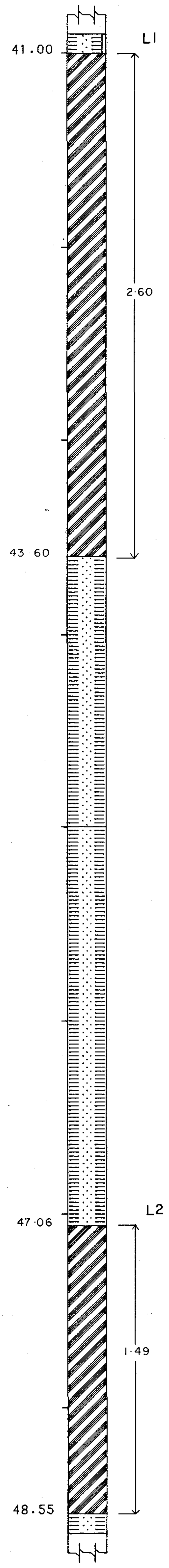
GY 120
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date November '82	Encl. 43
Report No CEPR 31/82	Drawing No 2777	

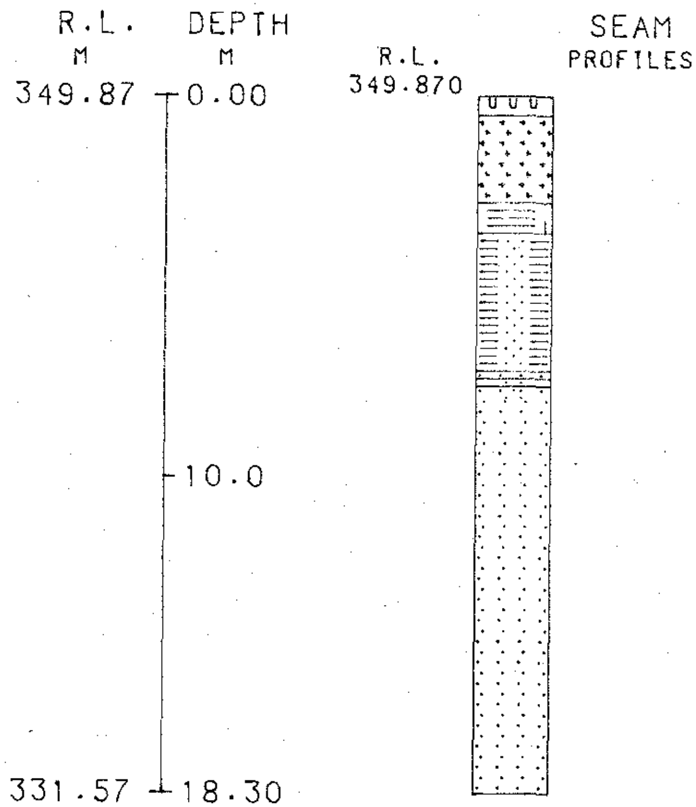
See Encl 36 for Legend Reference and Scales

5 cm

650325



GY 121



THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L.5/61
TASMANIA

GY 121
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl.44
Report No: CEPR 31/82	Drawing No: 2777	

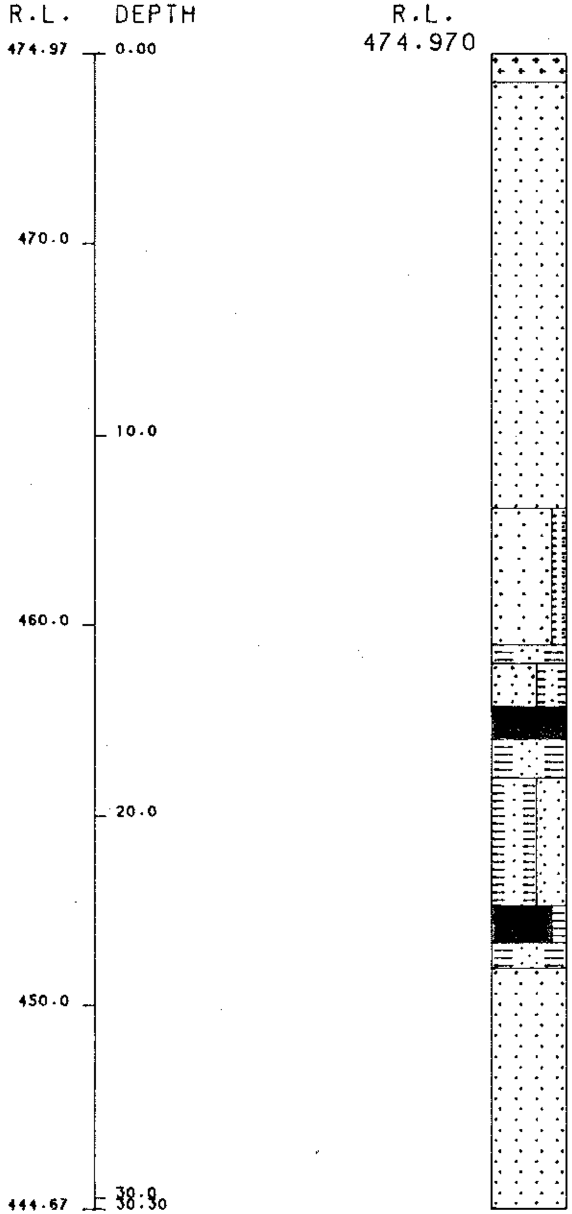
See Encl. 36 for Legend Reference and Scales

5 cm

650326

179

GY 122



THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 122

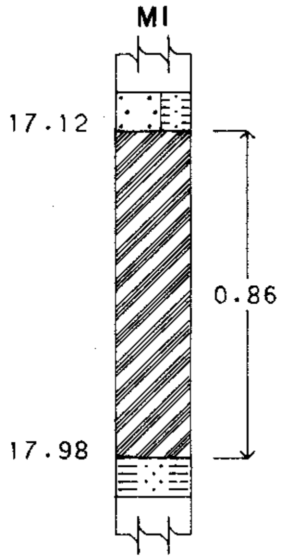
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl. 45
Report No: CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650327



180

GY 123

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

192

GY 123

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

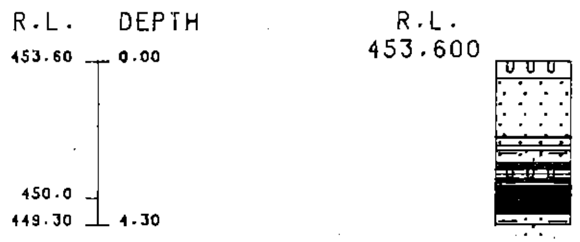
Author: Coal Division	Date: November '82	Encl. 46
Report No. CEPR 31/82	Drawing No. 2777	

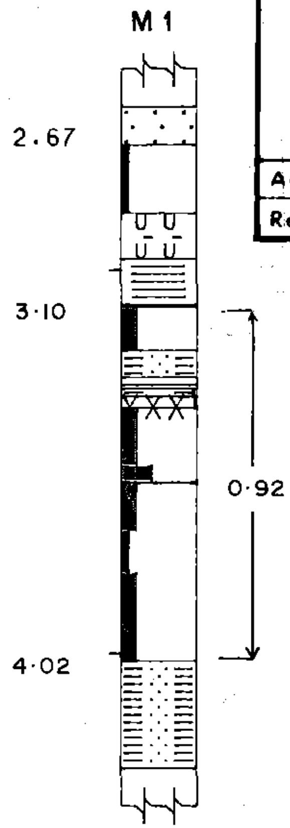
See Encl. 36 for Legend Reference and Scales

5 cm

650328

GY 124





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MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 124
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

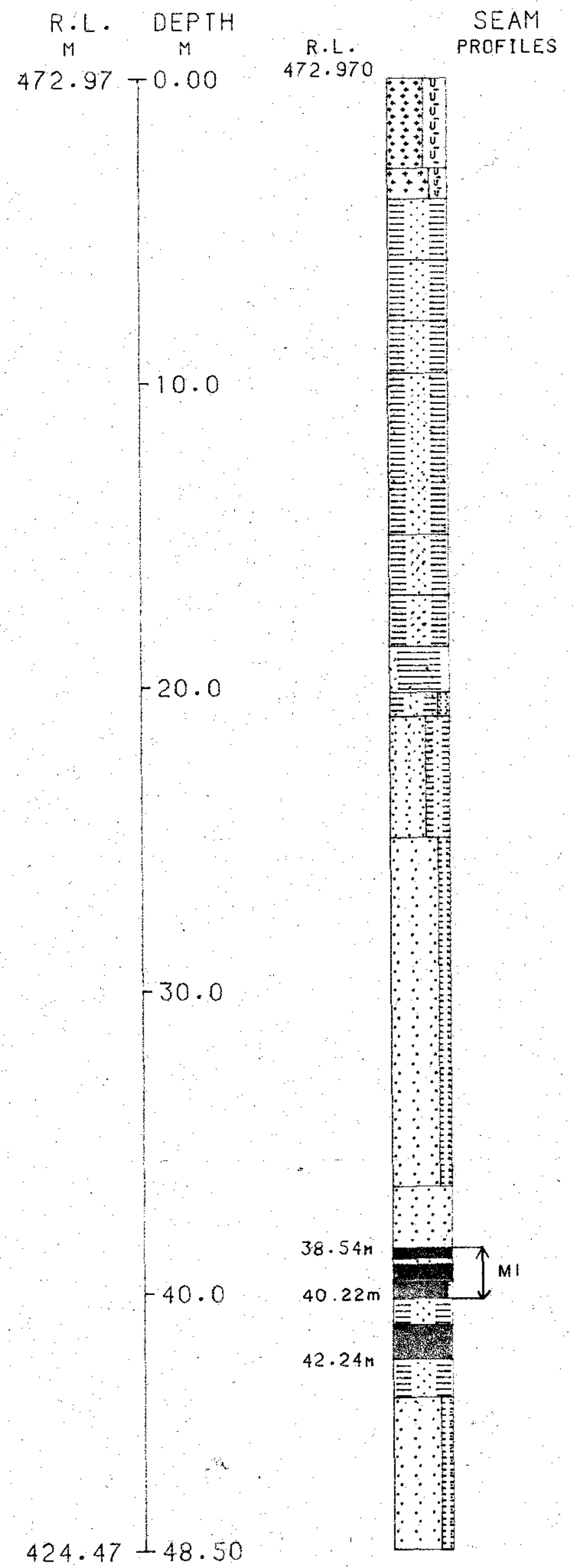
Author Coal Division	Date : November '82	Encl. 47
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650329

GY 127



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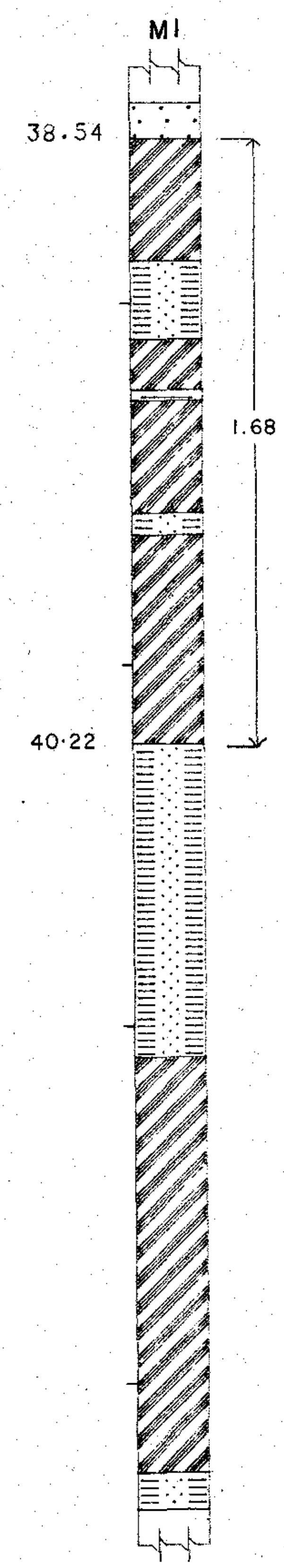
MT. NICHOLAS — E.L.5/61
TASMANIA
GY 127 193

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl.48
Report No: CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm



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MT. NICHOLAS — E.L. 5/61
TASMANIA

194

GY 128
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

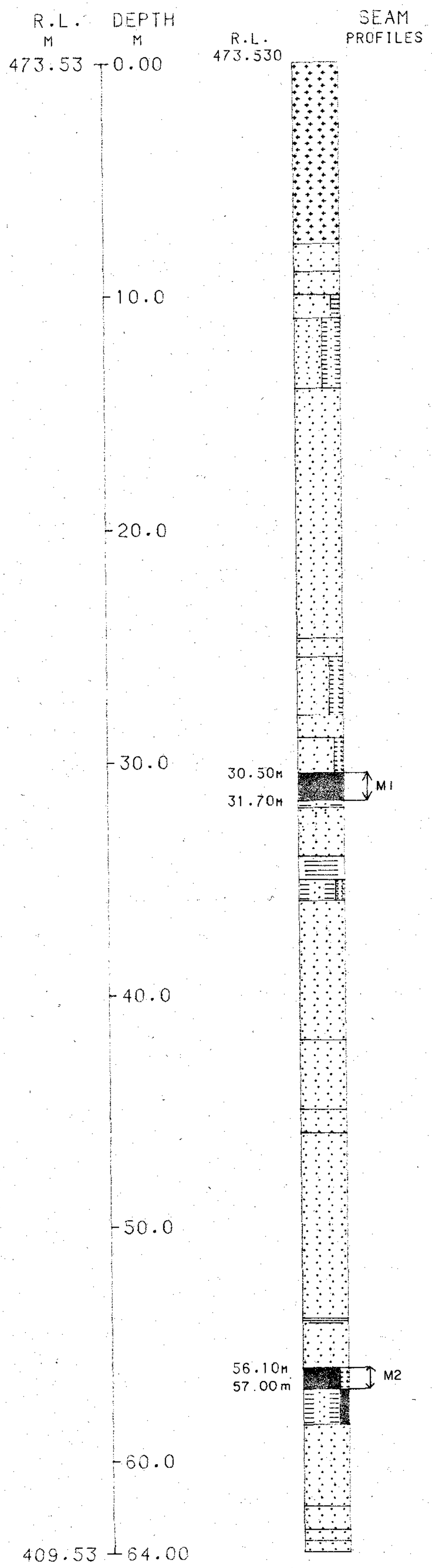
Author: Coal Division	Date: November '82	Encl. 49
Report No: CEPR 31/82	Drawing No: 2777	

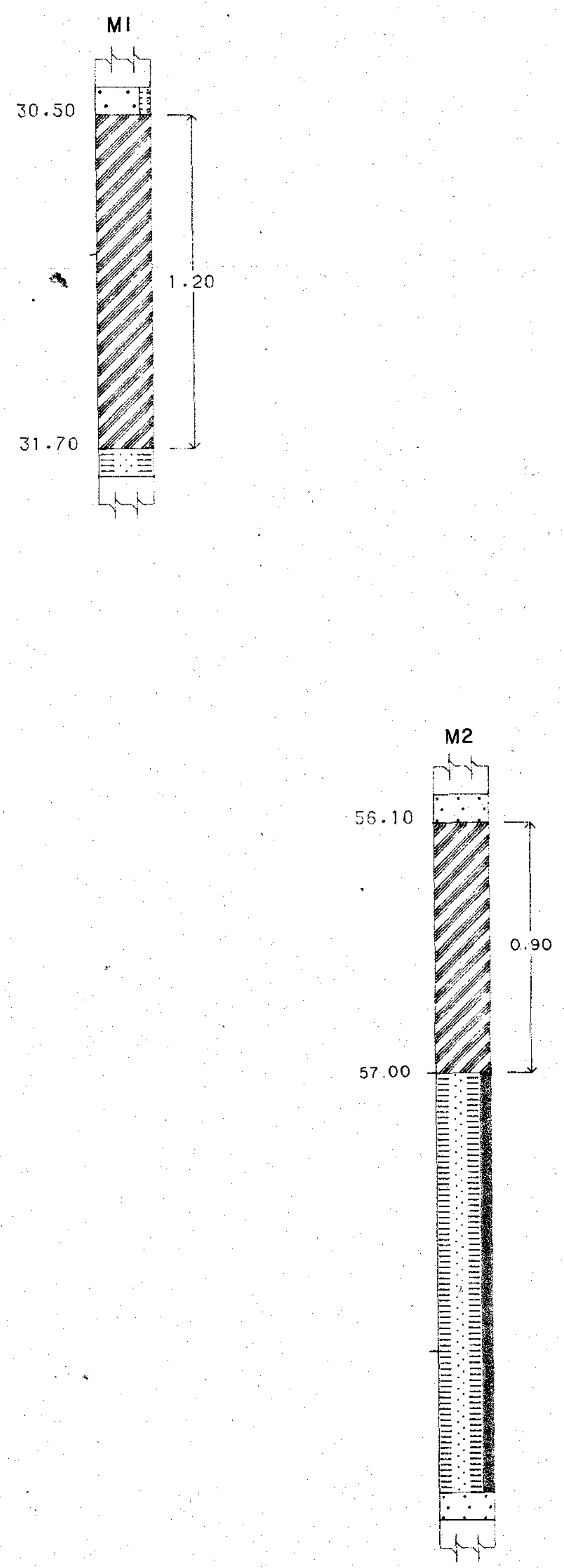
See Encl. 36 for Legend Reference and Scales

5 cm

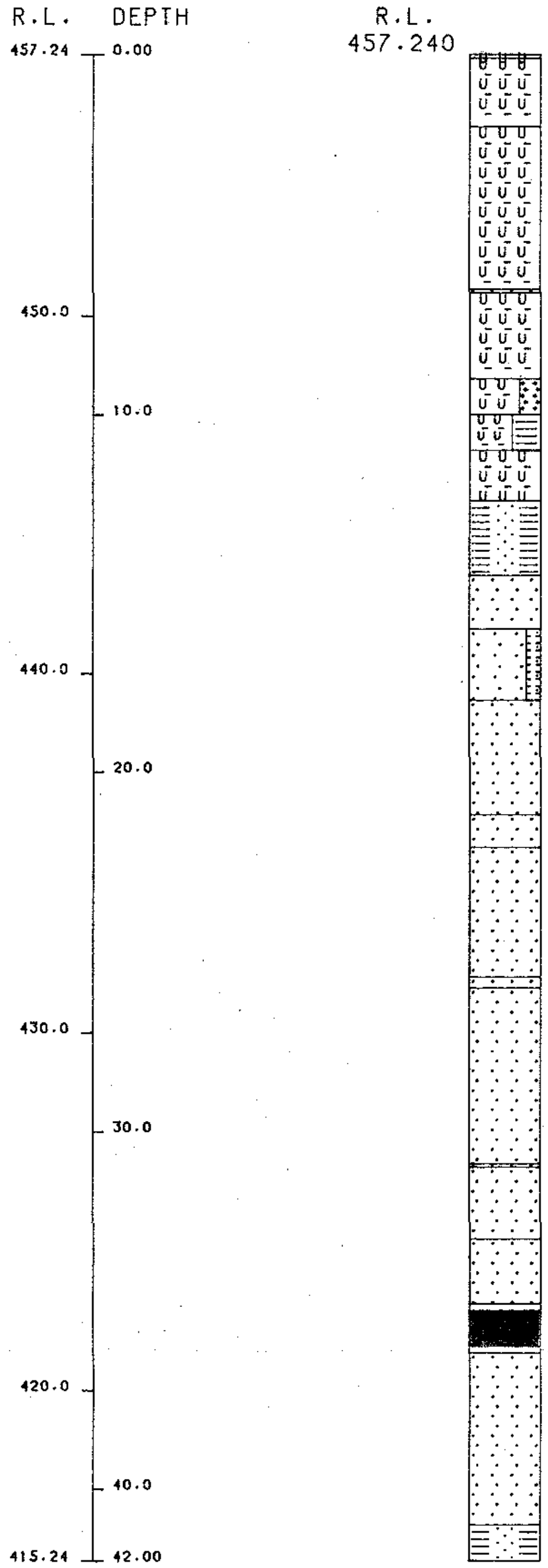
650330

GY 128





GY 130



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MT. NICHOLAS — E.L. 5/61
TASMANIA

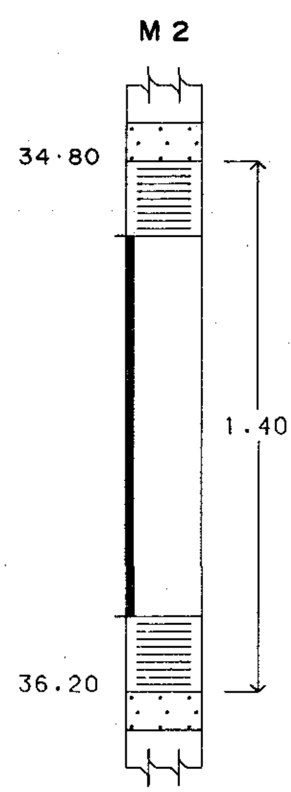
GY 130
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date: November '82	Encl.50
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650331



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MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 132

195

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82
Report No: CEPR 31/82	Drawing No: 2777

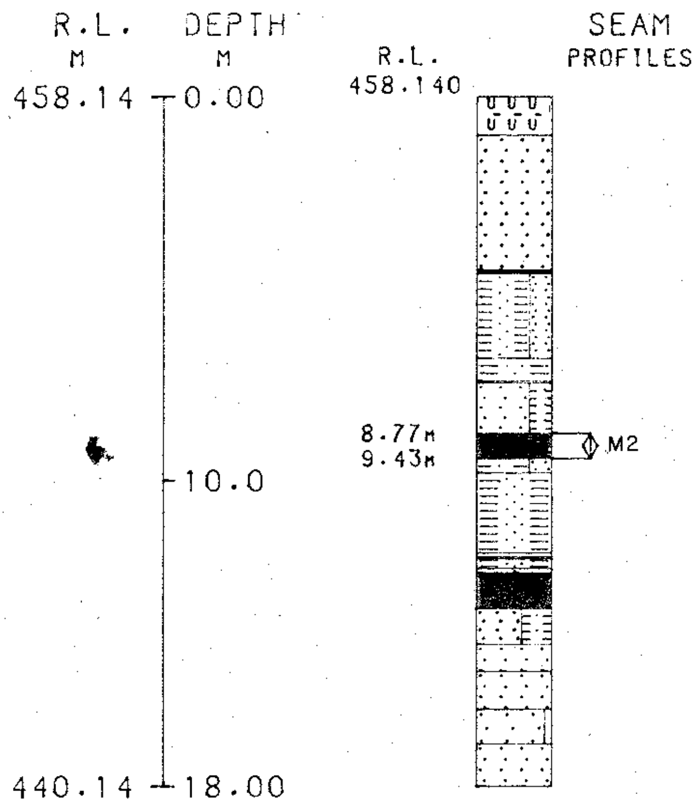
Encl. 51

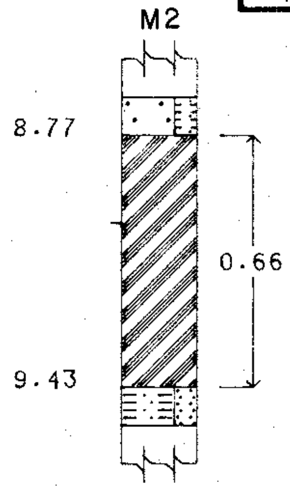
See Encl. 36 for Legend Reference and Scales

650332

195

GY 135





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MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 135

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date November '82	Encl. 52
Report No CEPR 31/82	Drawing No 2777	

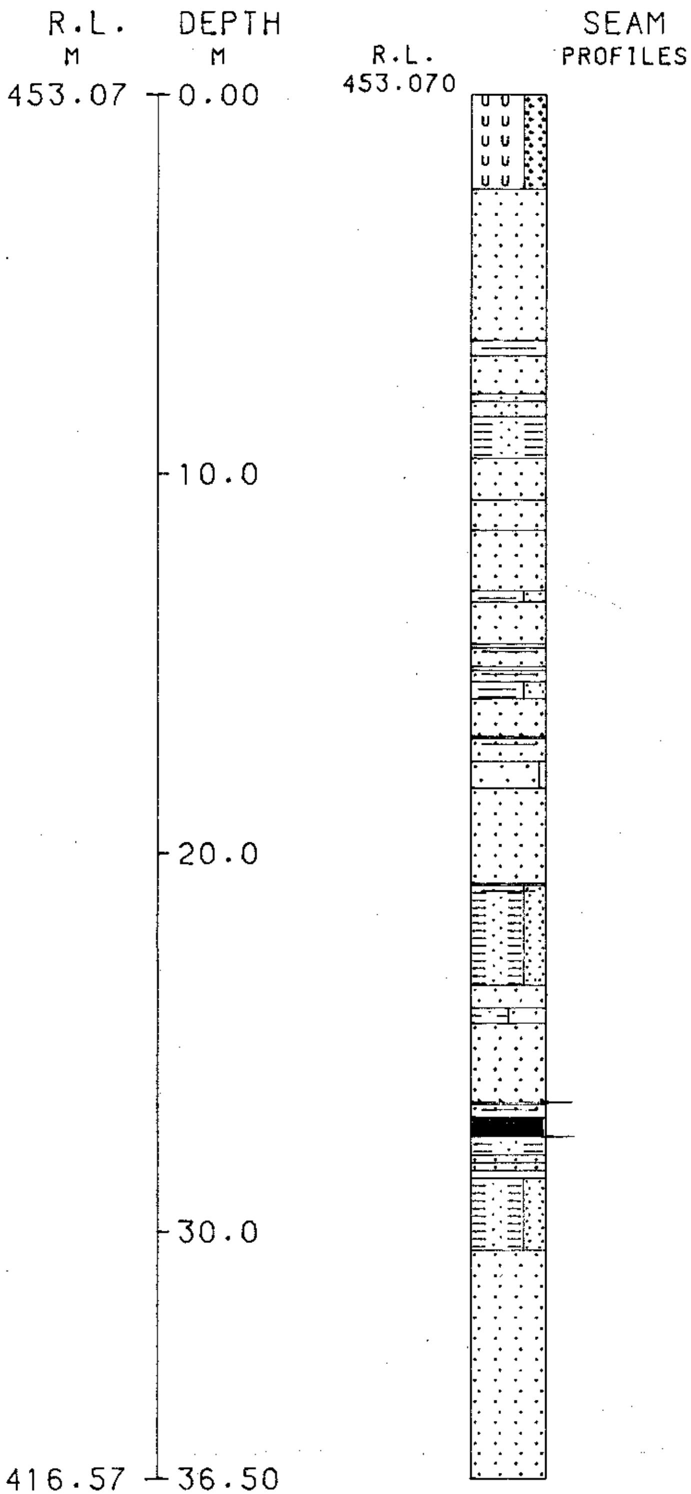
See Encl. 36 for Legend Reference and Scales

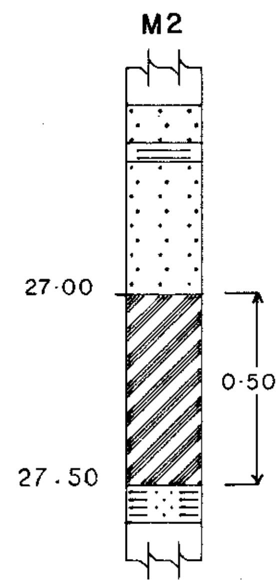
5 cm

650333

183

GY 136





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MT. NICHOLAS — E.L.5/61
TASMANIA

GY 136
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author . Coal Division	Date : November '82	Encl.53
Report No CEPR 31/82	Drawing No: 2777	

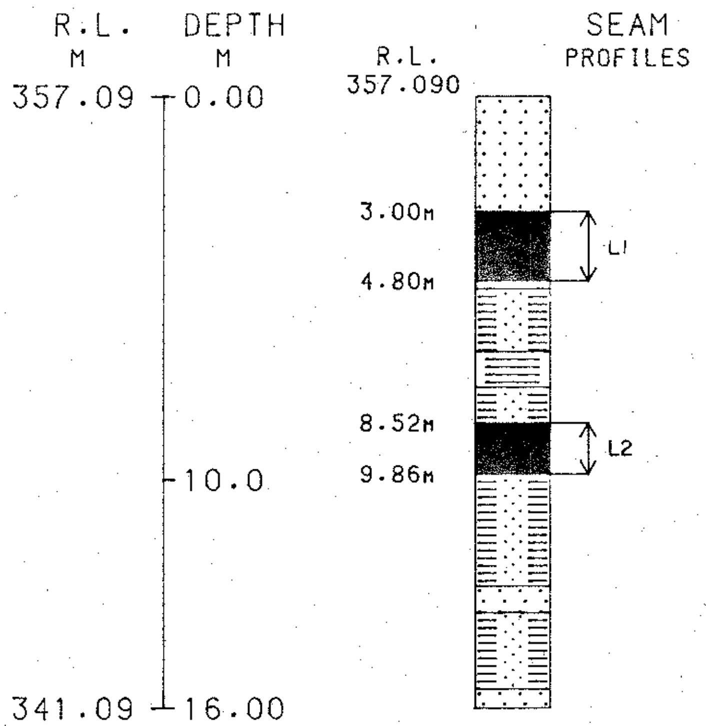
See Encl. 36 for Legend Reference and Scales

5 cm

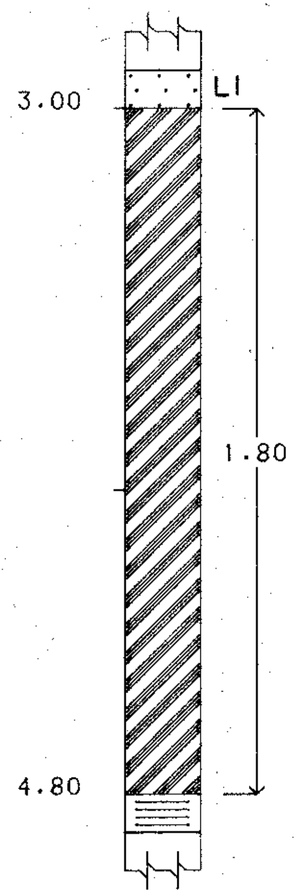
650334

184

GY 137



5 cm



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MT. NICHOLAS — E.L. 5/61
TASMANIA

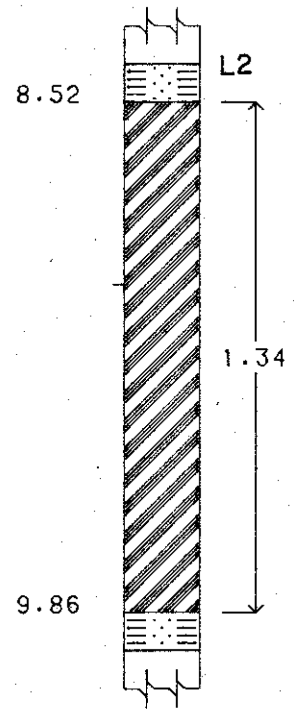
GY 137

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl. 54
Report No. CEPR 31/82	Drawing No: 2777	

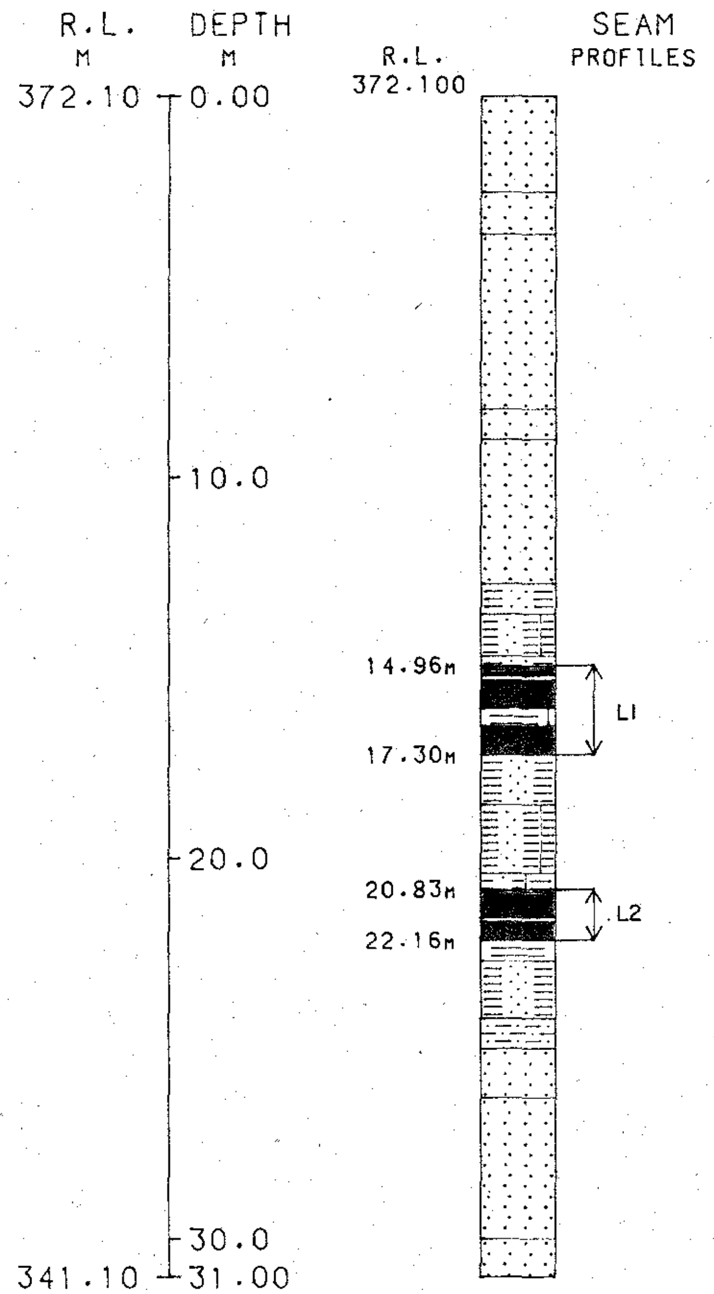
See Encl. 36 for Legend Reference and Scales

650335



185

GY 138



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MT. NICHOLAS — E.L. 5/61
TASMANIA

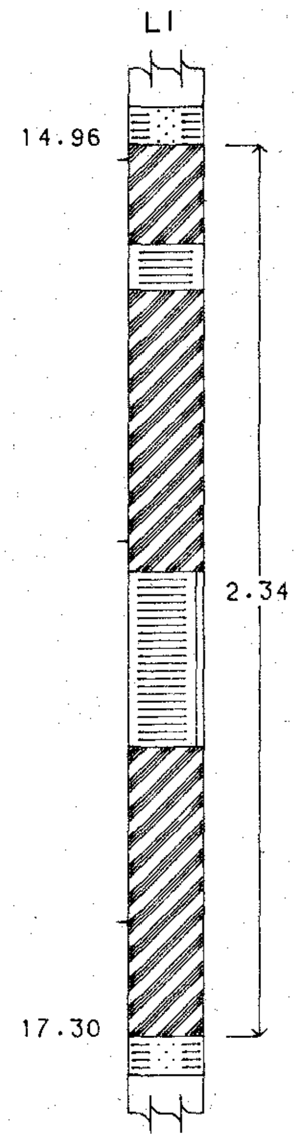
GY 138
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

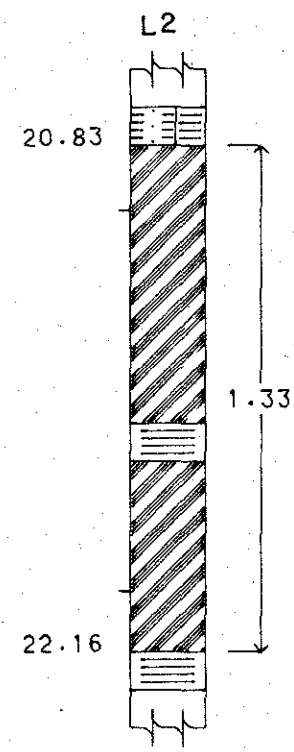
Author Coal Division	Date November '82	Encl. 55
Report No CEPR 31/82	Drawing No 2777	

See Encl. 36 for Legend Reference and Scales

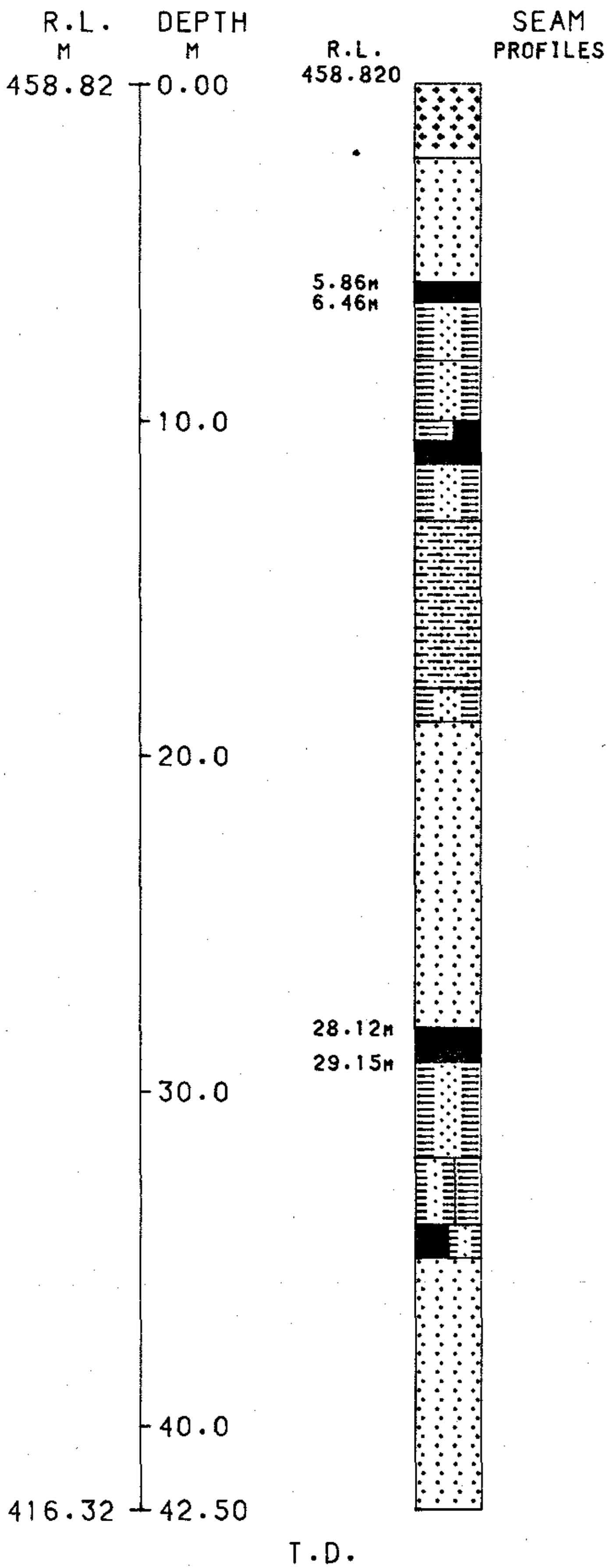
5 cm

650336





GY141



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MT. NICHOLAS — E.L.5/61
TASMANIA

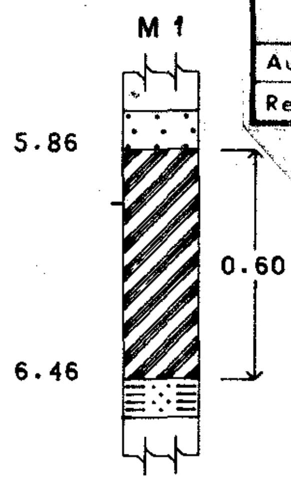
GY 141
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

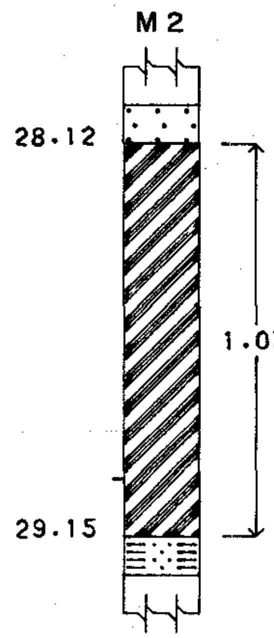
Author Coal Division	Date November '82	Encl.56
Report No. CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650337





187

GY142

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L.5/61
TASMANIA

196

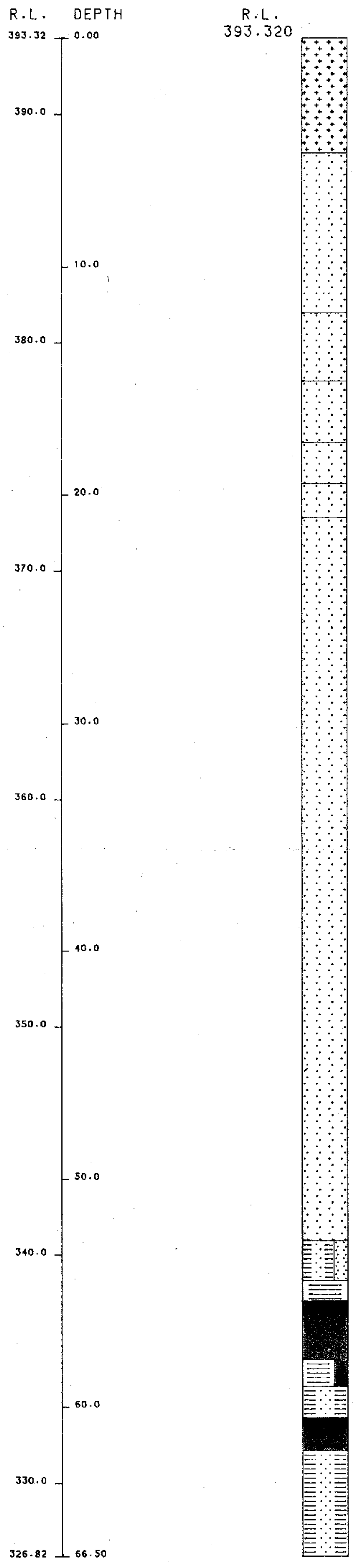
GY 142
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

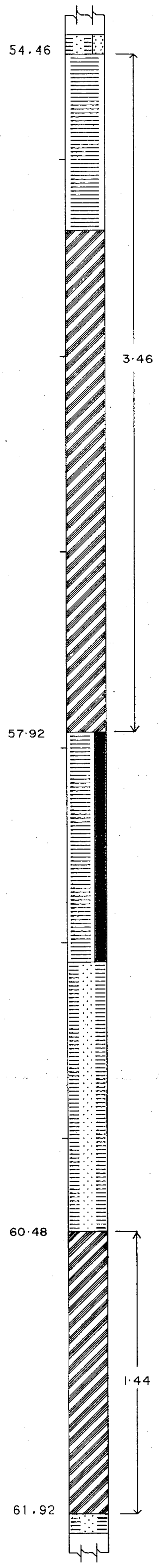
Author Coal Division	Date : November '82	Encl. 57
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650338





GY 143

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 143 197

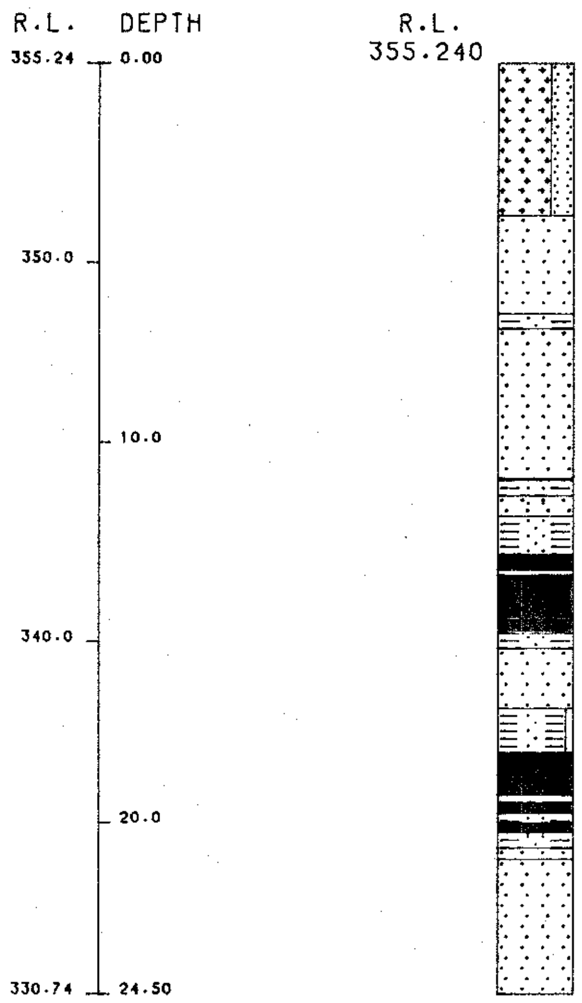
DRILL HOLE LITHOLOGY
WITH EXPANDED SEAM SECTIONS

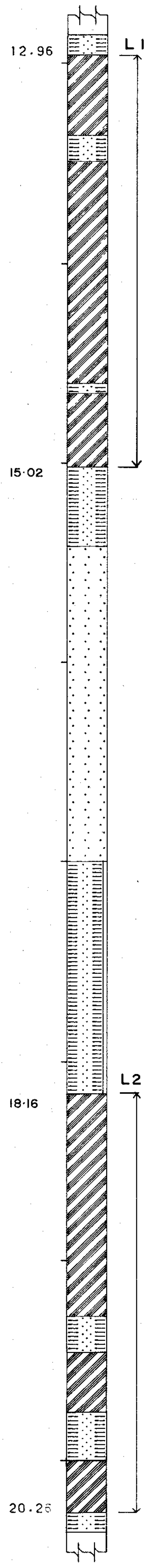
Author: Coal Division	Date: November '82	Encl. 58
Report No: CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

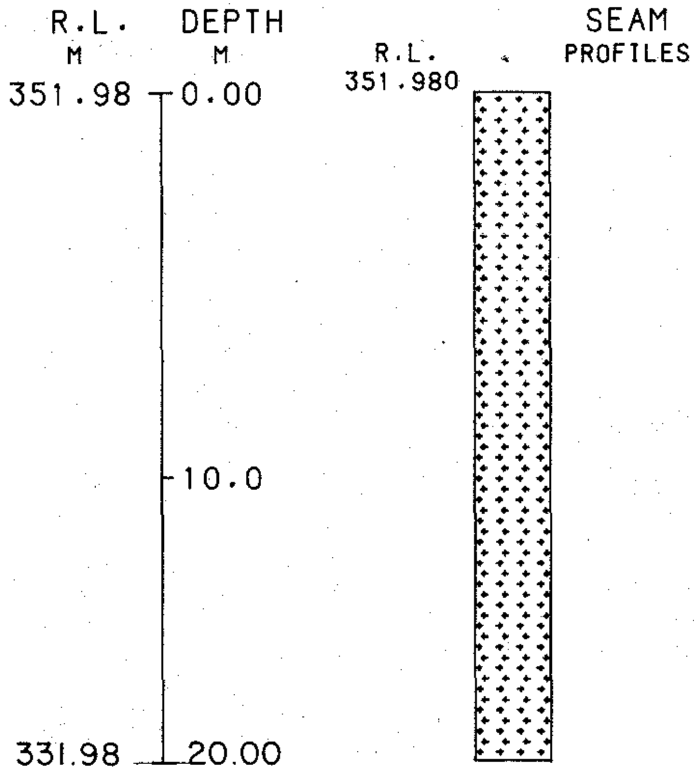
5 cm

650339





GY146



THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

GY 146

DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date : November '82	Encl.59
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650340

182

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

198

GY 151

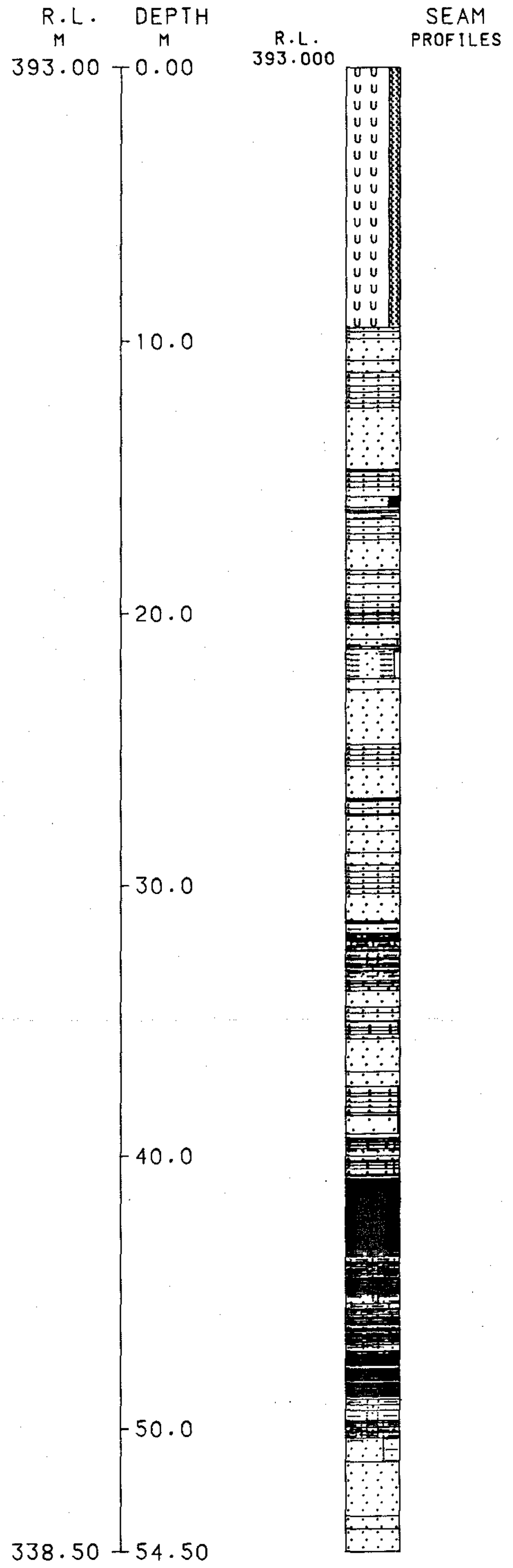
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date: November '82	Encl.60
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

650341

GY157



THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA
GY157 199

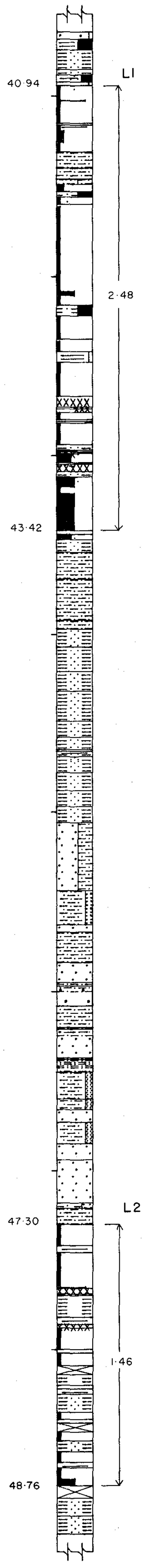
DRILL HOLE LITHOLOGY
WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl. 61
Report No: CEPR 31/82	Drawing No: 2777	

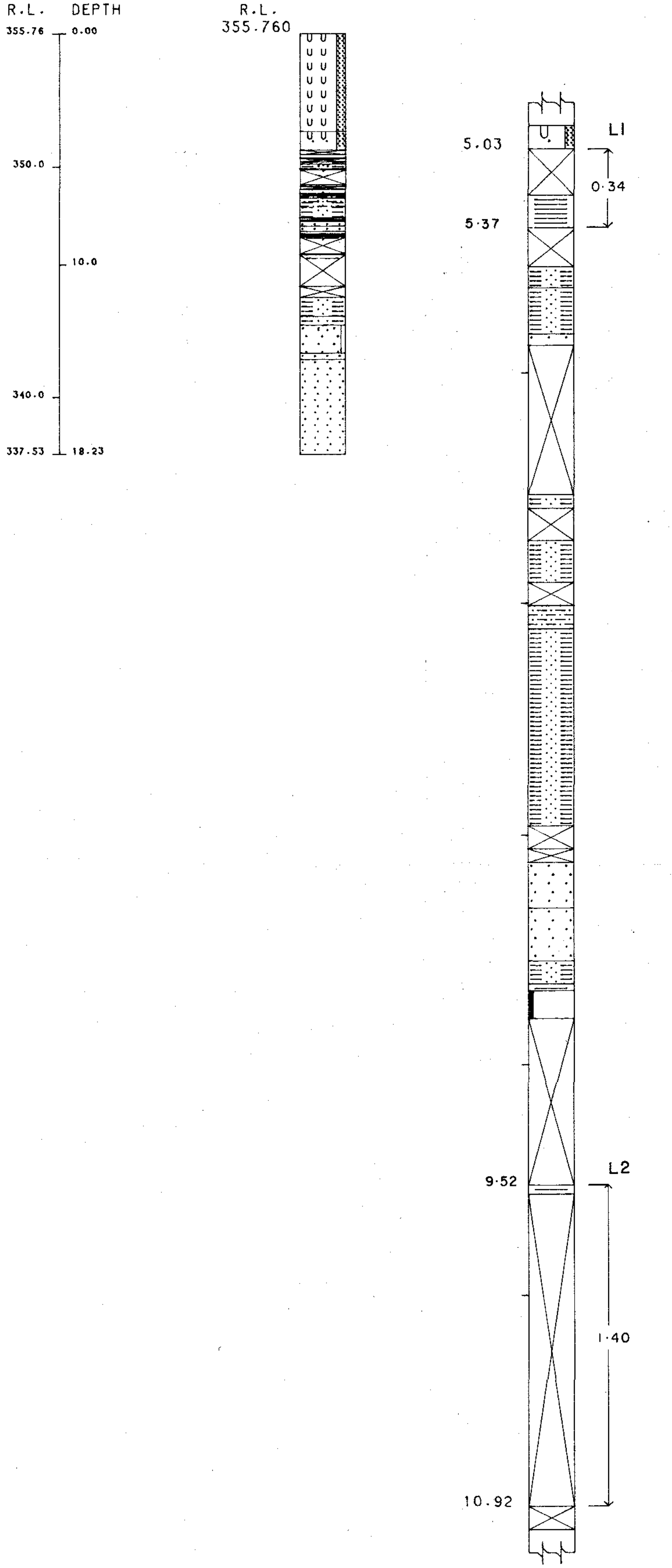
See Encl. 36 for Legend Reference and Scales

5 cm

650342



GY164



THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

200

GY164
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl. 62
Report No: CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650343

GY166

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L.5/61
TASMANIA

GY 166

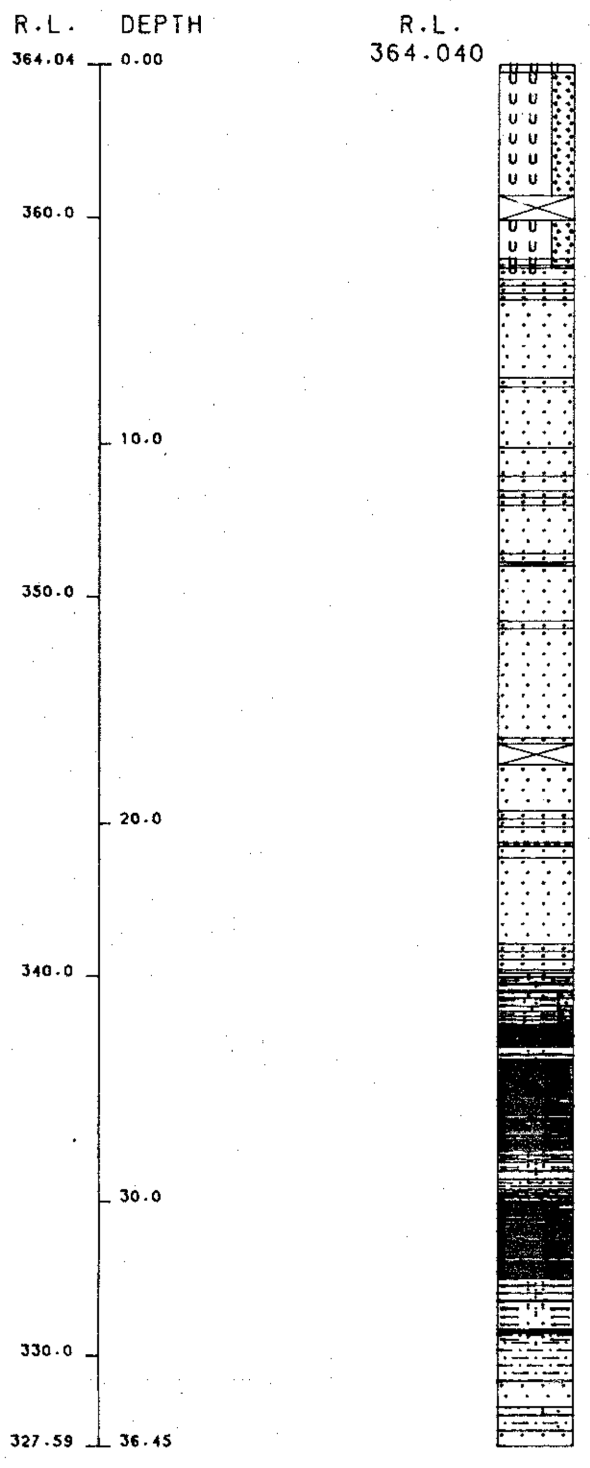
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

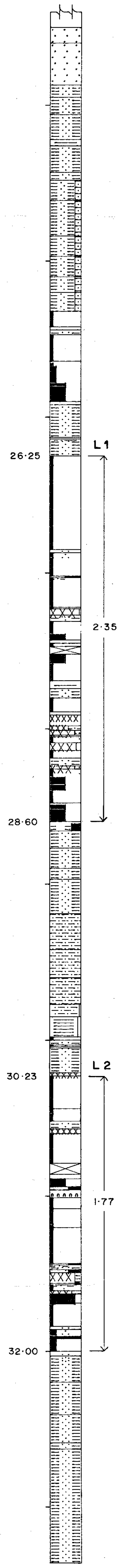
Author: Coal Division	Date: November '82	Encl. 63
Report No CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

650344





GY167

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L.5/61
TASMANIA

201

GY 167

DRILL HOLE LITHOLOGY
WITH EXPANDED SEAM SECTIONS

Author Coal Division	Date November '82
Report No CEPR 31/82	Drawing No: 2777

Encl.64

See Encl. 36 for Legend Reference and Scales

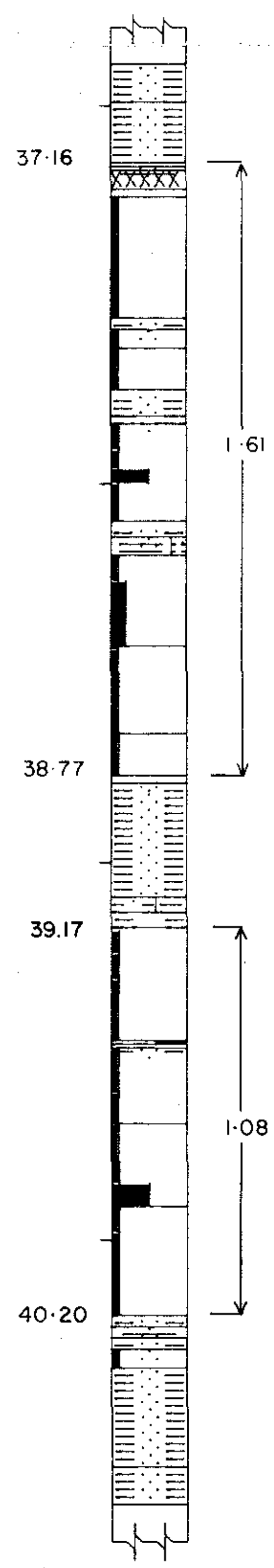
5 cm

650345

R.L.	DEPTH
468.74	0.00
460.0	10.0
450.0	20.0
440.0	30.0
430.0	40.0
423.34	45.40

R.L.
468.740

MI



GY168

THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61.
TASMANIA

202

GY 168
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

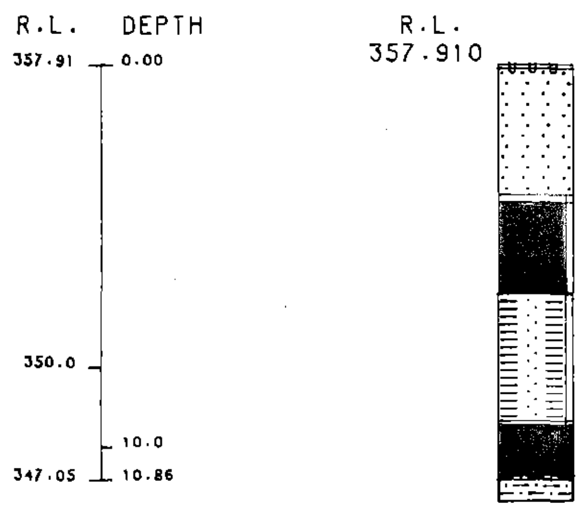
Author . Coal Division	Date : November '82	Encl. 6 5
Report No CEPR 31/82	Drawing No: 2777	

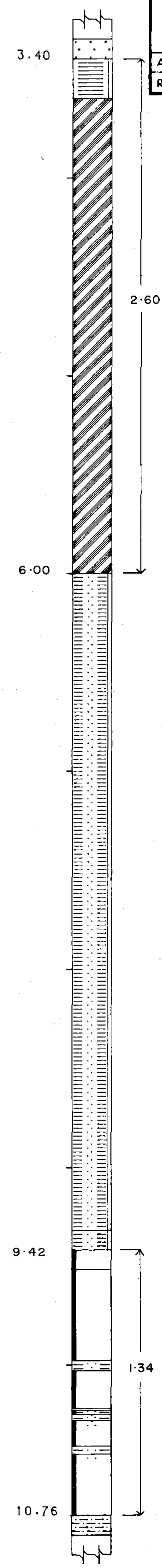
See Encl. 36 for Legend Reference and Scales

5 cm

650346

GY173





THE SHELL COMPANY OF AUSTRALIA LTD.

MT. NICHOLAS — E.L. 5/61
TASMANIA

GY173
DRILL HOLE LITHOLOGY WITH EXPANDED SEAM SECTIONS

Author: Coal Division	Date: November '82	Encl.66
Report No. CEPR 31/82	Drawing No: 2777	

See Encl. 36 for Legend Reference and Scales

5 cm

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