DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

A STRATIGRAPHIC SECTION ACROSS THE UMBERATANA GROUP-WILPENA GROUP BOUNDARY Near Horrocks Pass in the Wilmington Area

by

MARK BENBOW
REGIONAL GEOLOGY DIVISION

Rept.Bk.No.76/29
G.S. No. 5706
DM. No. 152/76

4th March, 1976

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SUMMARY

A section was measured across the Umberatana Group - Wilpena Group boundary near Wilmington in the Southern Flinders Ranges, on the western margin of the Adelaide Geosyncline.

Grey red massive siltstones are correlated with the Reynella Siltstone Member and the Elatina Formation. No evidence for glaciation was observed.

The overlying Nuccaleena Formation is composed of several metres of pink, thinly bedded dolomite. In the Buckaringa-Warren Gorge area where a similar sequence has been described, the contact between the Elatina and Nuccaleena Formation is sharp (Jablonski, 1975).

Twenty six metres of interbedded sandstones and siltstones in the lowermost Brachina Formation, dissimilar to those underlying the Nuccaleena Formation, are equated with the Seacliff Sandstone Member. A bed 30 m above the Nuccaleena Formation, contains a (35 x 10) cm very angular block of 'bluish-grey' laminated siltstone embedded in sandstone. It may be a piece of Tapley Hill Formation.

The base of the Seacliff Sandstone Member in the type section can be taken as the base of the Wilpena Group, whilst the Nuccaleena Formation is taken as the base in the Flinders Ranges. The relationships of the Nuccaleena Formation and Seacliff Sandstone Member is one of complex intertonguing.

INTRODUCTION

A section was measured near Wilmington, a position between the Stuart Shelf, Northern Flinders Ranges and Adelaide, to aid in correlations between these areas, of Umberatana Group - Wilpena Group boundary units. The section includes the Willochra Sub-Group of the Umberatana Group and the overlying Nuccaleena and Brachina Formations of the Wilpena Group. The Willochra Sub-Group is composed of the Angepena, Wilmington and Elatina Formations, present

in the original type section, 78 kilometres north of Wilmington, near Buckaringa Hill. The Sub-Group occurs in the western part of the Adelaide Geosyncline and is made up of shallower water facies than either the Farina or Yerelina Sub-Groups in the east (Thomson, 1969).

In the Northern Flinders Ranges the boundary between the Umberatana and Wilpena Groups is marked by the lower limit of the Nuccaleena Formation, which consists of 30 feet of pink flaggy dolomite, overlain by 200 feet of purple shale interbedded with other thin dolomites (Thomson, 1969).

The Nuccaleena Formation sensu stricto does not occur in the Adelaide area, but instead, in the Hallet Cove - Pt. Stanvac Section, there are "20 feet of thin dolomite and interbedded red siltstone", and "lithologically identical red siltstone and dolomite interbedded in Unit 3 (3) (named the Seacliff Sandstone Member) at four lower stratigraphic levels" (Thomson, 1966). Thus the base of the Wilpena Group is there taken at the base of Unit (3), Thomson (op. cit.), Dalgarno and Johnson (in Thomson et al., 1964). In the Burra, Orroroo and Adelaide areas, the Nuccaleena Formation is discontinuous and considered to be intertonguing with and overlain by the red and grey feldspathic Seacliff Sandstone Member (Thomson, 1969).

On the Stuart Shelf, the Whyalla Sandstone Member has been correlated with the Seacliff Sandstone Member (Thomson and Johnson, 1968). "Near South Oakden Hill the Whyalla Sandstone contains lenses of dolomite of the Nuccaleena type (Thomson, 1969).

In the Olary Region "The basal formation of the Wilpena Group is a thin dolomite member of the Nuccaleena Formation or the lateral equivalent of this, red-brownish weathering feldspathic quartzites up to 400 feet thick often with interbedded dolomite". These have been considered equivalent with the Seacliff Sandstone Member (Forbes, 1970).

A section at Wilmington could help clarify this inter-relationship of the Nuccaleena Formation and Seacliff Sandstone Member, by establishing whether dolomite bands are interbedded in sandstone (i.e. a sandstone correlatable with the Seacliff Sandstone Member), or siltstone, or whether there

are distinct formations of dolomite and sandstone. The section may also help clarify the position of the Whyalla Sandstone Member, whether it be considered stratigraphically overlying the Nuccaleena Formation, or intertonguing with it.

Another problem considered is the stratigraphic position of the Reynella Siltstone Member. Its correlate on ORROROO has been considered similar to mudstone in the Elatina Formation in Brachina Creek in which glacial erratics are found. There the Elatina Formation was defined by Dalgarno and Johnson (in Thomson et al., 1964) as comprising Mawsons (1939) Units 44 and 45, a pink pebbly sandstone with glacigene lenses. On ORROROO, Binks (op. cit.) has correlated "cross-bedded, red brown feldspathic sandstone with interbeds of red brown massive siltstone" with the Elatina Formation. "Granule grains up to (2-4) mm are common". Dalgarno and Johnson (in Thomson et al., 1964) Unit (4) of the Hallet Cove - Pt. Stanvac Section (the Reynella Siltstone Member) with the Elatina Formation.

METHOD

A section was run across Beautiful Valley Creek 3 kilometres W.S.W. of Wilmington.

Station locations were plotted on photographs 6508/R4/SVT20 enlarged to a scale of 1:10 000 and distances were measured by tape.

For a more objective description of lithologies, the following classifications were used.

1. Rock colour chart based on the Munsell System (colour in brackets is author's own field terminology necessitated where a suitable division did not occur).
2. Wentworth grain size system.
3. McKee and Weir's bed size system.

DISCUSSION OF THE SECTION

(in stratigraphically ascending order)*

Unit 1 (greater than 46 metre) is a light brown very fine-grained sandstone, with grit bands and heavy mineral cross bedding.

Binks (1966) suggested massive red siltstone in "the uppermost Willochra Formation" (i.e. Units 2 and 4) may be correlated with the Reynella Siltstone Member near Adelaide. Units 2 (56.3 metre) and 4 (4.5 metre), very distinctive units, support such a correlation on lithological grounds. One narrow calcareous gritty horizon was observed near the base of Unit 2, Interbedded are coarse-grained grey-red siltstones, more siliceous and resistant, having poor to good bedding, with cross bedding evident where a lamination is apparent (Unit 3).

Units 1, 2, 3 and 4 may collectively be correlated with the Elatina Formation however, Unit 1, conspicuously different in colour, may possibly be upper Wilmington Formation. Jablonski (1975) describes a similar, generally coarser grained sequence in the Buckaringa Gorge area, and describes sediments similar to Unit 1 as forming the base of the Elatina Formation.

The Reynella Siltstone Member in the Adelaide region is laminated in part, although not conspicuously so.

The overlying dolomite of Unit 5 (3.4 metre) from the regional mapping of Binks (ORRORO0 1:250 000 series) is correlated with the Nuccaleena Formation, marking the base of the Wilpena Group. No interbedded siltstones were observed nor a number of dolomite bands interbedded in siltstone, as is the case in the type section on COPLEY and in the Buckaringa-Warren Gorge areas (Jablonski, op. cited).

Nine and a half metres (Unit 6) of grey red laminated siltstones directly overly Unit 5 and are similar to the siltstones of Unit 10 (greater than 120 metre). The interbedded units 7, 8 and 9 (9.6, 8.7, 7.6 metres thick

---

*The writer is not familiar with the formations of the Umberatana and Wilpena Groups, making correlations difficult.

respectively) is a sandstone-siltstone sequence. Binks (op. cit.) mentions "them very similar to sandstones in the underlying unnamed upper member of the Willochra Formation". In this section however, they are dissimilar, differing conspicuously in variability and colour. These sandstones have been equated with the Seacliff Sandstone Member of the Brachina Formation near Adelaide. (Thomson and Johnson, 1968), however, they contain no dolomite interbeds. Correlation can be made because of conspicuous grey-red argillaceous sandstones, containing shale fragments and mica flakes, that occur in both. One bed of Unit 9 contains a 35 x 10 cm very angular block of "bluish-grey" laminated siltstone, embedded in sandstone. It may be a piece of Tapley Hill Formation. No evidence for the block being dropped was detected.

Within Unit 10 are several thin calcareous laminae (see photos, 1, 2, 3) which are very similar to silty carbonate within the Seacliff Sandstone Member at Hallet Cove.

ACKNOWLEDGEMENTS

Thanks are given to members of the Regional Geology Division, in particular Ron Coats and Bren Thomson, for fruitful discussion. Acknowledgement is given to personnel of the Drafting Division and typing pool for their suggestions and perseverance.

MB:FdeA
4/3/76

MARK BENBOW

REFERENCES

Binks, P.J., 1966. Geology of the Horrocks Pass Area. Quart. Geol. Notes, Geol. Surv. S. Aust. No. 20, pp.9-11.

_____1971. The Geology of the Orroroo 1:250 000 map area. Geol. Surv. S. Aust. Rept. Invest. No. 36, pp.36-44.

Forbes, B.G., 1970. Progress of Mapping in The Olary Region. Geol. Surv. S. Aust. Rept. Bk. No. 70/37 unpublished.

Jablonski, H., 1975. "Late Precambrian Geology of the Warren-Buckaringa Gorge Area, Flinders Ranges, South Australia". Unpublished Honours Thesis, Adelaide University.

Mawson, D., 1939. The Late Proterozoic Sediments of South Australia. Trans. Anzaas, 24.

Thomson, B.P., 1966. Stratigraphic Relationships between Sediments of Marinoan Age - Adelaide Region. Quart. Geol. Notes, Geol. Surv. S. Aust. 20, pp. 7-9.

_____1969. Precambrian Basement Cover - The Adelaide System. In: L.W. Parkin (Editor), Handbook of South Australian Geology. Geological Survey of South Australia, Adelaide, pp. 69-71.

Thomson, B.P. et al., 1964. Precambrian Rock Groups in the Adelaide Geosyncline. A New Subdivision. Quart. Geol. Notes, Geol. Surv. S. Aust. 9, pp. 12-15.

Thomson, B.P. and Johnson, J.E., 1968. Marinoan Stratigraphy, Pt. Augusta Region. Quart. Geol. Notes, Geol. Surv. S. Aust. No. 25, pp. 4-7.

APPENDICES

Amdel
The Australian Mineral Development Laboratories

Flemington Street, Frewville, South Australia 5063
Phone Adelaide 79 1662, telex AA82520

Please address all correspondence to Frewville,
In reply quote: MP1/13/4/0

The Director,
Department of Mines,
Box 38, Rundle Street P.O.,
ADELAIDE, SA 5000

11th November, 1975

Attention: M. Benbow

REPORT MP 1071/76

YOUR REFERENCE:	Application of 3-9-75
MATERIAL:	4 Rocks
LOCALITY:	As given in application
IDENTIFICATION:	P328-P331/75
DATE RECEIVED:	6-10-75
WORK REQUIRED:	Examination of detrital grains, etc..

Investigation and Report by: Dr B.G. Steveson

Officer in Charge, Mineralogy/Petrology Section: Dr K.J. Henley

K.J. Henley

for F.R. Hartley
Director

mhb

DETRITAL GRAINS IN VARIOUS SEDIMENTARY ROCKS

Sample: P328/75; TSC34779

Location:
Applicant's Mark 23C; Reynella Siltstone.

Rock Name:
Calcareous siltstone.

Thin Section:
An optical estimate of the detrital fragments in this rock gives the following:-

	%
Sand Grade and Coarser	
Quartz	4
Carbonate	3
Lithic	7
Feldspar	trace
Silt Grade	
Quartz	70
Carbonate	10
Feldspar	5
Mica	<5

This rock contains a considerable range of detrital fragment types and, basically, these can be divided into an abundant population of silt-grade fragments and less common grains which are much coarser.

Various types of lithic fragments are most abundant in the coarse-grained material; these generally consist of fine-grained sedimentary rocks, either siltstones or mudstones. Most of these fine-grained sediment fragments are dark between crossed nicols and clearly consist predominantly of clay minerals but some have well defined quartz fragments and these range up to coarse silt-grade. The siltstone and mudstone fragments tend to have rather elongate shapes, presumably as a result of the original foliation of the rock, but most show considerable evidence also of rounding. One large fragment intersected in the thin section consists of a very fine-grained sandstone with an abundant argillaceous matrix and this fragment appears to have been invaded (before deposition) by coarse-grained calcite. One large lithic fragment contains a phenocryst of potassium feldspar and appears to be a fragment of a porphyritic acid volcanic rock.

Carbonate fragments in the rock commonly show rather unusual textures; particularly distinctive are coarse-grained aggregates of calcite which have been marginally replaced by chlorite and in some places by quartz. The carbonate has a grain size of 0.1-0.3 mm and forms a random granular array. Chlorite has penetrated from the periphery of the patches of calcite and has replaced the latter. One equant coarse-grained calcite fragment has a peripheral zone of quartz and chlorite and this too has partly corroded

the calcite. Other large carbonate grains have a fine-grained granular texture and consist of almost submicroscopic equant crystals of dolomite. These crystals have not been altered. The origin of these carbonate fragments cannot be determined unambiguously from examination of this thin section but it appears that the siltstone contained detrital fragments of limestone and that the calcite has been recrystallized and coarsened whereas dolomitic fragments have probably retained their original mineralogy and texture. One fragment in the thin section consists of a calcareous sandstone and hence it appears that the provenance of the Reynella Siltstone included some dolomitic and calcareous sedimentary rocks.

The sample contains sand-grade quartz and feldspar fragments which are commonly at least 0.2 mm in diameter. The most characteristic feature of these grains is their roundness and this indicates that the grains were probably derived from a pre-existing coarse-grained sedimentary rock. This hypothesis is enhanced by the presence on one of the quartz grains of secondary overgrowths of silica; these are outlined by a trail of iron oxides between the original detrital grains and the overgrowths and also by the abundances of iron oxide in the secondary quartz itself. Sand-grade feldspar grains are not abundant but one grain of plagioclase was identified.

The silt-grade detrital fragments are typical of somewhat calcareous siltstones. Quartz is the predominant phase and forms equant rather angular crystals which are generally less than 0.04 mm in size. Both plagioclase and potassium feldspar are also present and these minerals have similar grain size distributions and shape as the quartz grains. Calcite is fairly abundant and the equant shape of the small patches of calcite indicates that these are probably of detrital origin although it is possible that they have been somewhat recrystallized after deposition. Some of the carbonate grains are dolomitic and, again, the equant and in some cases rounded shape of these grains indicates their detrital origin. A few patches of dolomite have a distinctly rhombic outline and hence the rock contains some authigenic dolomite; also present in the thin section are a few veinlets of carbonate and these too consist of mobilized carbonate. It is likely that much of this secondary (i.e. non-detrital) carbonate is derived locally from partially recrystallized detrital carbonate grains.

With respect to the environment of deposition of this siltstone it can only be said from examination of the thin section that the sample is a fairly typical calcareous siltstone but that it does contain a population of coarser fragments which appear to have been derived from both sedimentary and volcanic sources. The presence of these large fragments implies that at least during some of the time in which this rock was deposited powerful currents were available for the transportation of fragments much larger than silt-grade.

Sample: P329/75; TS34780

Location:
Applicant's Mark 23B, Wilmington Formation.

Rock Name:
Mature feldspathic sandstone.

Thin Section:
An optical estimate of the detrital grains gives the following:-

	%
Quartz	90-95
Feldspar	5-7
Tourmaline	trace
Mica	trace
Zircon	trace

The proportions of the detrital grains listed above correspond closely to the overall proportions of these constituents in the rock since the sample has been well compacted and contains only a small amount of argillaceous matrix material. As a result, the rock contains about 90% of quartz and hence it is essentially a pure quartz sandstone; however, some feldspar is present and this suggests that the source area from which the rock was derived contained a granitic or a gneissic rock.

The quartz and feldspar grains have been extremely well sorted and the grain size range is from about 0.15 mm-0.25 mm. The quartz grains have been compacted together and few have their original detrital outlines; instead, the grains tend to be subangular and have long or concavo convex grain boundaries. Many of the quartz grains have slightly elongate shapes and this is a rather distinctive feature of the rock especially when compared to the excellent sorting and chemical maturity of the detrital material. Both potassium feldspar and plagioclase are present in the rock. Tourmaline, mica and zircon are accessory components of the detrital fraction and they occur as grains and flakes which are similar in size to the quartz and feldspar.

The description above applies to 90-95% of the detrital material in the rock; however, the sample does contain a few detrital grains which are significantly larger than those described immediately above. In this respect the rock is similar from the sample from the Reynella Siltstone. The large fragments consist mainly of quartz with some accessory feldspar and they range in size up to about 0.6 mm. The quartz and feldspar grains are generally subround but there are one or two grains of ?silty material which have subrectangular shapes.

Essentially therefore, the rock consists of well sorted very fine sand-grade quartz with accessory feldspar and trace amounts of mica, tourmaline and zircon. This indicates that the rock is a mature sandstone derived from feldspathic source rocks. In addition the rock contains a small proportion of significantly coarser grained fragments many of which have round or sub-round outlines. From a petrographic point of view the considerable chemical and physical maturity of the rock is consistent with its formation in a beach environment in which the sediment was continually reworked and the

good sorting of the rock was achieved. The presence of particularly large particles is probably due to some variations in the provenance of the sample.

Sample: P330/75; TS34781

Location:
Applicant's Mark 20A; Seacliff Sandstone Member.

Rock Name:
Poorly sorted sandstone.

Thin Section:
An optical estimate of the detrital grains in this rock gives the following:-

	%
Quartz	90
Feldspar	5
Opaques	2-5
Chert	2-5
Mica	trace-1
Zircon	trace

The proportions of the various detrital grain types given above indicate that the rock has considerable chemical maturity and also that the provenance area included some sedimentary rocks. The sample is distinctly poorly sorted and many of the detrital grains have low sphericities. The largest grain intersected in the thin section is more than 2 mm in diameter and commonly the grains range in size down from 0.4 mm to almost submicroscopic. There appears to be a complete range of grain sizes from very small silt-grade grains to grains about 0.4 mm in size and there is no evidence of bimodality in the grain size distribution. Some quartz grains are round and this appears to be a feature particularly of grains which are about 0.3 to 0.4 mm in size, but most grains of quartz, feldspar and chert are subangular to subround. The grains have been compressed together and some grains have long or concavo-convex boundaries; however, most grains appear to have retained their detrital form and this can be detected even in those quartz grains which have a small proportion of overgrowth, since trails of clayey material of iron oxide distinguished the overgrowth from the primary detrital quartz.

A few quartzite grains (which have been classified with quartz in the listing above) have very irregular internal crystal boundaries and appear to be largely vein quartz. Both potassium feldspar and plagioclase feldspar were identified in the thin section but it is not possible to determine the relative proportions of each of the feldspar types except to indicate that both seem to be present in moderate amounts. Chert grains are well defined in the thin section and many of these appear to have resisted abrasion and are 0.3 to 0.4 mm in size. One or two of the chert grains have distinctly elongate outlines and in this regard they resemble many of the small to medium sized quartz grains.

This is a sandstone which has a considerable chemical maturity in that it consists largely of quartz, quartzite and chert grains with up to 5% feldspar. If labile heavy minerals were present they have been removed during transport and deposition and only zircon now remains. The presence of well rounded grains commonly more than 0.2 mm in size and a considerable population of

smaller and similar-sized subangular grains suggests that the detrital grains were derived from more than one source and that depositional processes were not sufficiently intense to sort the varied detrital particles; if this interpretation is correct then the chemical maturity of the detritus is in part a result of derivation from sedimentary rocks rather than from a primary igneous or metamorphic source.

Sample: P331/75; TS34782

Location:
Applicant's Mark 18B; Seacliff Sandstone Member.

Rock Name:
Argillaceous sandstone.

Thin Section:
An optical estimate of the detrital grains gives the following:-

	%
Quartz	90-95
Feldspar	5-7
Chert	<3
Opaques	<2
Muscovite	<2
Zircon	trace

This rock consists of sand-grade detrital particles in a dark argillaceous matrix which comprises approximately 25 to 30% of the total volume of the rock. The quartz and feldspar grains commonly range in size from about 0.08 mm to 0.3 mm and the rock is poorly to moderately sorted. Many of the larger quartz grains have notably well rounded outlines but, as is common, smaller grains of quartz and feldspar tend to be subangular to subround. It is inferred that much of the roundness of the quartz grains is probably the result of their derivation from pre-existing sedimentary rocks rather than being the result of intense abrasion during deposition. Feldspar grains tend to show somewhat more rectangular and subangular outlines than the quartz grains with which they occur but, even so, some feldspar grains have unusually well rounded outlines. Some of the feldspar is a little altered (more so in this rock than others described in this report) but plagioclase still shows relics of polysynthetic twinning.

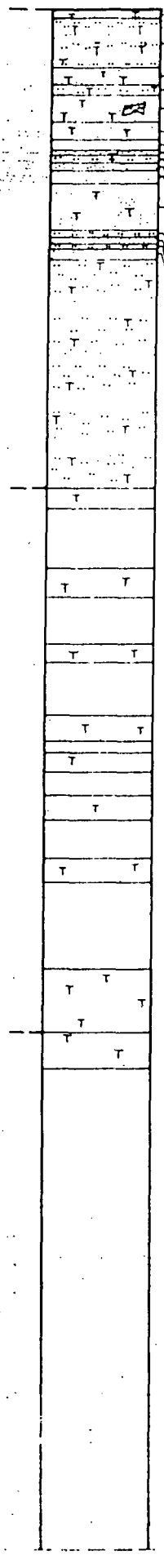
The chert grains have similar characteristics to the quartz grains and the presence of this material also indicates a sedimentary provenance for this rock.

The most notable characteristic of this rock is the abundance of clay matrix (which suggests immaturity) and the roundness of many of the quartz grains (which suggests maturity); this is interpreted as being due to the fact that much of the detrital material in this sample was derived from pre-existing sedimentary rocks and that, in fact, during the latest cycle of deposition the rock has not been transported very far and sorting has been ineffective. This precludes the deposition of the rock in a energetic beach environment and is possibly more indicative of deposition in a fluvial regime.

DETAILED SECTION OF SEACLIFF SANDSTONE SEQUENCE

SCALE 1:100

BRACHINA FORMATION



UNIT NO.

9

8

7

Sandstone; very fine-grained, (greyish-brown), quartzose, rippled surface, ?heavy mineral crossbed laminae, non-calcareous

Siltstone; (greyish-pale-brown), poorly laminated, non-calcareous. Sandstone interbeds, very fine-grained

Sandstone; very fine-grained, some coarser flakes (fine-grained) of greenish ?mica

Siltstone; pale-brown, poorly laminated, non-calcareous, no obvious cross-bedding. Some cross-bedded siltstone near creek, more greyish-red and shale like with dendrites

Sandstone; fine-grained, pale-brown, rather speckled, non-laminated, non-calcareous, containing a 35 x 10 cm block of laminated, (grey), siltstone, quite angular. Photo 4

Sandstone; fine-grained, pale-brown, rather speckled, non-laminated, non-calcareous

No outcrop, but presumably siltstone

Sandstone; fine-grained, greyish-brown, non-laminated, reflecting flakes of mica up to mica in sand grain size, non-calcareous

Siltstone; weathered, very poorly laminated

Sandstone, fine-grained, pale-brown, non-calcareous.

No outcrop.

Sandstone; very fine to fine-grained, pale-brown, non-calcareous, microveinlets of quartz. Obscure lower boundary

Siltstone, greyish-red, partially laminated, to sandstone, very fine grained

Sandstone; fine-grained, greyish-red to pale-brown, porous, (not quartzose), flecks of mica, occasional clasts (4mm) of brown siltstone, not laminated. P331/75

Siltstone; greyish-red, very poorly laminated

Sandstone; fine-grained, greyish-red to pale-brown, porous, (not quartzose), flecks of mica, occasional clasts (4mm) of brown siltstone, not laminated, no obvious cross-bedding.

Siltstone; greyish-red, more distinctive bedding, very poorly laminated, no obvious ripple marks f_{33}^{45}

No to little outcrop of siltstones, greyish-red, with several sandstone interbeds

Sandstone; conspicuous resistant, fine-grained, pale-brown. Bedding plane not very well defined. Quartz veining $\overset{85}{\underset{00}{S}}$ f_{39}^{45} Bottom of bed not evident

No outcrop.

Sandstone; conspicuous resistant, quartzose

No outcrop, probably sandstone, less siliceous.

Sandstone; fine to medium-grained, quartzose, (darker) pale-brown, non-laminated, non-calcareous, jointed $\overset{85}{\underset{00}{S}}$ f_{39}^{42}

Sandstone; fine to medium-grained, quartzose, (darker) pale-brown, non-laminated, non calcareous. On other side of creek, on bedding surface, ?basalt, very coarse-grained, pink, angular and quartz; coarse-grained, translucent, milky, sub-angular, in medium-grained matrix, ie gritty, at least 6cm thick, bed 50cm thick P330/75

Sandstone; fine-grained, (darker) pale-brown, non-laminated, non-calcareous, quartzose.

Sandstone; fine-grained, quartzose, non-laminated f_{39}^{36}

Sandstone, fine to medium-grained, quartzose, (darker) pale-brown, non-laminated, non-calcareous.

Sandstone; fine-grained, quartzose, (greyish), non-laminated, non-calcareous

Poor outcrop.

Slope of surface changes from sub horizontal to about 30°.

No outcrop on hill slope, float of weathered sandstone from mid top

FIG. 3a

BRACHINA FORMATION

Sandstone; fine-grained, moderate yellowish-brown, (sandy), non-calcareous. Prominent, but poor, outcrop.

7

?Siltstones, greyish-red with sandstone interbeds. Very poor to no outcrop.

Sandstone: very fine to fine-grained with ?mica flakes. Poor outcrop.

Siltstone, greyish-red

Sandstone, very fine to fine-grained, non-calcareous
Siltstone: greyish-red
Sandstone: very fine-grained, lighter colour, non calcareous.

Siltstone: greyish-red, well bedded, poorly laminated, non calcareous. Shingly in places. $\frac{58}{25}$

6

NUCCALEENA FORMATION

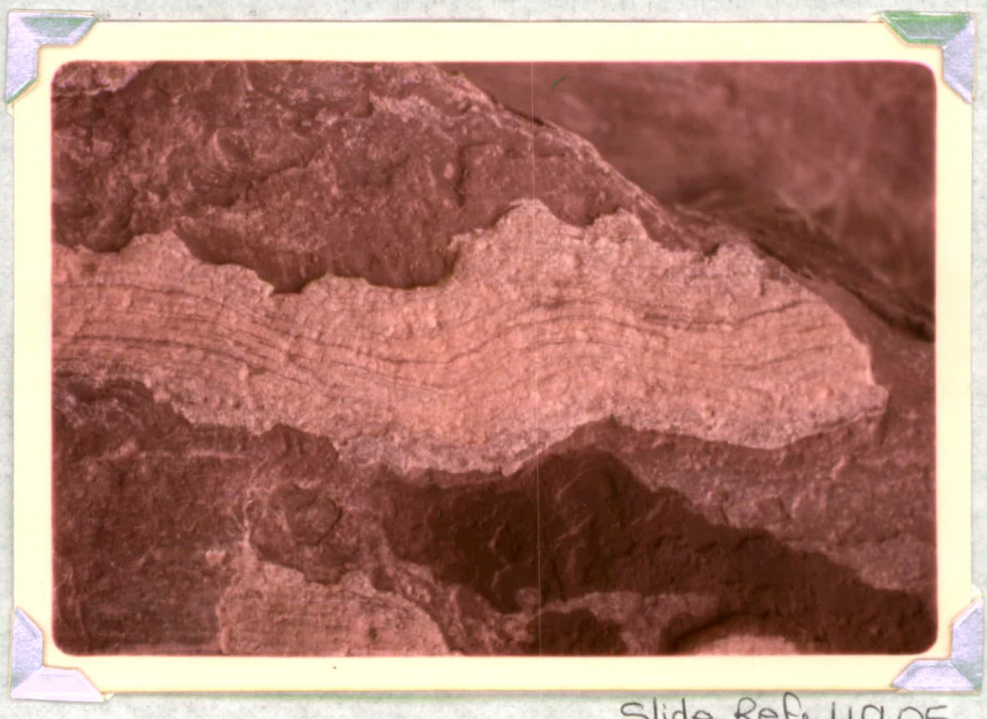
5

Dolomite: greyish pink (weathered), pale-red (fresh), reasonably well-bedded, thinly bedded. (Thickness of beds varies 5cm - 20cm). A weak banding more evident on weathered surface. Upper and lower contacts not evident. $\frac{60}{39}$

FIG. 3b

Slide Ref: 11904

1. Brachina Formation: View of bedding plane. Possible longitudinal ripples - conspicuous greyish-orange pink 'crests' of laminated calcium carbonate; 'troughs' of greyish-red laminated siltstone. Wave length 10 cm, ?amplitude 1.5 cm (see detailed section for location).



Slide Ref: 11905

2. Enlarged view of above.

Slide Ref: 11906

3. Brachina Formation: bedding surface, with preferential weathering of certain laminae. Greyish-orange pink laminae of carbonate, with greyish-red laminae above and below.

Slide Ref: 11907

4. Brachina Formation: view perpendicular to bedding plane, showing 35 x 10 cm angular (bluish-grey) laminated siltstone boulder in pale brown non laminated sandstone. Small angular pebble at bottom left hand corner of boulder. Overlying siltstone is greyish-red.

Slide Ref: 11908

5. Brachina Formation: gently cross bedded, laminated siltstone. Top 1/3 greyish red, bottom 2/3 predominantly olive greenish laminae.

Slide Ref: 11909

6. Brachina Formation: greyish red laminated siltstone with post depositional load structures. Cleavage evident.

Note: Wet conditions prevented a complete coverage of rock units.

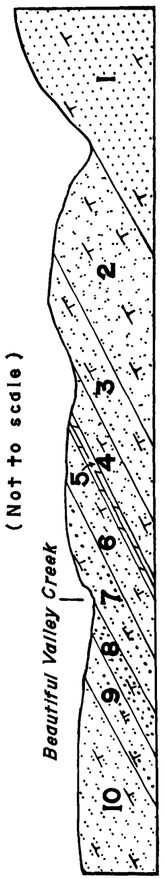
UMBERATANA GROUP–WILPENA GROUP BOUNDARY

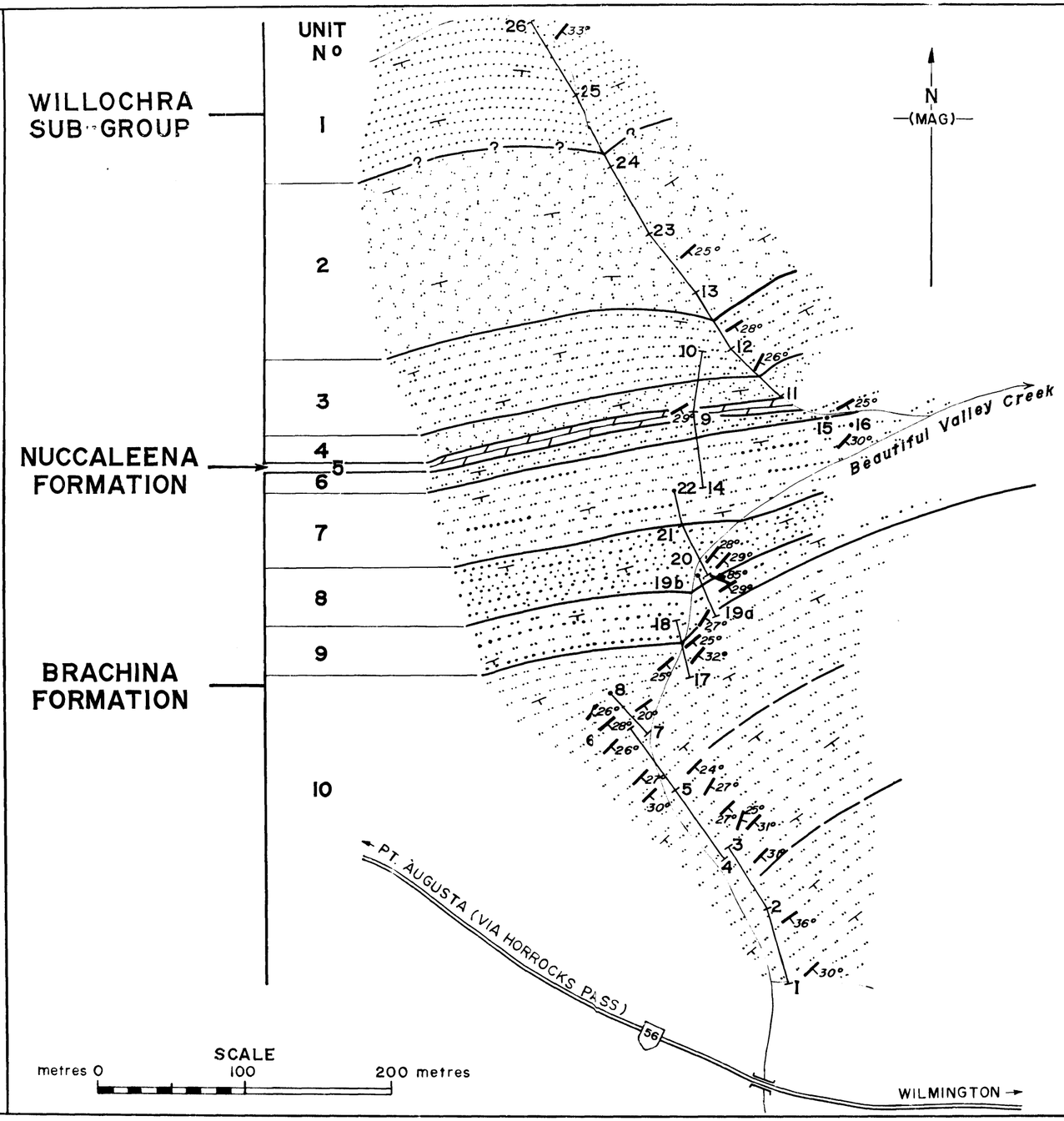
PLAN and SECTION

HORROCKS PASS AREA

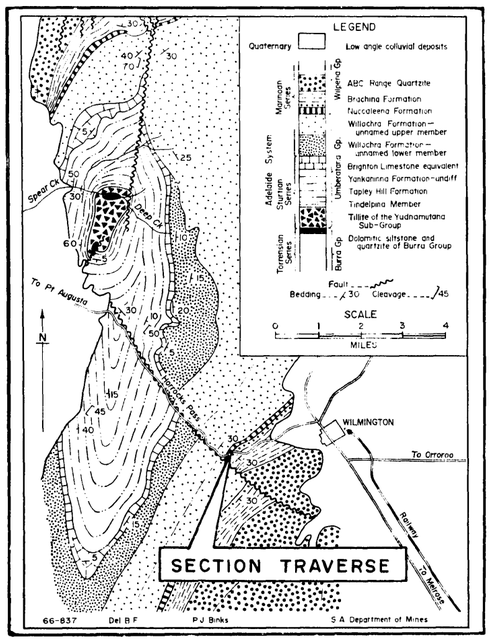
S DIAGRAMMATIC SECTION N

(Not to scale)





LOCALITY



REFERENCE

STATION 24 15

SECTION TRAVERSE:

BETWEEN STATIONS 24 23 (=50 m)

BETWEEN STATIONS 21 22 (<50 m)

GEOLOGICAL BOUNDARY .....

GEOLOGICAL FORM LINES .....

BEDDING; INCLINED ..... 25°

JOINTING; INCLINED ..... 85°

CREEK .....

HIGHWAY..... 56

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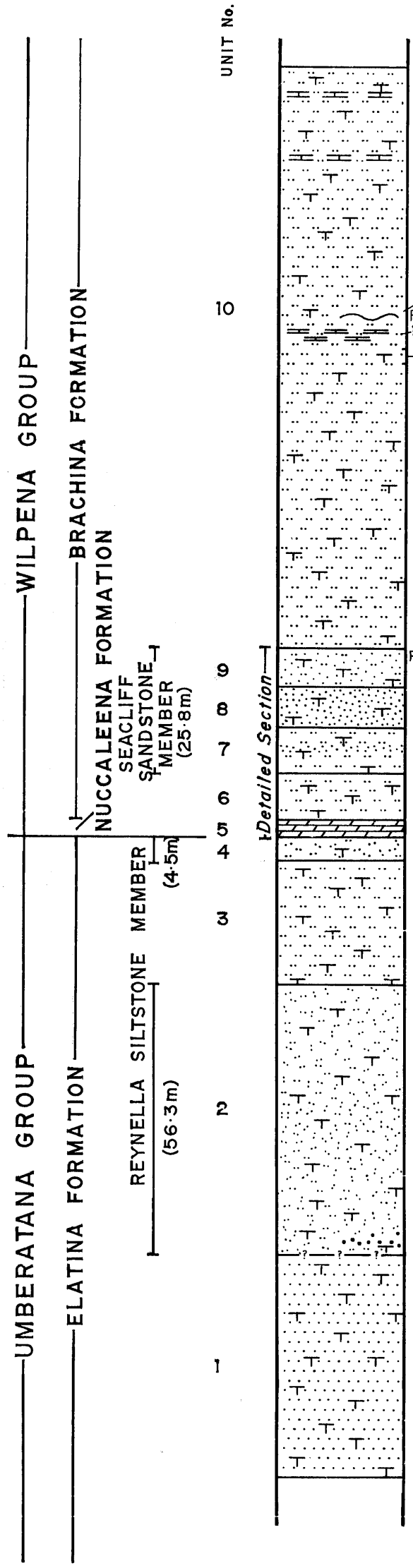
S.A. DEPT. OF MINES

75-894

UMBERATANA GROUP— WILPENA GROUP BOUNDARY SECTION

HORROCKS PASS AREA

SCALE 1cm ≡ 10m



calcareous, 9cm. thick bed, dark thin laminae in lighter, coarser laminae.

calcareous, 18cm. thick bed, darker laminae < 1mm., lighter laminae thicker and more calcareous.

conspicuous longitudinal?ripples displayed on bedding surface oriented parallel to creek. Wavelength 10cm., amplitude (1-1·5)cm.; the crests are composed of laminated, carbonated, greyish-orange-pink in colour, the troughs of siltstone, greyish-red, poorly laminated.

two thin beds, poorly laminated with cross-beds of carbonates, rich siltstone, separated by very thinly bedded siltstone. Several carbonate rich greyish-orange-pink laminae < 1cm. between non-calcareous greyish red and light olive-grey laminae. Gently rippled.

several more resistant quartzose beds ≈ 20cm. and poorly thick laminated.

Siltstone, greyish-red, very thinly bedded to thinly laminated, redder laminae finer grained than more greenish or lighter laminae. Good to poor bedding, parting, good outcrop, several very minor calcareous beds, rippling.

Sandstone, very fine-grained quartzose in part, (greyish-brown) to greyish-red interbedded with siltstones, pale brown to greyish-red, poorly bedded, poorly laminated, some beds have mica flakes and siltstone fragments. P331/75 argillaceous sandstone. One bed contains a 35 X 10cm. angular boulder of laminated siltstone.

Sandstone, fine-grained, quartzose, pale-brown, bedding not well defined to well defined. One narrow band < 10cm., with very coarse grained sub-angular to angular grains. P330/75, poorly sorted sandstone.

Siltstone, greyish-red with sandstone interbeds, very fine grained, greyish-red to yellowish-brown, and friable near top.

Siltstone, greyish-red, less than finely bedded, reasonably well bedded, poorly laminated, shingly when weathered.

Dolomite, greyish-pink (weathered), pale red (fresh) thinly bedded, well bedded, a weak banding evident on weathered surface. Upper and lower contacts not evident.

Siltstone, greyish-red, non-bedded, non-laminated, poor outcrop.

Siltstone, quartzose at base, greyish-red, poor to well bedded, laminae visible occasionally.

Siltstone, greyish-red, non bedded, non laminated; not outcropping in part.

siltstone contains detrital grains up to 0·6cm., some well rounded; calcareous, a very weak bedding. P328/75 a calcareous siltstone.

tentative boundary

Sandstone, very fine to fine grained, quartzose, light brown, thinly bedded and well bedded, occasional bands of sub-angular quartz and feldspar up to 0·6mm., heavy mineral cross bedding.
P329/75, a mature feldspathic sandstone.

M. BENBOW

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FIG. 2

76-89

6532