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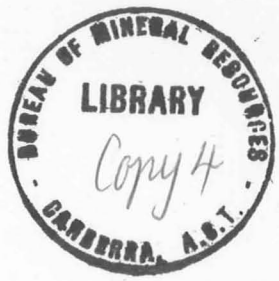
Record No. 1971/81



A Petrographic Examination of Samples from Five Holes in the Lower Part of the Triassic, Bowen Basin, Queensland.

by

S. L. Roddick

A PETROGRAPHIC EXAMINATION OF SAMPLES FROM FIVE HOLES IN THE LOWER PART OF THE TRIASSIC, BOWEN BASIN, QUEENSLAND.

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SUMMARY

Cores and cuttings from five shallow holes in the Triassic of the Mount Coolon 1:250,000 Sheet area indicate a sequence consisting of alteration of reddish brown mudstone and greenish grey quartz sandstone. Individual rock types extend for at least 61 m in an east-west direction and at least 122 m in a north-south direction. One thin mudstone lens wedges out northwards; there are no signs of erosional features elsewhere in the sequence. Cross-stratification is present in the sandstone and possible soil structures were observed in the mudstone. Dolerite sills intrude the major sandstone bodies.

The lithology suggests continental sedimentation, probably fresh water. An interfingering relationship between the Rewan Formation and the Lower Clematis Sandstone is suggested.

INTRODUCTION

This petrological study of core and cuttings from the lower part of the Clematis Sandstone is part of an environmental study of the Triassic sequence of the Bowen Basin, Queensland. The Clematis Sandstone is the middle unit of the Mimosa Group. It consists of cross-stratified quartz sandstone with minor bands of quartz pebble conglomerate, and, in the sequence here studied, reddish brown mudstone. Five shallow holes were drilled near the base of the unit to determine:

1. the nature of the sedimentary rocks in the lowermost part of the Clematis Sandstone in the northern part of the basin;
2. the sedimentary structures in the sandstone and mudstone;
3. the geometry of the sandstone and shale bodies;
4. the nature of igneous bodies in the sequence;
5. the palaeoenvironment.

The holes were drilled in the Mount Coolon 1:250,000 Sheet area, at latitude 21°12'S, longitude 148°11'E. This is about 120 km (75 miles) west of Mackay and 14 km (8.5 miles) west-southwest of Turrawalla homestead. The location in relation to the regional geology is shown in Figure 1, and the layout of the holes relative to one another in Figure 2. The symbols used in the section are explained in Table 1.

Most of the previous fieldwork on the Triassic of this area has been outlined by Jensen (1969). Malone et al. (1964) use the term Carborough Sandstone for the Clematis Formation and suggest a thickness of about 460 m (1500 ft) in this area. Jensen (1969) suggested a gradual, transitional change from Rewan Formation to Clematis Sandstone. He described the lower part of the Clematis Sandstone as being about 90 m (300 ft) thick, seldom exposed, and consisting of thin to medium-bedded, medium to coarse-grained sandstone, interbedded with brown and, in places, red mudstone. He described the unit as being dominated by quartz-rich sandstone, in contrast to the underlying more lithic Rewan Formation.

METHODS EMPLOYED

Five holes were drilled during the 1969 field season under the supervision of P.J. Alcock. A Fox Mobile rig was used to drill to a depth of 61 m (200 ft); cuttings were obtained every 1.5 m (5 ft) and cores at selected intervals. Electric and gamma ray logs were made. The drill samples are stored at the BMR Core and Cuttings Laboratory, Fyshwick.

All cuttings were examined under alcohol with a low power binocular microscope. The slabbed core was also examined under a similar microscope. Descriptions were plotted in detail on a log sheet (Plates 1-5) and correlation between holes established (Figs 3, 4). Examination and descriptions were made by W.A. Burgis and S.L. Roddick. The electric and gamma ray logs were found to be of quite irregular quality and of questionable use. They were thus used with some reservation.

LITHOLOGICAL DESCRIPTION

The overall impression of the sequence drilled is of interbedded reddish brown mudstone and green quartz sandstone, with minor igneous intrusions. Plant impressions, carbonaceous material, and coal fragments are common in the sandstone.

A thick lithologically consistent mudstone interval can be recognized in the central portion of each of the drilled sections and this has been used as the datum in the correlation diagrams (Figs 3, 4).

The sequence consists of seven sedimentation units numbered from the base as shown in Figure 4.

Unit 1 consists of reddish brown mudstone with silty sandstone in the upper part. There is a minor amount of grey mottling in the mudstone. Hole 6 and Hole 4 suggest that this unit is underlain by a fine-grained sandstone.

Unit 2 consists of greenish grey sandstone which is micaceous and moderately well sorted. The grains are subangular to subrounded. Grainsize is mainly medium and fairly even, though it varies from very fine to coarse. Subrounded lithic fragments are relatively common. The quartz content is distinctive, generally being greater than 40 percent of the sample, and in some samples up to 90 percent. The few concentrations of heavy minerals are mainly of magnetite. Plant material is prevalent; carbonaceous material commonly forms thin bands within the sequence. Sand-sized coaly fragments are disseminated through the sandstone in places. This unit is about 8 m thick. It is cross-bedded, especially in the lower part (see cored interval of hole 4). The cross-bedding is marked by faint dark laminae and by grainsize layering. The dark laminae are generally micaceous.

Purplish brown mudclasts 0.5 to 4 cm across are present in the sandstone. Some of these are elongated and were deposited parallel to the bedding.

The sandstone unit is intruded by a dark grey igneous body 1-2 m thick. Thin section examination reveals long plagioclase laths in a typical doleritic fabric. Calcite inclusions and veins, probably secondary, are present. This body appears to transgress the bedding as, in hole 4, it is located in the lower part of the sandstone unit but, in hole 5, it is near the top. The top of the igneous body has a chilled border. 'Flame' structures are present at the upper contact, for example in the core from the 41 m (135 ft) level of hole 6. The adjacent sandstone is not apparently metamorphosed, although some is brecciated and fragments of it occur in the intrusion. These observations suggest that the body is a sill and not a flow.

Unit 3 is mainly a massive reddish brown mudstone commonly slightly silty, micaceous, and in places slightly carbonaceous. Gradational boundaries with the underlying sandstones were observed only in holes 5 and 6. Core from hole 5 displays an interbedding of sandstone, siltstone, and mudstone. Thin silty and fine sandy intervals up to 3.5 m thick are present in each hole but they cannot be traced between holes. Much of this unit has a greenish mottling (e.g. hole 7, from 35-36 m (115-120 ft)). Micro-cross-stratification is present at some horizons, such as at the 55 m (180 ft) level of hole 8.

Tubules, probably formed by worms, are present at the top of Unit 3, and are particularly noticeable in the core from 33-35 m (110-115 ft) from hole 7 (see Fig. 5). The upper 10 cm of this core is grey mudstone with irregular grey and brown mottling containing brown nodules, 2 to 3 cm across. The nodules have complex internal structures, somewhat concentric, but with many irregularities. The grey mudstone grades downwards into the reddish brown mudstone which forms the bulk of the unit. The reddish brown mudstone has a concentration of greenish tubules extending perpendicular to the lengthwise bedding. Some of the tubes have a black material in the central portion which resembles organic matter. It is suggested that these tubules are worm burrows. The concentration increases again at the 34.5 m level, where the mudstone is peppered with nodules similar to those in the grey mudstone. Here they are elliptical and can be easily extracted from the mudstone. The tubules in this section of the core have veinlets of iron-rich material which is thought to have resulted from upward movement of water. It is likely that the sequence described represents an ancient soil profile, and that the elliptical structures are sesqui-oxidic nodules formed in it.

Unit 3 is 9 to 15 m thick; it maintains a constant 12 m in a north-south direction, but thickens westwards (Figs 3, 4). It appears to be slightly more silty to the north.

Unit 4 is a major sandstone unit that extends from 14 to 29 m in hole 4. It is lithologically similar to unit 2, being greenish grey quartz-rich micaceous sandstone, commonly with minor lithic fragments. It contains minor conglomeratic beds and thin reddish brown mudstone layers. Grainsize variation is generally irregular, but there is an indication of a slight fining in a westerly direction. Vertical changes in grainsize do not appear to be cyclic.

A thin intrusion cuts the unit in holes 6, 7, 8. It is similar to the igneous body in unit 2.

Unit 5 is a thin mudstone unit similar to unit 3. It displays the only sign of pinch-out observed. It thins in a northerly direction from 4.5 m to about 1.5 m. Hole 7 contains only two thin mudstone layers which are assumed to be related to unit 5. These are separated by sandstone similar to unit 4.

Unit 6 is the top unit of all of the holes except hole 7. This sandstone unit is similar to units 2 and 4, but has a reddish brown weathered appearance. The upper 2 m is rubbly and iron-stained. Cross-stratification was not observed in this section.

Unit 7, only present in hole 7, is reddish brown mudstone similar to units 5, 3, and 1. It is highly weathered, and structural features are obscured.

None of the major boundaries in these holes shows signs of an erosional surface, and many boundaries are gradational (e.g. the 30 m level of hole 8). Also there is no concentration of mudclasts within the sandstone above the mudstone sequences.

CONCLUSIONS

Five shallow holes have shown the lower part of the Clematis Sandstone of this area to consist of thick interbedded green sublabile sandstone and reddish brown mudstone, with minor thin reddish brown mudstone and conglomeratic units within the thick sandstone horizons.

The igneous bodies transgress bedding and have 'flame' structures on their upper borders, sandstone above being brecciated. They are probably transgressive sills and are mostly 1 to 2 m thick.

The sandstone and mudstone are relatively uniform. Their maximum lateral extent is unknown but most are continuous in the holes examined, and of relatively uniform thickness. One thin mudstone lens wedges out northwards, and some others slightly thicken westwards. Cross-stratification is present in the sandstone and possible soil structures in the mudstone. Mudclasts are present in the sandstone in the lower parts of the well sections but no evidence of major erosional surfaces was seen.

There are no signs of cyclic sedimentation.

The rocks examined suggest an interfingering of the Rewan Formation and part of the Clematis Sandstone in this area. The red mudstone is typical of Rewan Formation and the quartz-rich sandstone is typical of the Clematis Sandstone.

The lithology suggests continental deposition, probably fresh water. This conclusion is based on the presence of plant remains and coaly fragments, the lack of marine fossils, the fairly thin alternation of mud and sand, with minor pebbly layers, and the presence of soil-like structures in the mudstones.

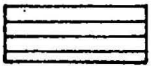
REFERENCES

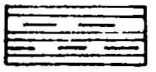
JENSEN, A.R., 1969 - Progress report on the study of the Clematis Sandstone and Rewan Formation. Bur. Miner. Resour. Aust. Rec. 1969/66 (unpubl.).

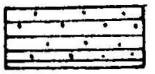
MALONE, E.J., CORBETT, D., and JENSEN, A.R., 1964 - Geology of the Mount Coolon 1:250,000 Sheet area. Bur. Miner. Resour. Aust. Rep. 64.

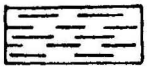
MALONE, E.J., 1964 - Depositional evolution of the Bowen Basin. J. geol. Soc. Aust., 11(2), 263-82.

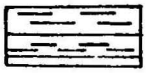
TABLE 1. EXPLANATION OF SYMBOLS & ABBREVIATIONS USED

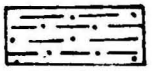

Mudstone


Silty Mudstone

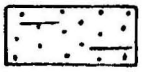

Sandy Mudstone


Siltstone


Muddy Siltstone


Sandy Siltstone


Sandstone


Silty Sandstone

ABBREVIATIONS

abd	abundant	md	muddy
ang	angular	Mdst	mudstone
Bd, Bdg	bed, bedding	Mic, mic	mica, micaceous
Biot, biot	biotite, biotitic	mnr	minor
brn	brown	Mtx	matrix
c	coarse	Plt	plant
c	with	poss	possible
carb	carbonaceous	prob	probable
cht	cherty	Qz, qz	quartz, (itic)
Cl, cl	clay, clayey	Rem	remains
diff	different	Sd, sd	sand, sandy
dk	dark	sh	shaly
f	fine, finely	sl	slightly
Frag	fragment	slt	silty
gn, (gn)	green, greenish	Sltst	siltstone
grdg	grading	Sst	sandstone
Grn	grain	subang	subangular
gy	grey	subrnd	subrounded
Incl	inclusion	tn	thin
intbdd	interbedded	v	very
intlamd	interlaminated	vc	very coarse
irreg	irregular	vf	very fine
Lam, lamd	laminae, laminated	vrtl	vertical
Len	lens	wh	white
li	lithic	wthrd	weathered
lt	light	Xbdg	cross-bedding
m	medium	Xbdd	cross-bedded

To accompany B.M.R. Record 1971/81

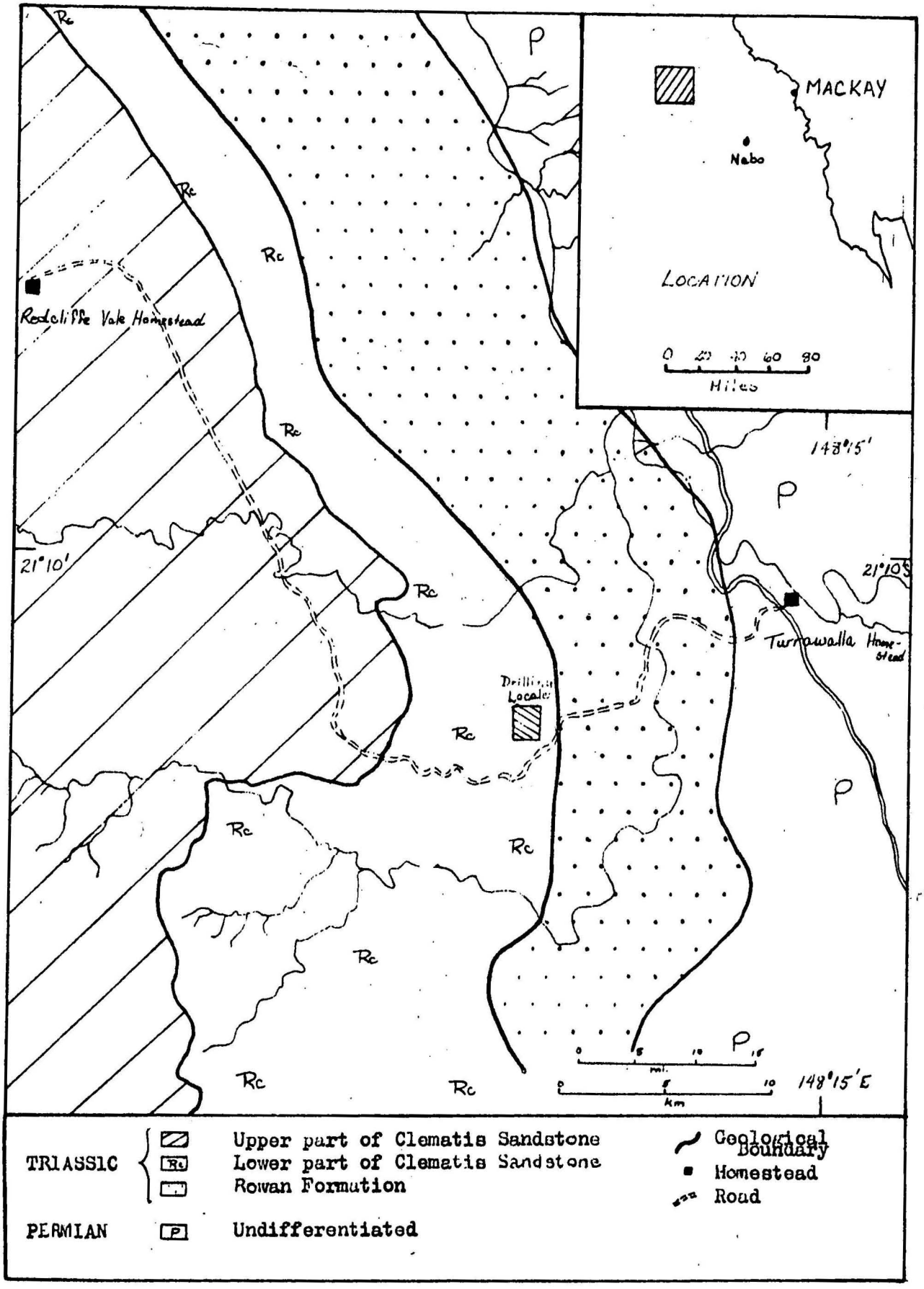


Fig. 1 : Geological setting and location of drill holes

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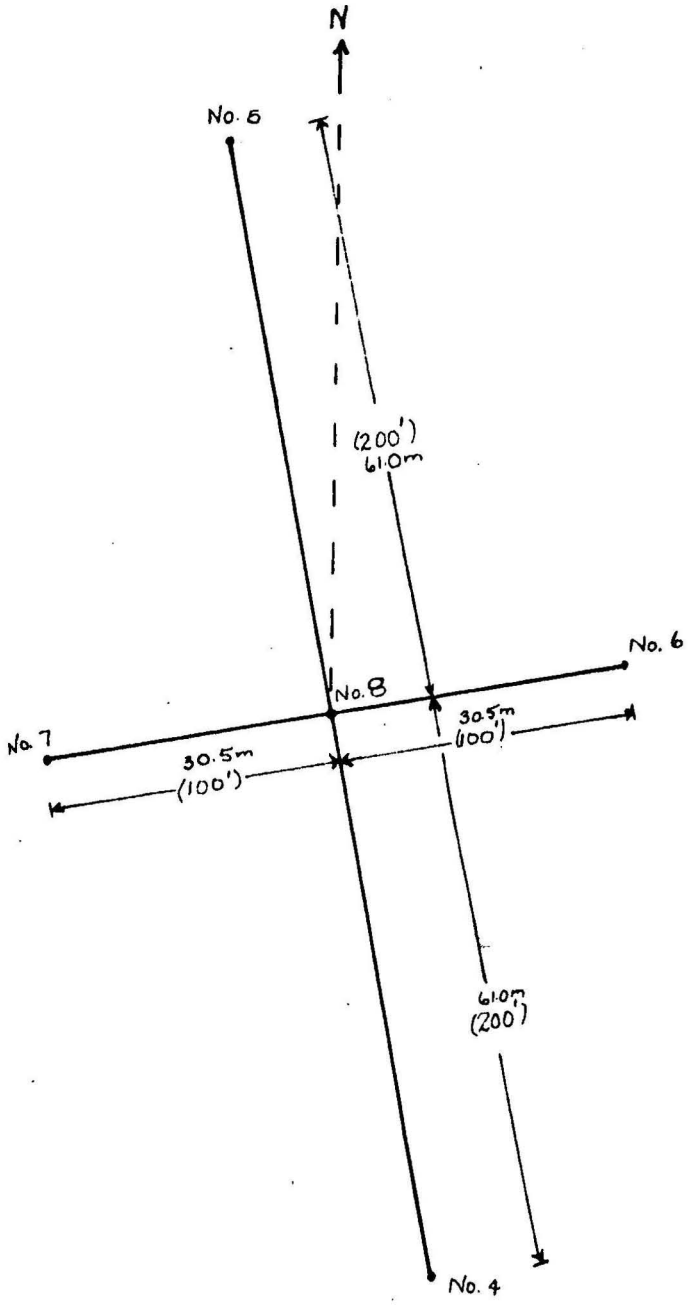
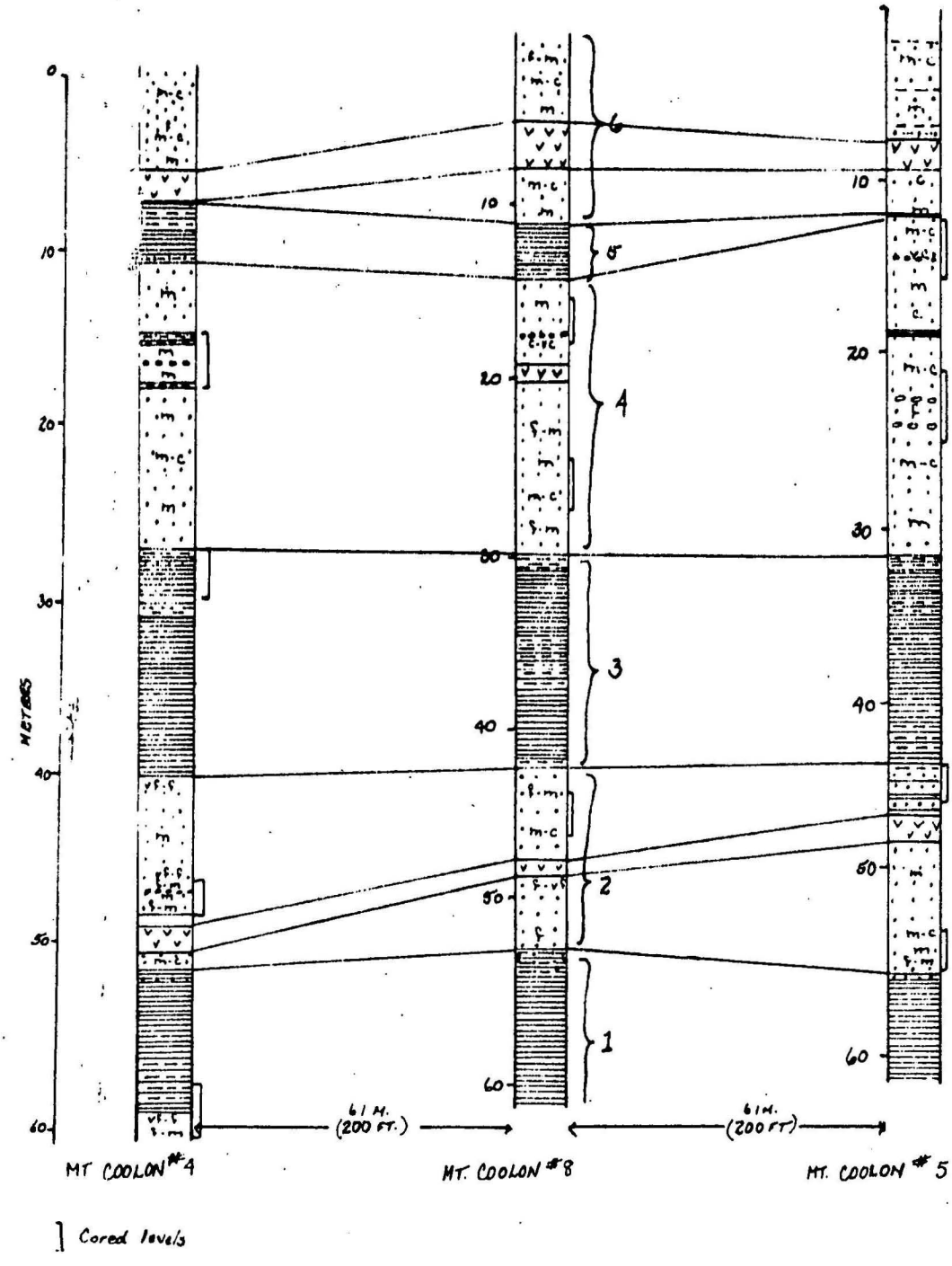


Fig. 2 : Layout for holes - Mount Coolon 4 - 8

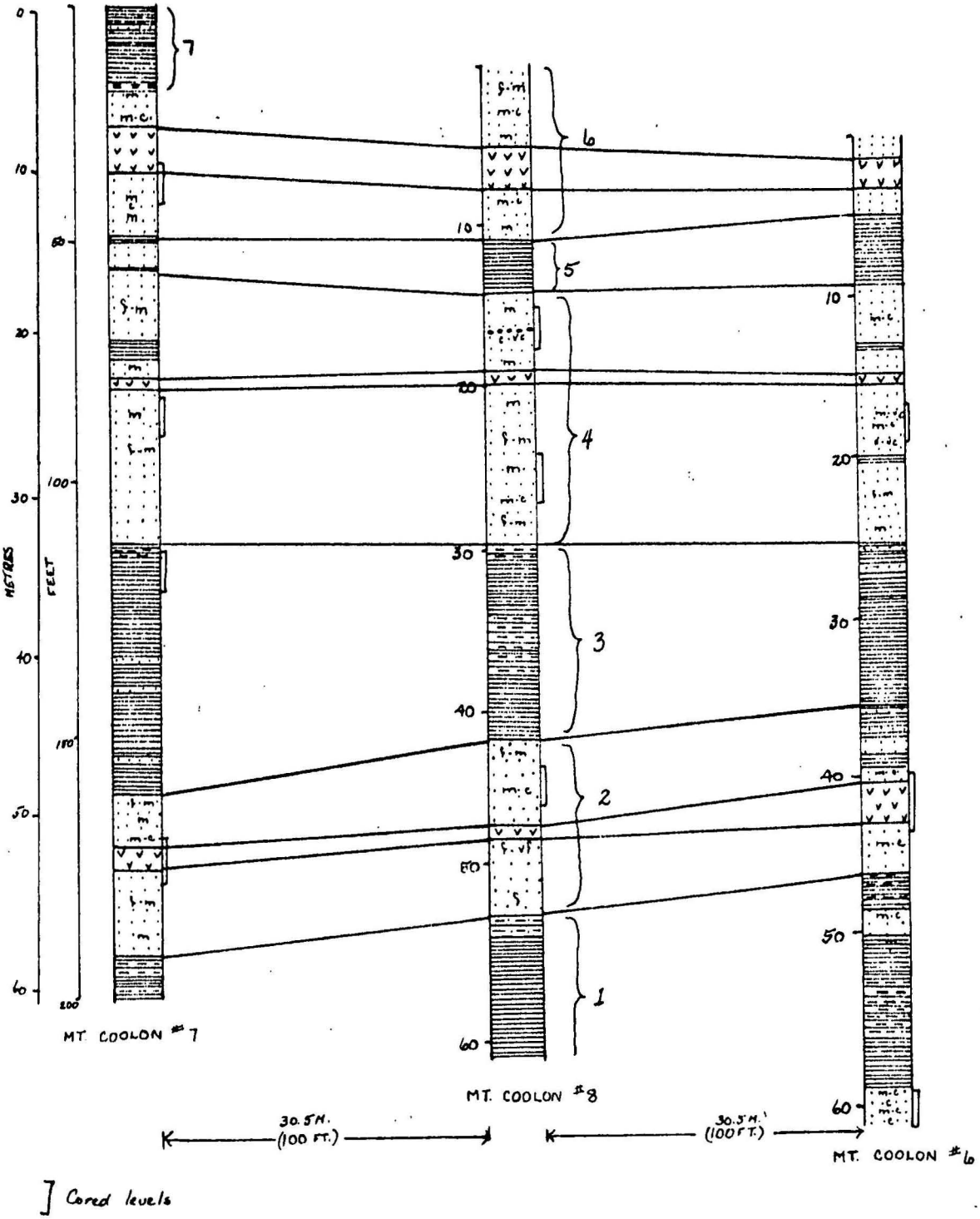
To accompany Record 1971/81

Fig. 3 : Correlation of holes drilled along the strike of the beds.



To accompany BMR Record 1981/81

Fig.4 : Correlation of holes drilled across the strike of the beds.



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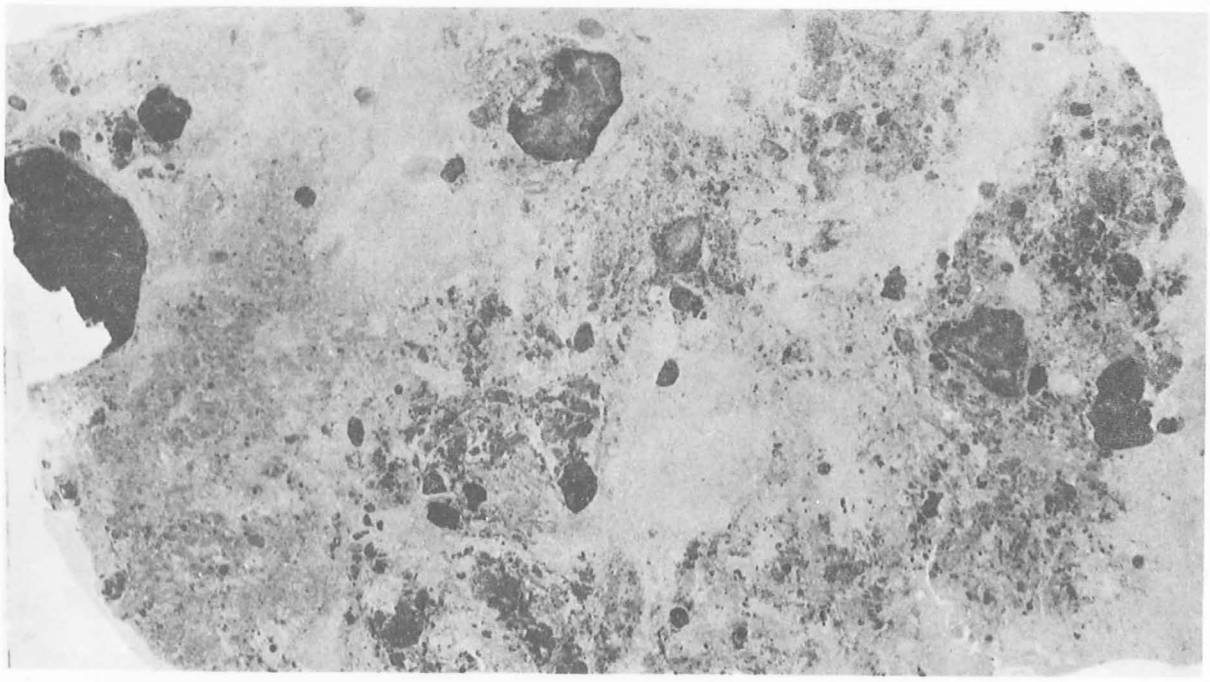

Fig. 5: Channels filled with grey clay in a lithified soil consisting of derived sesquioxidic nodules and clay pellets.

BMR MOUNT COOLON NO. 4

CUTTINGS LITHOLOGY	CUTTINGS DESCRIPTION	CORE LITHOLOGY	CORE DESCRIPTION	S.P. LOG	INTERPRETED LITHOLOGY	RESISTIVITY LOG	GAMMA LOG	DESCRIPTION
m-c	tan,mic,mod srtd,wthrd,festnd, li Frag,qtz Grnl				m-c			tan,wthrd,mic,mod srtd,festnd,li & qtz Grnl & Pbl
m	gy,wthrd buff,festnd,calc Vng				m			lg Rk;gy,wthrd,calc Vng
m	buff, mic, festnd,Slt				m			red-brn & buff, wthrd,mic,mtl lt gy
m	red-brn,mic,mtl lt gy in part				m			
m	gy to gn-gy,mic,hem,mod srtd, wthrd buff,few li Frag,qtz Grnl, coal Grn in lower part				m			gy to gn-gy,mic,hem,mod srtd,few li & qtz Grnl,coal in lower part
m		m	gn-gy,mic,hem,Pbl Cgl;Intbd of gn-gy,mic,mod artd Sst		m			
m		m	gn-gy,mic,mod artd,xbdd,scatd Grnl & Pbl,few tn Bd of f Sst		m			
m			Intbd Cgl & Sst,qtz Grnl,li Frag,mnr carb		m			gn-gy to gy,mic,mod srtd,hem,li Frag,qtz Grnl,Intbd of dk gy,mic, Mdst
m					m			
m-c	gn-gy,mic,hem,mod artd,li Frag, qtz Grnl,sl carb				m-c			
m					m			
m			red-brn,mic,mtl lt gy,few Bd of gy Sst,lamd,disturbed,burrowed		m			red-brn,mic,mtl lt gy,lamd, disturbed,burrowed
m					m			
m	red-brn,mic,mtl lt gy				m			
m					m			
wthrd					m			
m	gy,mic,abd plt Rem				m			
m	gn-gy,mic,hem,mod srtd,few coal Grn				m			gn-gy,mic,hem,mod srtd,xbdd,th of Bd
f-m	dk gn-gy,mic,mod srtd				vf-f			
			gn-gy,mic,hem,p to mod srtd,xbdd, few li Frag,Bd of Pbl Cgl,mnr coal mudclasts		f-m			
			gn-gy,mic,mod srtd Sst,few Grnl, xbdd,mnr mudclasts		m-c			
m	dk gy,c grnd				f-m			lg Rk;gy
m-c	buff-gy,mic,mod srtd,Sst				m-c			gn-gy as above Sst
m	red-brn,mic,mtl lt gy,Mdst							
vf-f								red-brn,mic,mtl gn-gy,lamd, disturbed,burrowed
			red-brn,mic,mtl gn-gy,lamd, disturbed,burrowed,tn Bd of gn-gy,vf Sst in lower part					
f-m			gy-red,mic,p to mod srtd,xbdd, mudclasts		vf-f			gy-red
					f-m			red-brn

Metres / Feet

To accompany B.M.R. record 1971/81

E 55/A 7/1

PLATE 2

BMR MOUNT COOLON NO. 5

CUTTINGS — CORE

LITHOLOGY	DESCRIPTION	LITHOLOGY	DESCRIPTION	SP LOG	INTERPRETED LITHOLOGY	RESISTIVITY	GAMMA LOG	DESCRIPTION
m-c	buff,carb							buff, wthrd,mic,mod srtd,festnd, few li Grnl & Pbl, coal Grn
m	buff,mic,mod srtd,wthrd,festnd, few li Grnl & Pbl,coal Grn in lower part							
v v v	gy,wthrd tan,festnd,calc Vng							lg Rk,gy wthrd,calc Vng
c m	gn-gy,mic,mod srtd,coal Grn	m-c c f-m m	gn-gy,mic,hem,mod srtd,few Bd of Grnl & Pbl,xbdd,some festnd gn-buff,mic,Grnl Cgl gn-gy,mic,mod srtd,xbdd,abd plt Rem,few Bd c grnd Sst,mudclasts mnr carb					
f	gn-gy,carb Mdst							
m c	gy,mic,hem,p to mod srtd							gy-gn,mic,hem,p to mod srtd, plt Rem,faint xbdg,li Frag
m-c f-c f-m m-c	gn-gy,mic,hem,mod srtd,mnr carb	m-c f m-c	dk gn-gy,mic,p to mod srtd,xbdd, few li Pbl dk gn-gy,Grnl Cgl dk gn-gy,mic,mod srtd,lamd,xbdd					
m								red-brn,mic,mtl lt gy,carb in part
	gy,carb Sltst							
	red-brn,mic,mtl lt gy							
f	gn-gy,mic,mod srtd Sst	f-m f-m	red-brn,mic,mtl gn-gy,lamd, burrowed,disturbed, gn-gy,mic,hem in part,mod srtd, xbdd,red-brn mudclasts,Bd of mic					gn-gy,as below
v v v v	gy							lg Rk,gy
m	gn-gy,mic,mod srtd,wthrd red-brn few Pbl in lower part	m-c m f-m	gn-gy,mic,mod srtd,xbdd,abd red-brn mudclasts or Mdst Pbl gy,mic,mod srtd,xbdd,Bd ofmic					gn-gy,mic,mod srtd,wthrd red-brn xbdd,few mudclasts,few Pbl in low part
	red-brn,mic,mtl gy in part							red-brn,mic,mtl gy in part

Metres: 0, 10, 20, 30, 40, 50, 60

Feet: 0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200

To accompany B.M.R. record 1971/81

E 55/A7/2

PLATE 3

BMR MOUNT COOLON NO. 6

CUTTINGS LITHOLOGY	CUTTINGS DESCRIPTION	CORE LITHOLOGY	CORE DESCRIPTION	S.P. LOG	INTERPRETED LITHOLOGY	RESISTIVITY LOG	GAMMA LOG	DESCRIPTION
	red-brn,wthrd,mic,festnd,mod-p srtd,few li Frag,							red-brn,wthrd,mic,festnd,mod – p srtd,few li Frag
	gy,Dolr							gy,Dolr
	red-brn,sl carb,wthrd,mic							red-brn,sl carb,wthrd,mic
	gn-gy,qtz,mic,subrndd,mod srtd							gn-gy,qtz,mic,subrndd,mod srtd
	dk gy							dk gy
		m-c, vc, g	gn-gy,qtz,mod srtd,mic,subang, li Frag,xbdd	Scale Change				
	gy Slst,carb							gy Slst,carb,mic
	red-brn,slty,mic,mtl gy,mnr qtz Grn							red-brn,slty,mic,mtl gy,mnr qtz Grn
	gn-gy Sst,qtz,mic,subang,li Frag, mod srtd					Scale Change		gn-gy,qtz,mic,subang,li Frag, mod srtd
	gy,Dolr		gn-gy,mic,qtz,li Frag,calc veins mod srtd					gy,Dolr
	red-brn Mdst,as above		dk gy,calc Incl					gn-gy,qtz,mic,subang,li Frag, mod srtd
			gn-gy,mic,qtz,mnr li Frag, carb					
	red-brn Mdst,carb,festnd							red-brn Mdst,carb,festnd
	red-brn,mtl gy,mic,mnr carb							red-brn,mtl gy,mic,mnr carb
	red-brn Slst,mic							red-brn Slst,mic
	red-brn,Mdst,slty,carb,mic		red-brn,festnd,qtz,mnr li Frag, land					
	gy,qtz,mod – p srtd,subang,Sst		red-brn,Slst,burrowed gn-gy,qtz,festnd,xbdd,red-brn mudclasts,mnr li Frag red-brn Mdst					gy,qtz,mod – p srtd,subang,mic

To accompany B.M.R. record 1971/81

E 55/A7/3

PLATE 4

BMR MOUNT COOLON NO. 7

CUTTINGS LITHOLOGY	CUTTINGS DESCRIPTION	CORE LITHOLOGY	CORE DESCRIPTION	S.P. LOG	INTERPRETED LITHOLOGY	RESISTIVITY	GAMMA LOG	DESCRIPTION
	red-brn,wthrd,Mdst,mnr carb, mnr Slt							gy Sst,qtz,festnd,li Frag, plt Frag
	gy,qtz Sst,festnd,li Frag, subrndd,plt Frag,mnr coal Frag							red-brn,wthrd,carb,mnr Slt
	red-brn-crm,Slst,lamd,carb							red-brn Slst,lamd,carb
	gy Sst,qtz,subrndd,mod srtd,mic, festnd							gy,qtz,subrndd,mod srtd,mic, festnd,mnr carb
	dk gy,Dolr		dk gy,Dolr					dk gy,Dolr
			gn-gy,mic,qtz,subrndd,mod srtd, xbdd					
			xbdd,mnr plt Frag,li Frag					gn-gy,qtz,mic,subrndd,mod srtd, mnr coal Frag
	gn-gy,qtz,mic,subrndd,mod srtd, mnr coal Frag						BASE ADJUSTMENT	
	dk gy,Dolr		gn-gy,mic,qtz,mnr li Frag,subrndd mod srtd,xbdd		BASE CHANGE	BASE CHANGE		red-brn,mic
	dk gy lg dk							dk gy,Dolr
	gn-gy,mic,qtz,mnr li Frag,mod srtd,subrndd							gn-gy,mic,qtz,li Frag,subrndd, mod srtd,xbdd
			gy,mnr carb,slty					gy,mnr carb,slty
	red-brn,mic,mtl crm-gy,slty at top		red-brn,mtl gn,burrowed,nodules, fe veinlets					red-brn,mtl gn,burrowed,nodules, fe veinlets
	gn-gy,Sst,qtz,mic,subrndd, red-brn Slst							gn-gy,qtz,mic,subrndd,mod srtd, li Frag
	gn-gy,qtz,mic,subrndd,mod srtd, li Frag		gy-gn,mic,qtz,li Frag,subrndd					gy Ig Rk
	gy Ig Rk		gy Ig Rk,calc veins					
			gy-gn,qtz,mic,li Frag,subang, mod - p srtd					as above
	red-brn,mic							red-brn,mic

Metres / Feet

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200

20 30 40 50 60

To accompany B.M.R. record 1971/81

E55/A7/4

PLATE 5

B.M.R. MOUNT COOLON No. 8

CUTTINGS

CORE

Lithology	Description	Lithology	Description	Interpreted Lithology	Gamma Log	Description
f-m, m-c, m	red-brn,wthrd,mic,festnd,qtz, mod-p srtd, few li Grnl & Pbl					red-brn,wthrd,mic,festnd,qtz, mod-p srtd,few li Frag,Grnl & Pbl
v v v v	gy,Dolr					gy,Dolr
m-c, m	brn-buff,mic,qtz,carb,festnd, mod-w srtd					brn-buff,mic,qtz,carb,festnd, mod-w srtd
	crm-brn-red,sl carb,mic					crm-brn-red,sl carb, mic
m	dk gy-red					dk gy-red
m	gn,mic,qtz,mod w srtd, subrndd.	m, c, vc, f	gn-gy,qtz,subrndd,mic,mod srtd, li Frag cgl,li Frag,mudclasts gn,qtz,mic,mnr mudclasts, li Frag			gn-gy,qtz,mic,mod-w srtd,subrndd, mudclasts,mnr cgl Bnds,li Frag
v v v v	dk gy					dk gy
m	crm Sh					
f-m, m	gn-gy,qtz,mic,subrndd,li Frag, Coal in upper part, mod w srtd to w srtd					gn-gy,qtz,mic,subrndd,li Frag, mnr coal Frag in upper part,mod-w srtd,xbdd,mnr mudclasts
		m, c, m-c	gn,qtz,mic,mod srtd,mnr mudclasts gn,subrndd,p srtd,li frag,qtz, mic, xbdd gn,qtz,mic,li frag,xbdd			
f-m	red-brn Sltst					red-brn,mtl gy in part,mnr qtz grn
m	red-brn,mtl gy in part, mnr Qtz grn					
m	red-brn Sltst					red-brn
					Current Change	
						as above
f-m	red-brn,mic Sltst					red-brn,mic.
		f-m, vf, f-m, m-c, m-c	red-brn,mic,qtz,subrndd,mod srtd, mnr Slt li frag,xbdd qtz,mic,li Frag,subang to subrndd gn-gy,mod srtd			red-brn,mic,qtz,subrndd,mod srtd, mnr slt
f-m, f, f-vf	gn-gy,qtz,mic,subang,li Frag, mod w srtd					gn-gy,qtz,mic,subang to subrndd, mod srtd,li Frag,xbdd,mnr slt
m	red-brn,slt,mic,mnr Qtz					red-brn,slt,mic,mnr Qtz

Metres / Feet

To accompany B.M.R. record 1971/81

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