COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS:

1965/260

PETROGRAPHIC NOTES ON THE REWAN FORMATION, SOUTNERN BOWEN BASIN, QUEENSLAND.

by

L.V. Bastian

PETROGRAPHIC NOTES ON THE REWAN FORMATION, SOUTHERN BOWEN BASIN, QUEENSLAND.

by

L.V. Bastian

Records 1965/260

CONTENTS

FIGURES

PETROGRAPHIC NOTES ON THE REWAN FORMATION, SOUTHERN BOWEN BASIN, QUEENSLAND.

by

L.V. Bastian

Records 1965/260

SUMMARY

Petrographic examinations have been made on 23 outcrop samples from the Rewan Formation, collected from outcrops in the southern Bowen Basin. The main rock types are subgreywacke and volcanic sandstone, the predominant detrital materials being clasts of volcanic rocks, and "chert" which may be the fine groundmass material of acid volcanics. Much of the quartz in these specimens also shows evidence of a volcanic source.

Combined with data from B.M.R. shallow holes drilled in 1963, the results show that trends towards increasing mineralogical maturity occur in the unit both upwards stratigraphically, and westwards; the most labile and the coarsest sediments being near the base on the east side of the Basin. Volcanic source areas east of the Basin are thought to have contributed most of the detritus for this unit.

INTRODUCTION

This report deals with petrographic examinations carried out on 23 outcrop samples from the Rewan Formation. This Lower Triassic unit crops out over a wide area of the Bowen Basin. The specimens examined were collected from the southern part of the Basin, in the Springsure, Taroom* and Mundubbera* 1:250,000 Sheet areas. The surface collecting was too sparse to afford adequate cover of the unit, but, in conjunction with data from other studies on material from the B.M.R. 1963 shallow drill holes (Arman, 1965), a reasonable understanding of the Rewan Formation in its southernmost outcrop areas was obtained.

Mapping of the unit in the area of study was carried out by Mollan, Exon and Kirkegaard (1964) and Jensen, Gregory and Forbes (1964). The B.M.R. shallow holes Nos. 22 and 23 were drilled in this unit in the south-western corner of MONTO, Nos. 18 and 21 in the south-eastern corner of BARALABA, and Nos. 24 and 25 near the north-western corner of MUNDUBBERA. Rock types in these holes are mainly volcanic sandstone and subgreywacke, with a quartz content ranging from 5% or less in sandstones near the base of the unit in B.M.R. Nos. 24 and 25 to 10 - 20% quartz in sandstones higher in the unit (Arman, 1965, p.10). Volcanic material in sandstones from the stratigraphically lower drill holes exceeds 60% (this includes some "chert" which is probably groundmass material from siliceous volcanics).

Most of the specimens were collected from outcrops in the south-eastern part of SPRINGSURE and the north-western part of TAROOM (see fig.1). They represent horizons either near to the base or near the top of the unit; the greater part of the unit is very poorly exposed. In the type section (measured section S29) (Mollan et al., 1964) the Rewan Formation is 1703 feet thick. Specimens T154A, B, and C, and T168 were collected from MUNDUBBERA (fig.1); included in these is a pebble collection (T154A), from about the base of the unit. The specimens have been integrated into composite sequences to aid comparisons between the western and eastern areas (fig.2).

Rock names have been assigned according to the classification of Pettijohn (1957), except in the case of "volcanic sandstone", a name used for rocks in which the detritus is dominantly of volcanic derivation, (Williams, Turner and Gilbert, 1955). The general petrographic data are presented in Table 1, while only special observations, comments and conclusions are treated in the body of the report.

WESTERN AREA

The most common rock types in this area are subgreywacke and volcanic sandstone; several specimens from near the top of the unit are protoquartzites. Near the base the sediments are fine to coarse-grained, and contain pebble bands, but throughout most of the unit they are fine-grained. They are generally well sorted, except near the base, where the

---

* Subsequent reference to 1:250,000 Sheet areas is signified by the use of capital letters for the geographic prefix e.g. SPRINGSURE.

Fig. 1. REWAN FORMATION – SPECIMEN LOCALITIES

SCALES

20 40 miles

INSETS 5 10 miles

Tertiary basalt Tb

Clematis Sandstone Re

Moolayember Fm Rm

Rewan Fm Rr

major road =========

minor road ---------

148°30′

150°00′

25°00′

Permian units

Rr

Re & Rm

Re

Jurassic & younger units

INSET 1

Jurassic units

THEODORE

INSET 2

Consuelo C.

SP159 A–F

Tb

"Rewan"

SP149

AF58

Carnarvon C.

Permian units

ED87

ED80 F, G

ED164

SP487

1

Rm

Re

Rm & younger units

T222, A–E

T225, A, B

TAROOM

BMR 21

BMR 18

BMR 22

BMR 23

T168

T154, A–C

2

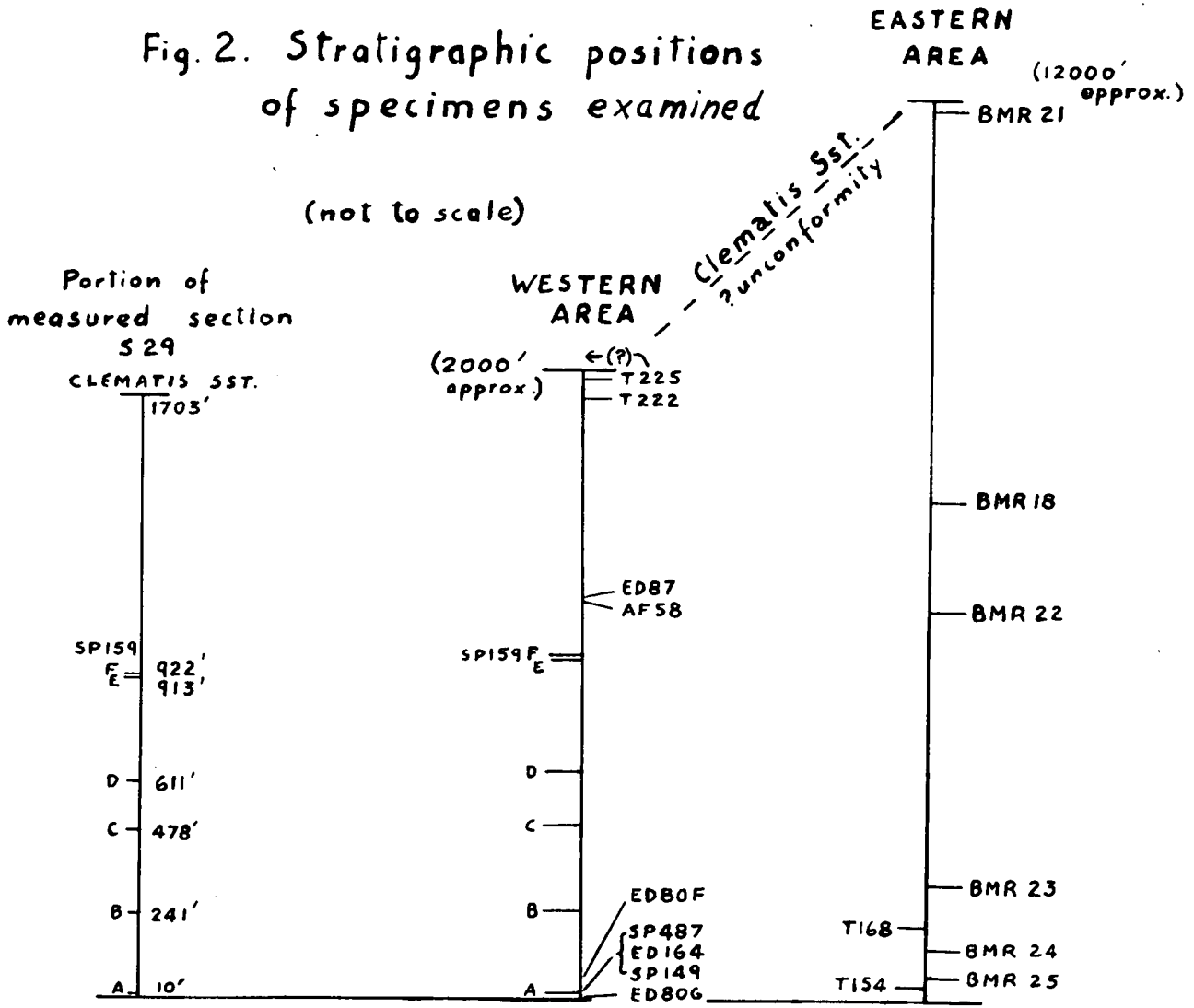
BMR 24

BMR 25

To accompany B.M.R. Record 1966/260

G55/17

Fig. 2. Stratigraphic positions of specimens examined



(EDBOF was collected 65' above the base;
EDBOG " " exactly at the base)

To accompany B.M.R. Record 1966/200 G55/18

coarse and pebbly lenses give rise to bimodal grain-size distributions.

Figure 2: Stratigraphic position of specimens examined.

The grains are mainly subangular, except for subrounded and rounded clasts of sedimentary rocks (and, to a lesser extent, other kinds of rock fragments). Grain sphericity is moderate and grain dimensional orientation parallel to the bedding plane is moderate to pronounced.

The quartz content ranges widely; from 5 to 30% near the base, 10 to 45% in the greater part of the unit, and attaining 60% near the top*.

* Specimens SP225A and B could possibly have come from the Clematis Sandstone. They were collected from 130 feet and 95 feet respectively below the base of a prominent cliff-forming sandstone in the Clematis Sandstone; comparison with measured section S29 suggests they may represent an interval 1700-1800 feet above the base of the section, i.e. within the Clematis Sandstone.

These are higher than the quartz contents of specimens from B.M.R. shallow holes on the east flank of the Basin. Embayed quartz, derived from volcanic rocks, is common; overgrowths are generally absent but in a few specimens of the more porous sands overgrowths are moderately developed. Metaquartzite is minor throughout and, in general, is less than 5%.

"Chert" (microcrystalline or cryptocrystalline silica) is distinguishable from fine siliceous volcanic rocks by the absence of flow orientation of crystals or traces of glass shards. Much of the "chert" was probably derived from fine vitric tuffs or the groundmass of acid volcanics; some may be from the surface silicification of pre-existing rocks. The chert content ranges from about 10 - 30%.

The most common mica is biotite, usually not exceeding 5%; muscovite and chlorite are much less common. Contrasting with this, the mica content of specimens from B.M.R. shallow holes on the east flank of the Basin is negligible. The biotite is occasionally swollen by leaching.

The main feldspar is orthoclase; microcline and plagioclase are minor.

Rock fragments (excluding "chert" and quartzite) range up to 50%; the low content in some samples is mainly a result of replacement by calcite of much of the original rock fragment content (e.g. in ED80F). Volcanic rock fragments generally predominate; they include volcanic flow rocks and tuff of mainly acid type. Fine micaceous shale and claystone, are fairly common. Some specimens contain clasts of micrographic textured rocks, thought to be derived from granodiorite, and fragments of epidote-bearing rocks. In SP159E and F sieve-textured mica-quartz grains, of probable metamorphic origin, are present. Only in SP222, SP225A and B from near the top of the unit are non-volcanic components predominant (SP225A and B may be from Clematis Sandstone, see footnote on previous page).

Matrix and cementing materials vary widely, and in general it is hard to distinguish between primary matrix and alteration products. Kaolinite, illite, chlorite, unidentified clay aggregates, calcite and barite have all been noted. Hydrated iron oxides from weathering of matrix and cements are ubiquitous. The calcite cement typically occurs fontainebleau-textured crystals, and replaces many other primary constituents. ED164 contains about 10% hydrated iron oxide pseudomorphing rhomboid crystals of an earlier cementing medium - probably siderite.

Accessory minerals are very uncommon near the base; but only appear in appreciable amounts in the specimens from near the top. Accessory tourmaline and zircon are usually present, apatite and epidote have been seen, and pyroxene is uncommon.

The only argillaceous specimen in this suite, SP159B, is a red claystone, characteristic of the Rewan Formation. It contains iron oxide as very fine red-brown spots and filaments disseminated through the clay. This mode of iron oxide occurrence which contrasts with the dense iron oxide patches typically seen in weathered rocks, has also been seen in the Clematis Sandstone (Bastian 1965a). It appears to be characteristic of primary iron oxides deposited with the clays.

EASTERN AREA

Descriptions of the specimens from this area should be considered with descriptions of samples from the B.M.R. shallow holes Nos. 18; 21, 22, 23, 24 and 25, which provide the main information on the Rewan Formation in this area.

Specimens T154A-C were collected from near the base of the unit, and include a tuff composed of volcanic rock fragments, subordinate plagioclase and quartz crystals. The grains of this tuff are angular and poorly sorted. In T154C the grains are slightly rounded and the tuff may have been slightly reworked. The pebble collection, T154A, is dominated by volcanic rocks, mostly of acid types. In thin sections of T154B and C, fragments of intermediate rocks are common and fragments of basic rocks fairly common. Thus the pebbles in T154A may not be fully representative of the volcanic types distributed through the unit. Specimen T168 from stratigraphically higher than the specimens from B.M.R. No.24, has less volcanic material and the grains are more rounded than in specimens from the base of the unit.

The quartz content of all these specimens is very low, as in specimens from the shallow holes. The quartz grains are typically strongly embayed. The plagioclase is labradorite (extinction angles on combined carlsbad-albite twins in T168 indicated the compositions An60, An64 and An65; extinction angles on plagioclase from T154B indicated An50). In addition to the typical acid types, intermediate and basic volcanic rocks also contributed to these sediments.

Extracts from a study of specimens from the B.M.R. shallow holes by Arman (1965) are included as Appendix A of this report to facilitate comparisons.

MINERALOGICAL TRENDS AND SOURCE AREAS

Combined with petrographic data from specimens from the shallow holes, the observations recorded here indicate some significant trends in the Rewan Formation. The most labile, and the coarsest sediments of the unit are near the base on the east flank of the Basin. Upwards, the sediments become finer and their constituents less labile. The basal sediment was probably deposited in localized areas and derived over short distances. Westwards, there is an increase in quartz content indicating an increase in maturity of the sediment in that direction. The rock fragment clasts in the western area are also more siliceous, sub-labile and contain abundant mica. A similar lateral trend towards increasing mineralogical maturity westwards, was seen in the subsurface specimens from the Cabawin Formation (Bastian 1965, p.33), with which the Rewan Formation is correlated. On the basis of this trend and their petrographic features the two units can be readily equated.

Sediment evidently travelled westwards from dominantly volcanic sources to the east of the Basin. Minor sediment contributions came from plutonic rocks, sediments and metamorphics, from the source areas not necessarily to the east. The trends in the volcanic detritus would mask trends in the other clastic components of the sediments. Some of the sediment may have been derived from penecontemporaneous erosion of Rewan Formation sediments.

The lack of biotite in the eastern part of the Rewan Formation distinguishes this unit from the biotite-rich Moolayember Formation (Bastian 1965a); although some biotite appears in the western part of the Rewan Formation, it can still be distinguished from the biotite-rich Moolayember Formation.

The mineralogical trends, both laterally and vertically, within the unit, obscure any evidence from which the cause of westwards thinning of the unit (from about 12000 feet to under 2000 feet) might be deduced. Evidence for erosion of the unit over the Wandoan structure before deposition of the Clematis Sandstone has been provided by other work (Bastian & Arman, 1965).

ENVIRONMENT OF DEPOSITION

This study supports previous opinions on the environment of deposition of the Rewan Formation. It is suggested that red argillaceous beds in the unit were deposited from still waters in a subsiding shallow, probably non-marine, basin, and that the sandstone beds were deposited from streams. Evans (1965, p.9) has described spores from the Rewan Formation but no marine fossils have been found in the unit.

The red beds originated either from an arid landscape or from thick lateritic soils in a hot humid region. The small amount of heavy minerals suggest that slight reworking of sediment occurred. Thus rapid fluvial deposition in a terrestrial, oxidizing environment is indicated.

REFERENCES

ARMAN, M., 1965 - Petrographic notes on Bowen Basin shallow holes drilled in 1963. Bur. Min. Resour. Aust. Rec. 1965/215 (unpubl.).

BASTIAN, L.V., 1965a - Petrographic notes on the Clematis Sandstone and Moolayember Formation, Bowen Basin, Queensland. Ibid. 1965/240 (unpubl.).

BASTIAN, L.V., 1965b - Petrological report on the basement to Lower Jurassic sections of some subsidized wells in the Surat Basin. Ibid. 1965/120 (unpubl.).

BASTIAN, L.V., and ARMAN, M., 1965 - Petrographic notes on some Triassic sediments in U.K.A. Wandoan No.1 well and in adjoining areas. Ibid. 1965/227 (unpubl.).

EVANS, P.R., 1965 - Recent advances in Mesozoic stratigraphic palynology in Australia. Ibid. 1965/192 (unpubl.).

JENSEN, A.R., GREOGRY, C.M., and FORBES, V.R., 1964 - The geology of the Taroom 1:250,000 Sheet area, and the western part of the Mundubbera 1:250,000 Sheet area, Queensland. Ibid. 1964/61 (unpubl.).

MOLLAN, R.G., EXON, N.F., and KIRKEGAARD, A.G., 1964 - The geology of the Springsure 1:250,000 Sheet area, Queensland. Ibid. 1964/27 (unpubl.).

PETTIJOHN, F.J., 1957 - SEDIMENTARY ROCKS. Harper, New York.

WILLIAMS, H., TURNER, F.J., and GILBERT, C.M., 1955 - PETROGRAPHY. Freeman, San Francisco.

PETROGRAPHIC TABLE 1.

SPEC. NO. NAME.	TEXTURE: Sorting	TEXTURE: Grain-size mm.	TEXTURE: Round-ness	TEXTURE: Sphericity / Orientation	PERCENTAGE ESTIMATES: quartz	quartzite	chert	micas	K-felds.	plag.	rock frags.	matrix	cement	alter.	ACCESSORIES: tourm.	zircon	garnet	apatite	epidote
ED80G Ferruginous, volcanic sandstone	fairly good	max .45 mode .2 plus pebbles	(ang)-subang - subrd (-rd)	low / fairly strong	5	<5	15	1 (biot.)		r (volc. tuff,	45 flow rock, tuffaceous sed.)			30 (Hyd.Feox)					
					(plus - pebbles of vitric tuff, chert)														
ED164 Volcanic sandstone	poor, bimodal	max 3 crs. mode 1.5 fine " .4	(subang.) -subrd (-rd)	mod - high / mod	>5	2	<25 (?volc.)		2		30 (mainly tuffs, also clst, sltst)	5 (kaol.)	10 (?sid-erite) Xls	>20 (calcite)					
SP159A Volcanic sandstone	good	max .35 mode .15	(ang)-subang (-subrd)	mod / fairly strong	15	2	15 (mostly biot, also chlorite, musc.)	>5	>5	2 (as ab., & volc. flow rocks)	45	>5							r
SP487 Calcareous subgrey-wacke	good	max 2 mode .9	subang -subrd -(rd)	fairly high	>35 (volc. qtz common, mod. o'growth)	<5	5		<15		<10 (as ab.)		30 calcite, Xls. up to 6 mm.						
SP149 Calcareous subgrey-wacke	fairly good, polymodal	max 1.5 modes - .6, .25 (minor), .15	ang - subang (subrd)	mod / fairly strong	<30	>5	10	2 (musc, biot., few chlorite)	5		10 (As ab., & some meta.)		<40 (calcite, much replacement)						
ED80F Calcareous subgrey-wacke	good	max. .2 mode .1	(ang)-subang (-subrd)	mod (-low) / poor	25	5	>5	2		2	<10 (as ab.)		50 (calcite, Xls. up to 1 mm.)		c	r			
					(plus - 1% kaol., vermicular grains from leaching of mica)														
SP159B Ferruginous, silty claystone	good	max .04 (silty clay)			15% silt, unidentified. 10% illite. 75% red-brown ferruginous clay, fine spotted texture.														
SP159C Calcareous volcanic sandstone	very good	max .3 mode .15	ang.-subang. -subrd	mod - high / mod.	10	2	20	<5 (biot., corrugated)	>5	2	>30 (as ab.)	5 (illite patches) patches)	<1 barite (few 20 calcite (in		r	r	u		
															plus pyroxene (r)				
SP159D Subgrey-wacke	mod.	max .65 mode .2 (and one grain 4 mm.)	ang. - subang -subrd	mod / mod	<20	1	>10	5 (musc., biot.)	>10	u	>45 (mainly tuff, rhyolite; few micrographic; others as ab.)	5			r		r		
SP159E Volcanic sandstone	good	max .3 mode .15	(ang) subang. -subrd	mod - high / mod	<15	2	15 (?devit. glass)	volc.	<5	1 (as ab., except no micrographic grains)	45	<20 (fine illite)	<1 (minor calcite)					u	
															plus - pyroxene(r)				
SP159F Subgrey-wacke	fairly good, bimodal	max. 1.5 modes - .8, .4	subang. -subrd (-rd)	mod - high / mod	40 (o'growth to thick)	3 mod.	<15	1	<10	u (shale fairly comm.)	30 (as ab., and micrographic)	3			r				

SPEC. NO. NAME.	TEXTURE: Sorting	TEXTURE: Grain-size mm.	TEXTURE: Roundness	TEXTURE: Sphericity / Orientation	PERCENTAGE ESTIMATES: quartz	quartzite	chert	micas	K-felds.	plag.	rock frags.	matrix	cement	alter.	ACCESSORIES: tourm.	zircon	garnet	apatite	epidote
AF58 Volcanic sandstone	fairly good	max .4 mode .2 (minor mode .4)	(ang)-subang. (-subrd)	mod rather poor	5	1	>25	3 (biot. >musc.)	>5		50	<10							
ED87 Calcareous proto-quartzite	good	max 3 mode <1.5	subang - subrd	mod - high mod	45 (volc. qtz common)	4	10 (incl. chalcedony)		2		<10 (tuff, few sst)		>30 (calcite, lt. brn, Feox on cleavages)						
T222B Subgrey-wacke	good	max .15 mode .08	ang - subang (subrd)	low - mod fairly strong	>15		25 (?devit. volc glass)	2	>5	<5 (sh. sltst., and volc.)	35 (plus 5% kaol, patches)			5 (hyd. Feox)	u	c		u	
T222C (?)Volcanic sandstone	good	max .2 mode .1	(ang)-subang (-subrd)	mod fairly strong	10	>5	40 (? as ab.)	u	<5	u	20 (sh, volc.)	5		15 (as ab.)	r				
T222D Subgrey-wacke	fairly good	max .35 mode .15	ang - subang (-subrd)	low - mod poor	35 (few o'-growths)	>5	30 (as ab.)		2		15 (as ab., and meta., few micrographic rocks)	10 (mixed clays)		2	r		—		
T222E Proto-quartzite	fairly good	max .2 mode .08 (minor mode .15)	(ang) - subang. - subrd	mod fairly strong	>60 (press. soln)	>5	<10	3 (musc >biot)	2		5 (sh. sltst)	>10 (as ab.)			c	u			
T225A Subgrey-wacke	fairly good	max .25 mode .1	ang - (subang.)	low strong	50 (press. soln)	5 plus 5% opaque grains, dk. brn	>5 (musc., biot.)	5			>15 (sh., meta)	>10 (lt. brnish Feox stain)			a			u	
T225B Proto-quartzite	good	max .2 mode .1	(ang) - subang (-subrd)	mod - low strong	60 (press. soln.)	>5	>5 (musc., biot.)	>5 and minor			>10 (as ab.)	<10 (illite streaks, kaol. patches)			c		c		
T154A Conglomerate polymict					Pebbles - soda-rhyolite (2), rhyolite, granophyre, siltstone (?tuffaceous), vitric-crystal tuff, chert, sandstone (?reworked tuff)														
T154B Lithic-crystal tuff	fair	max 2 mode .8	ang		5 (volc. embayments common)					10 (An 50)	70 (vitric tuff, volc. flow rocks, mainly intermediate)	10	5 (calcite)						
T154C Volcanic sandstone	poor	max 7 mode 1.5	ang - (subang.)		5					20	65 (volc. flow rocks)	<10 (silty, reXlised, and chloritic druses)			—				
T168 Calcareous volcanic sandstone	fair	max 1 mode .4	(ang) subrd		2 plus - 2% blk. grains, minor "green biotite", chlorite					10 (An 60)	50 (35% flow rocks, 15% tuff)		35 (calcite, curved Xls)						

APPENDIX A

PETROGRAPHY OF B.M.R. SHALLOW HOLES

by M. Aman.

B.M.R. Baralaba No.18 (Depth: 210 feet)

Clay and siltstone were encountered on the upper 50 feet of this hole and fine-to medium-grained sandstone elsewhere. This section is thought to be equivalent to the middle part of the Rewan Formation.

Of the six samples, from 40 to 50 feet, 50 to 60 feet, 90 to 100 feet, 130 to 140 feet, 170 to 180 feet and from 208 feet, the first four are subgreywackes and the last two lithic greywackes. They are generally fine-to medium-grained, moderately sorted, and have subangular to subrounded grains of moderate sphericity. These sediments contain 10 to 20% quartz, about 5% metaquartzite, 15 to 25% feldspar (mostly potash feldspar), 15% clay matrix, 15 to 20% chert and 15 to 30% shale fragments. Iron oxide cement comprises up to 25% of some of the rocks, while in the specimen from the 130 to 140 feet interval chlorites, and chloritized volcanics and shales occupy as much as 15%. Epidote and opaque detrital minerals are common accessories. . . .

B.M.R. Baralaba No.21 (Depth: 110 feet)

The section in this hole belongs probably to the top part of the Rewan Formation, and consists mostly of fine- to medium-grained sandstone. Water was struck at 35 feet, and no samples were available for the interval between 35 and 100 feet. The following description is based on the samples taken from 30 to 35 feet and 102 feet.

The upper sample is a calcareous subgreywacke, while the lower is an argillaceous sandstone. They are fine to medium-grained, rather poorly sorted and have angular to subangular grains of moderate to low sphericity. (In the lower sample elongated grains are predominant). The samples contain 25 to 30% quartz, 5 to 10% feldspar (mostly potash feldspar) 10 to 15% chert, 10 to 30% calcareous and ferruginous cement, 5 to 15% micaceous rock fragments and up to 20% clay matrix, mostly in the lower sample.

B.M.R. Baralaba No.22 (Depth: 230 feet)

The sediments encountered in this hole are fine- to medium-grained sandstone, with red-brown to dark grey shale interbeds mainly in the intervals 20 to 30 feet, 70 to 110 feet, 120 to 150 feet, 160 to 170 feet, 190 to 210 feet and 220 to 230 feet. This section is equated with the middle part of the Rewan Formation.

The samples from 20 to 30 feet and 70 to 80 feet are sandy to silty claystones, while those from 40 to 50 feet and 170 to 180 feet are subgreywackes. The subgreywackes are fine to medium-grained, moderately sorted, and have subangular to subrounded grains with low to moderate sphericity. They consist of about 5% quartz, 15% feldspar (mostly potash feldspar), 15% chert and devitrified glass, 25 to 30% red shale and claystone, 10% clay matrix, up to 15% acid to intermediate volcanics. Abundant epidote and detrital opaque minerals are present as accessories. The claystone samples, on the other hand, have 10 to 20% quartz and up to 75% mixed clay aggregates which are partly ferruginized.

B.M.R. Baralaba No.23 (Depth: 130 feet)

This hole, drilled in the lower part of the Rewan Formation, encountered mainly chocolate brown shale and mudstone, with some intercalations of fine- to medium-grained sandstone in the intervals 80 to 90 feet and 110 to 130 feet.

The samples from 80 to 90 feet and 110 to 120 feet are fine- to medium-grained subgreywackes, while that from 128 feet is a medium-grained calcareous volcanic sandstone. These sediments are generally moderately sorted and the grains range from angular to subrounded and have moderate sphericity; rounding is more pronounced in the deepest sample. The subgreywackes contain about 10% quartz, 5% metaquartzite, 15% feldspar (mostly potash feldspar), and 15 to 25% chert and devitrified glass. Also present are 20 to 30% shale, 10 to 15% of matrix clay aggregate, and, in the sample from 80 to 90 feet 10% acid and intermediate volcanics.

The calcareous volcanic sandstone, on the other hand, consists of 10% quartz, 5% metaquartzite, 10% feldspar (mostly potash feldspar), 10% "chert" and devitrified glass, 20% acid and intermediate volcanics, 15% shale and siltstone and 25% calcite cement and replacement. As in the previous hole, epidote and opaque detrital minerals are common accessories.

B.M.R. Taroom No.24 (Depth: 85 feet)

The section encountered in this hole consists mostly of chocolate-brown to greenish black mudstone, with some medium-grained sandstone intercalations mainly in the intervals 5 to 30 feet and 70 to 80 feet. It is equivalent to the basal part of the Rewan Formation.

The samples from 20 to 30 feet and 70 to 80 feet are fine- to medium-grained, fairly well sorted, volcanic sandstone, having subangular to rounded grains with moderate sphericity. They contain about 5% quartz and 10% feldspar, the latter consisting of about equal amounts of potash feldspar and plagioclase (oligoclase to labradorite). The sample from the upper interval includes 20% andesite, 15% rhyolite, 10% chert and 28% calcite cement. The other sample contains 25% andesite and andesitic tuff and 30% "chert" and devitrified volcanic glass.

B.M.R. Taroom No.25 (Depth: 85 feet)

The lithology consists of volcanic pebble conglomerate and sandstone with some brown to dark mudstone mainly in 30 to 50 feet interval. The section is probably equivalent to the basal part of the Rewan Formation.

The samples from the intervals 20 to 30 feet, 40 to 50 feet, 50 to 60 feet and from 82 feet are all volcanic sandstones. The sample from 40 to 50 feet is fine-grained and moderately sorted, and the remainder are coarse-grained, rather poorly sorted, having subangular to rounded grains with moderate to high sphericity. They contain little or no quartz, up to 10% potash feldspar, about 5% kaolinite and abundant glass and rock fragments. The latter include 15 to 20% andesite, up to 25% rhyolite, 10 to 20% "chert" (probably groundmass material from siliceous volcanics such as rhyolite) and 5 to 10% shale. Most samples contain 5 to 15% calcite replacements; the sample from 20 to 30 feet has up to 40% calcite. There is also 5 to 10% iron oxide cement in some specimens.

APPENDIX B

LIST OF SPECIMEN FIELD NUMBERS AND REGISTERED ROCK NUMBERS

Field No.	Registered No.
ED80F	R17951
ED80G	R17952
ED164	R17955
SP149	R17138
SP487	R17139
SP159A	R17132
SP159B	R17133
SP159C	R17134
SP159D	R17135
SP159E	R17136
SP159F	R17137
AF58	R16126
ED87	R17954
T222B	R16342
T222C	R16343
T222D	R16344
T222E	R16345
T225A	R16347
T225B	R16348
T154A	R16336
T154B	R16337
T154C	R16338
T168	R16335