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1962/55

THE GEOLOGY OF THE RANKEN 1:250,000 SHEET AREA, NORTHERN TERRITORY

by

M.A. Randal and G.A. Brown.

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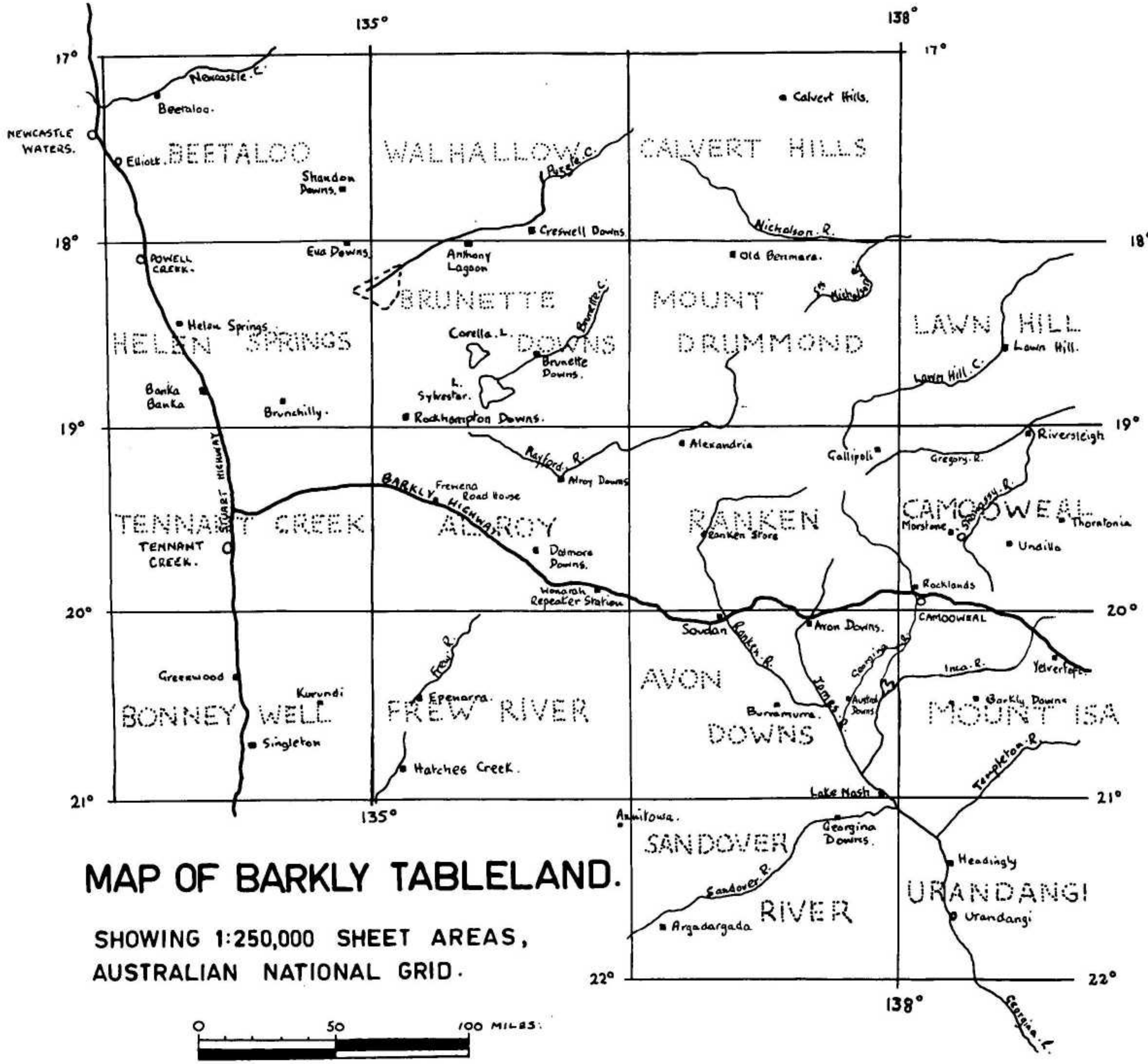
FIG. 1.



MAP OF BARKLY TABLELAND.

SHOWING 1:250,000 SHEET AREAS,
AUSTRALIAN NATIONAL GRID.

Bureau of Mineral Resources, Geology & Geophysics. April, 1962

To accompany Records 1962/49, 55, 56, 61.

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THE GEOLOGY OF THE RANKEN 1:250,000 SHEET AREA, NORTHERN TERRITORY

SUMMARY

The Bureau of Mineral Resources mapped the Ranken and Avon Downs 1:250,000 Sheet areas in 1961 and re-examined the western part of the adjoining Camooweal Sheet area; these areas, which make up the north-eastern part of the Georgina Basin, also form the eastern part of the Barkly Tableland (Figure 1). The geology of the Avon Downs and Camooweal Sheet areas is in other records - Randal and Brown (1962a and b) and Brown (1962).

The lack of outcrops and few exposed contacts on the Ranken Sheet make stratigraphic mapping difficult and conjectural. drillers' logs of water bores have provided little help. Many structures which are visible on air photos are not discernible on the ground.

Medium-grained quartz sandstone crops out as a low rubble-covered ridge south of Alexandria Homestead; the rock is similar to the Upper Proterozoic Mittiebah Sandstone which covers a large area on the Mount Drummond Sheet area to the north. The Alexandria outcrop is probably an anticline with Cambrian sediments (the Burton Beds) dipping off it.

White cavernous crystalline dolomite occurs as scattered blocks and boulders in the eastern part of the Sheet area. The dolomite contains chert nodules and bands and is similar to the dolomite near Camooweal; no fossils have been found in the dolomite and its stratigraphic and structural position is not clearly understood.

A scree of chert, siliceous shale and limestone covers low hills in the south-west of the area; these sediments, known as the Wonarah Beds, are Middle Cambrian and may be the time and lithological equivalents of the Burton Beds. No reliable regional dips have been seen in these beds and their relationship with the fossiliferous Ranken Limestone to the east is by fossil evidence only. The Ranken Limestone is probably a lens in the Wonarah Beds, but its relationship with the Camooweal Dolomite to the east is uncertain.

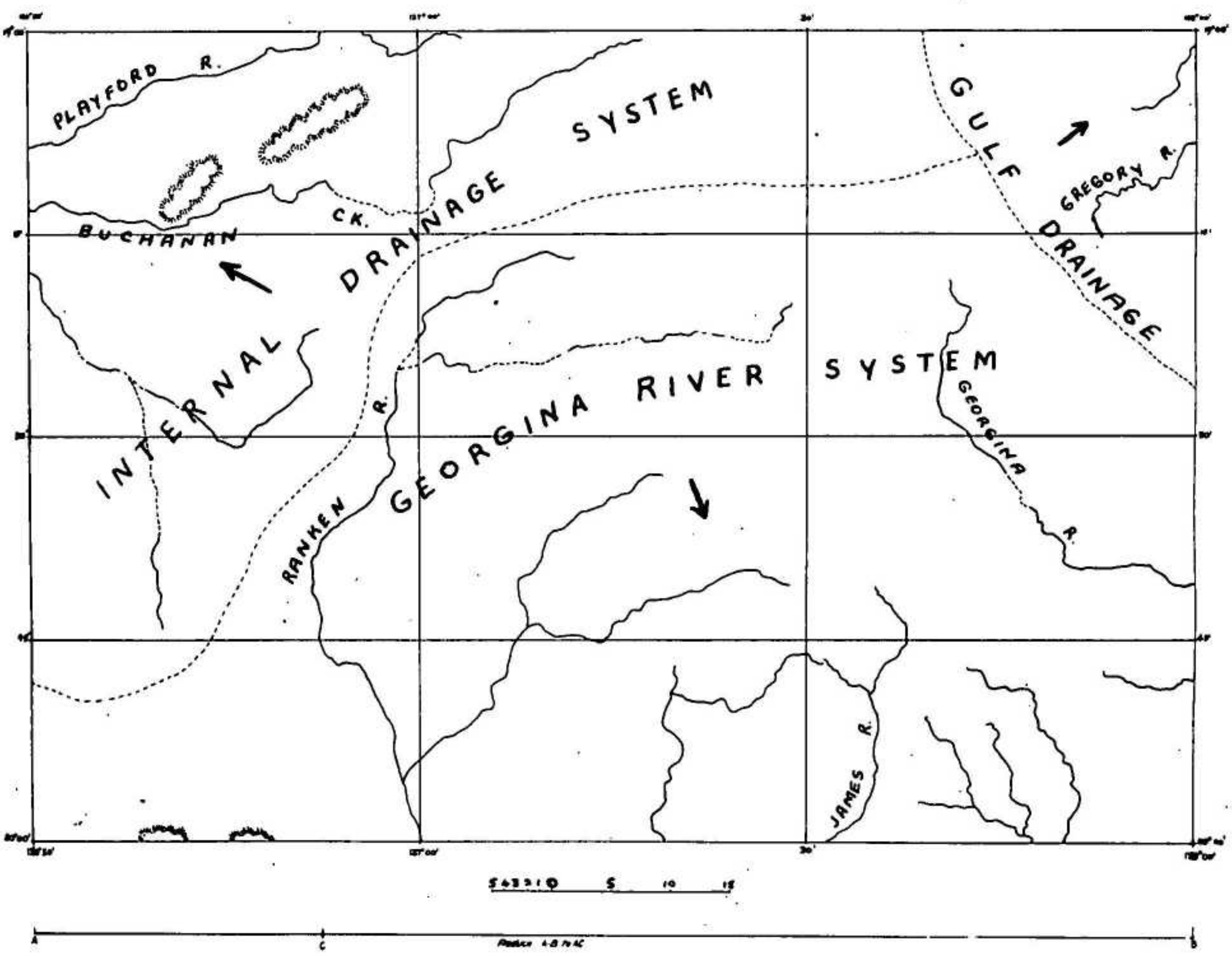
Mesozoic rocks form remnants in the southern part of the Sheet. Tertiary limestone occurs as a thin veneer over Palaeozoic rocks in the western part of the Sheet area.

INTRODUCTION

Location

The Ranken Sheet area lies in the Northern Territory of Australia between longitudes 136° 30' E and 138° E and latitudes 19° S and 20° S; its eastern boundary is the Queensland - Northern Territory border and the area is served by the town of Camooweal, eight miles to the east. The bitumen-sealed Barkly Highway from Mt Isa to Tennant Creek crosses the southern boundary of the area and provides access to the numerous bore tracks and stock-routes in the area. Three large cattle stations occupy the area - Alexandria Downs, Avon Downs and Rocklands; Gallipoli and Soudan are part of the Alexandria Holding; Rocklands Homestead is eight miles east of the area and Avon Downs Homestead five miles south. A Police Station and a store are located on the Ranken River at the junction of the Barkly and the South Barkly stock-routes between Alexandria Homestead and the Barkly Highway.

Figure 2: Physiographic sketch map of Ranken 1:250,000 Sheet area.



To accompany Record No 1962/55
Bureau of Mineral Resources, Geology and Geophysics, May 1962

E 53/16/4

Previous Investigations

In 1895 H.Y.L. Brown discovered Cambrian trilobites in the spoil from an old well near Alexandria. The fossils were described by Etheridge who later added to the collection (1897 and 1919). Woolnough (1912) and Jensen (1914) passed through the area en route to the McArthur River and they recorded the rocks near Alexandria, Ranken and Camooweal.

Between 1931 and 1939, F.W. Whitehouse examined Cambrian rocks in adjoining parts of Queensland and visited a number of fossil localities in the Barkly area. Dunstan (1913) visited the Barkly Tableland and mapped parts of the adjoining Camooweal Sheet area, between Camooweal and Riversleigh. Noakes and Traves (in C.S.I.R.O., 1954) visited the Barkly Tableland in 1947-48 but no detailed mapping was done.

A. A. Opik has made a number of visits to the Barkly Tableland over the period 1948 to 1955 and he collected a great deal of geological information and palaeontological material. The results of this work are contained in a number of unpublished reports (see References) which are the basis of papers given by Dr. Opik to the Cambrian Symposium at the 20th Geological Congress at Mexico City in 1956. The papers dealing with the Cambrian of Australia were collected and reprinted as Bureau of Mineral Resources Bulletin No.49; reference to Opik's contributions to this Symposium appear as Opik, 1957. During his 1953 visit to the area Opik was accompanied by J. N. Casey and M. A. Randal; on a number of previous visits he was accompanied by D. M. Traves.

M. A. Condon (1961) visited the area briefly during a reconnaissance trip through parts of the Georgina Basin. In 1960-61, the Ranken Sheet area was included in the photo-geological project on the Georgina Basin carried out by Shell Oil Coy (Mulder, 1961).

Air Photographs and Maps

The Ranken Sheet area is covered by vertical air-photographs flown by the Royal Australian Air Force in 1947 at a scale of 1:46,500; these photographs are not clear and many bores and tracks have been put in since the photos were flown. In 1960 the Division of National Mapping published the Ranken Sheet in the 4-mile Topographic Series; this map was compiled from the 1947 air-photos supplemented by spot-photography and ground control, carried out in 1958. Photo scale compilations of the separate one-mile areas are available and these show all cultural information to 1958.

PHYSIOGRAPHY

The Ranken Sheet area contains three drainage systems: the Georgina, Ranken and James Rivers form the Georgina River system and flow south-east into Queensland and then to Lake Eyre; the Gregory River which forms part of the Gulf Drainage System flows to the north-east into the Gulf of Carpentaria, and finally, the Playford River and Buchanan Creek, which form part of the Barkly Internal Drainage Basin, flow westward into blue-bush swamps near Alroy Downs. The stream divides are poorly defined; they are shown as dotted lines in Figure 2. The watercourses are generally confined to a single, well-defined channel; only a few are braided; near their headwaters the streams are poorly-defined and are low, barely discernible depressions in the monotonously uniform downs country. The gradient is low - about five feet per mile. In the south-east the streams have strongly developed but low valley profiles; in the north-east they have cut small gorges.

Figure 3: Shady Camp Waterhole on Buchanan Creek, south-east of Alexandria Homestead. (G.4452)

Figure 4: Grassy plains along Borodo Creek, in the centre of the Ranken Sheet area. Note the mirage along the horizon near the fence. (G.4447).

The rainfall in the area is low; the 15 inch isohyet cuts diagonally across the area from along the Georgina River to north of Alexandria Homestead, which normally records about 14 inches annually; Avon Downs Homestead, immediately south of the area averages 13 inches annually. The streams flow for a few months of the year only; for the remainder, water remains only in widely spaced waterholes, few of which are permanent (Figure 3).

The climatological division is described as Tropical Interior, vegetation as semi-arid tussock grass and semi-arid savannah. Gidyea scrub is widespread in the north-eastern part of the area and near watercourses; some stands of eucalypts occur near permanent or semi-permanent waterholes; mallee scrub and turpentine occur in small patches. The main vegetation is good quality Mitchell grass with patches of Flinders grass in small depressions (Figure 4).

Relief over most of the area is 225 feet, and the altitude ranges from 700 feet on Cattle Creek, to 925 feet near Gallipoli and on the hills south-east of Alexandria; a small hill on the Barkly Highway in the south-west rises to 1000 feet above sea level. The grass-covered plains (downs) of the Barkly Tableland attain their highest elevation in this Sheet area.

STRATIGRAPHY

General Considerations

In the Ranken Sheet area, stratigraphic information is obtained with difficulty due to the paucity of outcrop and the lack of exposed contacts. Large areas are covered with black soil and sand, with floaters of dolomite, and gravel formed of chert, with rare sandstone and pisolitic ironstone pebbles. Seventy water bores are in the area, but less than half of the available logs have drillers' descriptions of rock types. Even so, the logs are inadequate to use them for stratigraphy. However, an interpretation of some of these logs may be reliable if they are compared with some future geologically controlled bore. A number of these logs are shown on Plate 2.

It is difficult to formalise rock units because of the lack of stratigraphic information; consequently some units are described by the informal term "beds". Formations may be recognised later when subsurface information is available. The Camooweal Dolomite is retained with the formational rank implied by Opik (1957 and 1960); the stratigraphic and structural position of this unit is not clearly understood, however subsurface work should elucidate the problem. This may involve redefining the unit and restricting its areal extent, procedures which cannot realistically be carried out on the present information. The position of the Camooweal Dolomite in the text and in the map legend does not necessarily imply its stratigraphic position. The probable stratigraphic relationships between the units is shown in Figure 5.

UPPER PROTEROZOIC

Mittiebah Sandstone

Medium-grained quartz sandstone crops out as a low rubble-covered ridge south of Alexandria Homestead; it is similar to the Upper Proterozoic Mittiebah Sandstone which crops out over a wide area on the Mt Drummond Sheet area to the north. The outcrop is probably an anticline on which Cambrian sediments have been draped.

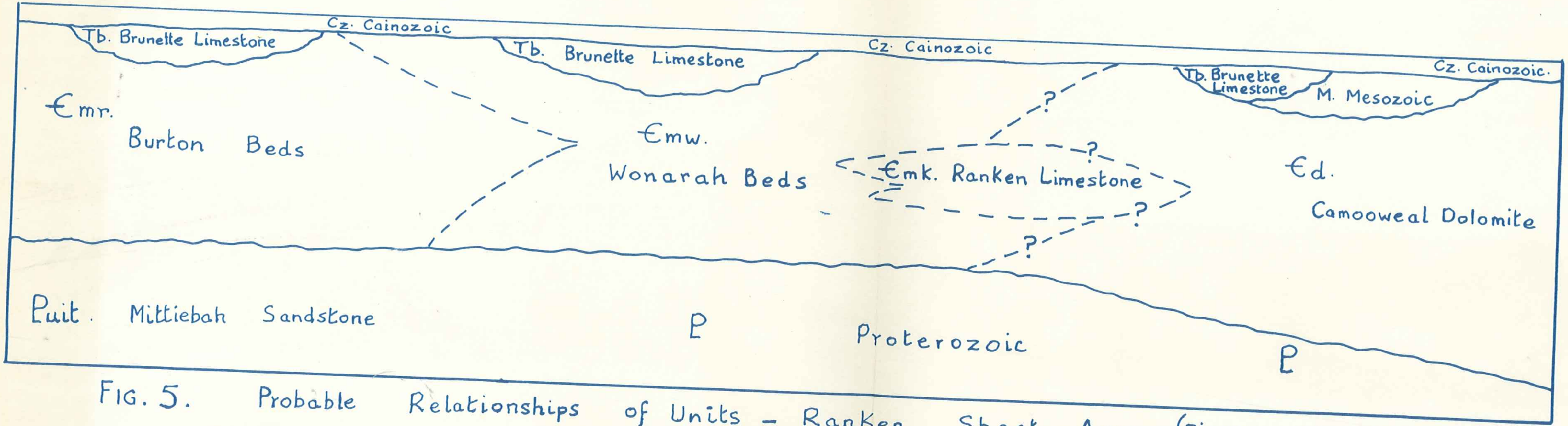


FIG. 5. Probable Relationships of Units – Ranken Sheet Area. (Diagrammatic, not to scale).

To accompany Record 1962/55

Bureau of Mineral Resources, Geology and Geophysics. April 1962

E 53/16/2

The Mittiebah Sandstone (Smith and Roberts, 1960) is named after the Mittiebah Range ten miles north of Alexandria Homestead and north of the Ranken Sheet area. The range is the type area for the formation; no type sections have been described but Smith and Roberts (1960) record an incomplete section of 9000 feet of quartz sandstone.

In the Ranken Sheet area, the Mittiebah Sandstone crops out as a low rubble-covered ridge fifteen miles long; it is six miles south-east of Alexandria Homestead and is between Buchanan Creek and the Playford River. The ridge is about seventy-five feet above the surrounding plain, but it does not contain any outcrops on which reliable measurements can be taken; the outcrop occurs as tumbled, massive blocks and scattered boulders. On the flanks of the ridge sandy soil supports a growth of small shrubs and trees; large red ant-hills are common and the area is locally referred to as "desert country".

The Mittiebah Sandstone is mainly a fine to medium-grained quartz sandstone, in part ferruginous; a basal glauconitic sandstone is known in the Mittiebah Range. Pebble and boulder conglomerates occur as lenses. In the Ranken area no bedding in situ was observed, but from the blocks and boulders the bedding ranged from medium to very thick with many cross beds.

No information on the structure of this unit can be obtained in this Sheet area but the elongated outcrop is regarded as the axis of an anticline with low flanking dips by Mulder (1961); in the Mittiebah Range, the formation dips consistently southwards. The Burton Beds near the Playford River have probably been deposited in a hollow in the basement controlled by a syncline elongated along the Playford River. Bore No.37 Alexandria, on the Playford River penetrated a pink quartzite underlying limestone at 330 feet (Plate 2). Bore No.1 Alexandria (Plate 2) probably bottomed in the Mittiebah Sandstone; therefore, from a calculation based on these logs, the surface of the formation in this area dips south-south-east at $4\frac{1}{2}^{\circ}$.

The Mittiebah Sandstone is the topmost Upper Proterozoic formation in the Mt Drummond Sheet area, (Smith and Roberts, 1960). It conformably overlies the Mullera Formation of siltstone, sandstone and shale, and Cambrian rocks overlie it with a distinct unconformity.

PALAEOZOIC

Camooweal Dolomite

In the eastern part of the Ranken Sheet area outcrops of a white cavernous crystalline dolomite occur as scattered blocks and boulders. The rocks contain chert nodules and bands, and are similar to dolomite rocks near Camooweal - the Camooweal Dolomite (Opik, 1954, 1957 and 1960). No fossils have been found in the dolomite, but fossiliferous chert and limestone fragments are scattered over the surface. The age and stratigraphic position of the dolomite is not clear; different workers have made different interpretations from field evidence, and rocks called Camooweal Dolomite have different relationships with Middle Cambrian rocks in separate areas. Most of the information obtained on this unit is from outside the Ranken Sheet area. The thickness of the Camooweal Dolomite is not accurately known, bore logs suggest it may be several hundred feet.

Figure 6: Gregory River Crossing on the Gallipoli Road.
Outcrop of medium bedded Camooweal Dolomite
with chert bands. (G.4448)

The name Camooweal Dolomite was first published in 1956, (Opik, 1957). Opik had previously used the term in unpublished reports (1954) and in field notes, some of which were destroyed by fire in 1953. The Camooweal Dolomite, as outlined by Opik (1957), included rocks which had previously been called Georgina Limestone (Whitehouse, 1931) and Barkly Group (Noakes, 1951 and Noakes and Traves, 1954). The early study of the carbonate rocks of the Barkly Tableland had been undertaken mainly in Queensland where access and outcrop are much better than in the Northern Territory. A rough correlation was then made between the Queensland Cambrian and the Cambrian near Alexandria and Alroy without continuity across the apparently unfossiliferous dolomite in the eastern part of the Barkly Tableland. Opik (1957) disagreed with the previous stratigraphy and nomenclature of the dolomite at Camooweal on the grounds that both the stratigraphy and nomenclature referred to fossiliferous Middle Cambrian rocks, whereas the dolomite was unfossiliferous and, in his opinion, pre-Middle Cambrian. A more detailed account of the historical background of the nomenclature is given in Randal and Brown (1962a).

There is now some doubt if all the rocks included in the Camooweal Dolomite are in fact pre-Middle Cambrian. However, Opik's nomenclature for this unit is retained.

The type area for the Camooweal Dolomite is around Camooweal township on the adjoining Camooweal Sheet area to the east of Ranken (Opik, 1954); no type section is described.

On the Ranken Sheet area the Camooweal Dolomite occurs in the eastern and central parts as widespread scattered outcrops; it extends northwards onto the Mount Drummond and Lawn Hill Sheet areas, eastwards onto the Camooweal Sheet area, and southwards onto the Mt Isa and Avon Downs Sheet areas. The best exposures of the unit within the Ranken Sheet area occur in the north-east near Gallipoli Homestead and in the south-east on the Barkly stock-route between Kiama Bore and the border fence. In these areas the Camooweal Dolomite forms pavements and small cliffs (Figure 6) in and about the watercourses, elsewhere the outcrops are few and occur as scattered boulders in the black soil plains (downs). The downs, which support a good growth of Mitchell and flinders grasses, are the main topographic expression not only of the Camooweal Dolomite but also of other carbonate rocks in the area. Consequently, any attempt to photo-interpret the areal extent of the Camooweal Dolomite by this topography is misleading.

Poor exposures in the Ranken Sheet area prevent a detailed description of the Camooweal Dolomite without reference to adjoining areas. A number of sections are described from the Camooweal Sheet area in Randal and Brown (1962a). The dolomite is mainly a white crystalline rock with chert bands and nodules; in the Gregory River the chert bands form a large part of exposed sections. The dolomite is cavernous and variable in colour - white, cream, buff, light brown. The white rocks are generally more coarsely crystalline and porous than the dark rocks. Usually the white dolomite is sugary and even friable. Pellet dolomite and intraformational conglomerate occurs in the area near the James River but is not known elsewhere in the Sheet area. Bedding varies from thin to very thick.

In a number of localities quartz sandstone boulders are scattered amongst boulders of dolomite and may represent sandstone beds within the unit. Similar sandstone beds have been noted in the Urandangi area. Quartzite and sandstone beds have been recorded in drillers' logs of some bores in the Sheet area (Plate 2). Chert nodules and bands are a striking feature of the Camooweal Dolomite; pieces of chert are scattered almost everywhere between dolomite outcrops. Fossiliferous chert rubble has been recorded in a number of localities in the area, but there is no proof that these cherts have come from the Camooweal Dolomite. The logs for bores which are presumably drilled in the Camooweal Dolomite record large flint and chert boulders.

The structure of the Camooweal Dolomite is uncertain. Good exposures are rare and are nearly always flat-lying. In the Gregory River near Gallipoli, the rocks dip at low angles to the south-south-west, but nearby they are flat-lying. A "quartzite and limestone" band 40 feet thick is reported from the drillers' logs of Bores 22 and 23 Alexandria (Plate 2); if this is the same band in each bore, the band is calculated to have an easterly dip component of 25 minutes.

The area of the Camooweal Dolomite was included in Whitehouse's Georgina Limestones of Middle Cambrian age (Whitehouse, 1931); this age was followed by Noakes and Traves (1951, 1954); however, they introduced the term Barkly Group. Opik (1954) disputed the Middle Cambrian age for the white crystalline dolomite which covered, in discontinuous outcrop, large areas of the eastern Barkly Tableland; he describes the non-conformable overlap of Cambrian sediments on the Camooweal Dolomite and the presence of "areal unconformities". Opik (1957 and pers. comm.) reports the finding of scattered chert nodules and limestone boulders containing Middle and Upper Cambrian fossils in the area of the Camooweal Dolomite. He considers these to be the remnants of a younger Cambrian sequence which overlay the Camooweal Dolomite and which has now been removed by erosion. Opik (1957) considers the lower Middle Cambrian Ranken Limestone overlies the Camooweal Dolomite "in the Ranken River area, where bores record 750 feet of dolomite". Plate 1 of this report is an unpublished map by A. A. Opik showing the areal extent of the Ranken Limestone and the Camooweal Dolomite near the Ranken River near Soudan. During the 1961 survey, no definite stratigraphic relationship could be established between outcrops of the fossiliferous black-grey crystalline limestone with chert, and the nearby outcrops of white crystalline dolomite. However, at Point R.K.148 a white dolomite contains fragments of trilobites and brachiopods which suggest that some, if not all, of the dolomite in this area may be a lateral equivalent of the Ranken Limestone. From the available bore records, only the No.17 bore (Alexandria) has penetrated below 800 feet in the Ranken Limestone. The driller's log reads :

at 220 feet	Change in rock
at 386 feet	Return to limestone
at 745 feet	aquifer
at 780 feet	Black sand and rock
at 805 feet	Sand

This bore log strictly cannot be interpreted as Camooweal Dolomite which is normally described by drillers as "hard limestone, flints and ribbonstone".

Smith and Roberts (1960) believe that rocks in the Mount Drummond area, which previously had been regarded as Camooweal Dolomite, overlie the Middle Cambrian Currant Bush Limestone; in the southern parts of the Tableland similar dolomite lithologies occur in a number of horizons through the Cambrian - Ordovician sequence.

It was shown, as a result of the mapping, that rocks of the Camooweal Dolomite interfinger with the Middle Cambrian Age Creek Formation near Morstone Homestead, north of Camooweal (Randal and Brown, 1962a); but interfingering elsewhere cannot be proved because of poor outcrop. The dolomite may not be a single unit; the scattered outcrops may represent a number of resistant beds in a more varied sequence or, alternatively, the dolomite may be the result of a diachronous environment. Drillers' logs, when freely interpreted, do indicate some slight variation of rock type (Plate 2).

The thickness of the Camooweal Dolomite is not exactly known. Opik (1957) suggests a thickness of 800 feet.

The depositional environment of the Camooweal Dolomite in the Ranken Sheet area is hard to know because: (a) of poor outcrop; (b) the processes which produce dolomite are not clearly understood. However, certain conclusions may be inferred from its carbonate nature and its relationships with other rock units in the Camooweal Sheet area (Randal and Brown, 1962a).

The Camooweal Dolomite was laid down in shallow, quiet sea as either a calcium carbonate or a dolomite mud, or possibly as a mixture of the two; and precipitation of carbonates followed. These stable conditions continued for some time as shown by the massive bedding in some areas. Slump rolls in chert nodules and bands suggest minor movement during deposition. Sedimentation was probably slow, which allowed thick beds of internally laminate sediments to form. The slow sedimentation and probable slow subsidence permitted sediments to remain at the interface, so that complete dolomitisation occurred and sedimentary features were obliterated.

The area of deposition of the Camooweal Dolomite in this part of the Barkly Tableland was tectonically stable - in the Camooweal Sheet area there appears to have been a somewhat greater rate of subsidence.

Ranken Limestone

Fragmented, crystalline limestone and chert, which occur in the valley of the Ranken River, have been named by Opik (1957) the Ranken Limestone. The limestone is richly fossiliferous and appears to intertongue with the Wonarah Beds to the west; its relationship to the Camooweal Dolomite to the east is not clear. The thickness of the Ranken Limestone is not known but it is probably only about a few hundred feet thick (see No.17 bore, Alexandria); its age is lower Middle Cambrian.

The fossiliferous limestone near Soudan Homestead (on the Avon Downs Sheet) was described by Opik (1957) as the "Ranken River Limestone", and all subsequent references to it were as "Ranken Limestone", which is used here. The area of the Ranken Limestone was previously included in the Alroy Downs Beds (David, 1932) and the Barkly Group (Noakes and Traves, 1954). Until additional information is obtained, it is preferable to retain Opik's i . nomenclature.

Figure 7: Typical outcrop of the Rankon Limestone, north of Soudan Homestead. The limestone is fragmented and contains numerous fossil fragments and chert smears.

(G.4435)

The type area for the Ranken Limestone is in and about the valley of the Ranken River between Soudan Homestead and Bore 17 Alexandria, ten miles south of Ranken Police Station. The unit crops out only in the type area; there are no type sections. The rocks occur as scattered slabs and large blocks in black soil downs, and gravel strewn plains along the Ranken River.

The Ranken Limestone includes oolitic, fragmented and crystalline limestone, silicified limestone, chert and some dolomite. Almost all the outcrops examined were richly fossiliferous (Figure 7); A. A. Opik's original fossil localities are shown in Plate 1. Bedding, often poorly developed, ranges from thin to medium. On Twelve Mile Creek, two miles south-east of Gidyea Yard on the Ranken River, a white dolomite coquinite containing trilobites has been mapped; it bears little resemblance to rocks elsewhere called Camooweal Dolomite.

The stratigraphic position of the Ranken Limestone is not clear from outcrop mapping. Condon (1961) considers the Ranken Limestone as probably overlying the Wonarah Beds and grading eastward into dolomite; he suggested the succession was dipping gently to the east. However, the dolomite, the limestone, and the Wonarah Beds have not been seen in contact; several miles of black soil separate outcrops of the Wonarah Beds from the Ranken Limestone. No reliable dips have been seen in the field. Opik (1957) maintains the Ranken Limestone intertongues with the Wonarah Beds and, stratigraphically, is a lens in it.

On fossil evidence Opik (1957 and unpublished material) considers it is impossible for the Ranken Limestone to overlie the top of the Wonarah Beds. Beds of limestone are known in outcrop in the Wonarah Beds and a large sinkhole (Figure 7 in Randal and Brown, 1962b) in the eastern part of the Wonarah Beds points to a limestone band being close to the surface.

The relationship of the Ranken Limestone with the Camooweal Dolomite is not certain. Condon (1961) considered the Ranken limestone graded upwards into the dolomite on the east side of the Ranken River. Fossiliferous dolomite does occur in this area but its continuity with the Camooweal Dolomite elsewhere can only be guessed at. Mulder (1961) considered the two units as facies variants.

Opik (1957) has interpreted the Ranken Limestone as a shore-line deposit. The limestone is essentially a fragmented coquinite with shell-in-shell structures and ripple marks.

The age of the limestone is lower Middle Cambrian, with a thin veneer of upper Middle Cambrian.

<u>Wonarah Beds</u>

In the south-western part of the Ranken Sheet area, the Wonarah Beds form low hills covered by a loose scree of chert, siliceous shale and limestone. The fossiliferous rocks may be continuous with Middle Cambrian rocks elsewhere on the Barkly Tableland; they are deeply lateritised, with a lateritic capping up to 30 feet thick. The Wonarah Beds are at least five hundred feet thick.

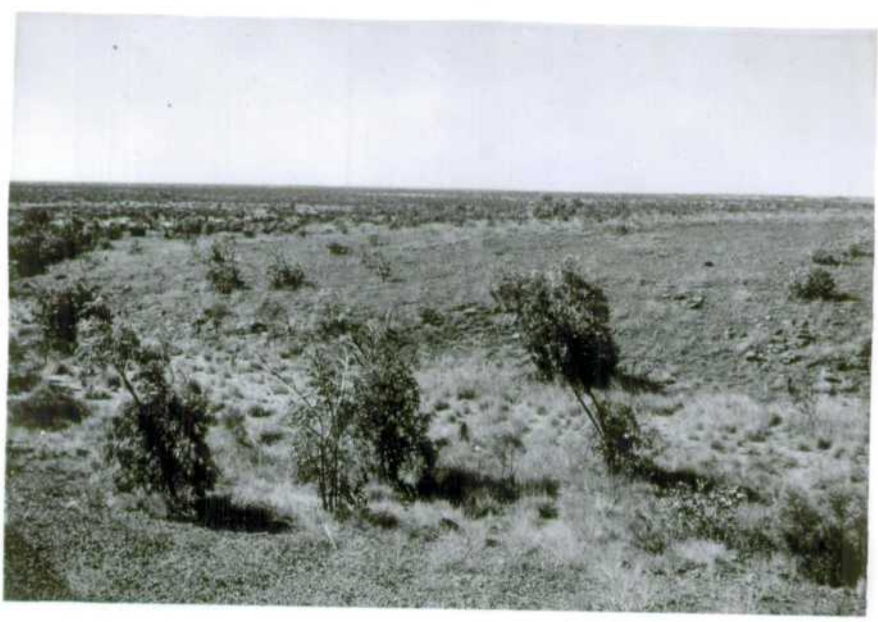


Figure 8: The Wonarah Beds outcrop as low rubble covered hills dissected by small gullies six miles north of Barry Caves.
(G.3348)

The name "Wonarah Beds" was used by Öpik (1957) to describe outcrops of Cambrian rocks along the Barkly Highway, west of Soudan Homestead. The area of these rocks was included in the Alroy Downs Beds of David (1932) and subsequently in the Barkly Group (Noakes and Traves, 1954). Although it is possible to correlate these rocks with other Cambrian deposits in the area, no formations have been recognized; Öpik's informal term "beds" is used to avoid future confusion in the nomenclature.

The sequence is named after the Wonarah Telephone Repeater Station (long. 136°20'; lat.19°54'S.) on the Barkly Highway, sixteen miles west of the Ranken Sheet area. Their outcrop has been extended to the south to near the Sandover River by photo-interpretation (Mulder, 1961). There are no type sections for the Wonarah Beds. Öpik (1957) shows the Wonarah Beds to be continuous with Cambrian outcrops at Tennant Creek and Alexandria.

The Wonarah Beds crop out in the south-western part of the Ranken Sheet area and extend onto the adjoining Alroy, Frew River and Avon Downs Sheet areas (Randal and Brown, 1962b). Large parts of the area consist of sandy scrub plains with low rubble-covered rises; the area is locally referred to as "desert". Outside the Ranken Sheet area this topography covers a large area between Frewena to the west, Annitowa to the south, and Burramurra to the east. Between Soudan and Wonarah the rocks crop out as distinctive rubble-covered hills (Figure 8) which rise 250 feet above the downs country near Soudan. These hills probably were protected from deeper erosion by the hard siliceous cap formed during lateritisation.

The Wonarah Beds consist of fossiliferous siltstone, chert, silicified shale, and silicified oolitic limestone; Condon (1961) reports leached dololutite and chert replacing dolomite. Outcrops in situ are rare; extensive rubble-covered rises are common. Good outcrops have been seen in only two localities (both near Barry Caves) and in both of these the sandstone and siltstone are extensively lateritised (Randal and Brown, 1962b).

The structure of the Wonarah Beds is not evident from field studies. Fourteen miles east of Wonarah Telegraph Station the rocks dip 3° south-west; east of Barry Caves, on the Avon Downs Sheet, they dip at low angles south-east. However, Mulder (1961) has shown dips of varying directions on his photo-geological maps; it is not certain which dips have a regional significance. The stratigraphic relationship of the Wonarah Beds with the Ranken Limestone has been discussed previously (page 8). The stratigraphic range of the Wonarah Beds is shown on a chart by Opik (1959) as extending both below and above the range of the Ranken Limestone.

The Wonarah Beds are lower Middle Cambrian and may be the time equivalents of rocks in other parts of the Barkly Tableland. The thickness of the Wonarah Beds is unknown but it is probably several hundred feet, as a bore at Wonarah penetrated 450 feet without any consistent change in lithology.

Burton Beds

Near Alexandria Homestead, Middle Cambrian rocks fill depressions in the surface of the Upper Proterozoic rocks. In this area the Cambrian rocks are fossiliferous shale, limestone and chert. Very few original outcrops are preserved - the rocks are mainly found as scattered silicified scree on low rises or as boulders in watercourses. The rocks are continuous with similar outcrops near Alroy Downs and may be equivalents of the Wonarah Beds.

The name Burton Beds was proposed by Smith and Roberts (1960) for outcrops of fossiliferous siltstone which occur extensively to the north in the Mount Drummond Sheet area. They have been traced into the fossiliferous rocks at Alexandria which were described informally by Opik (1957) as "Alexandria beds". The name has been approved by the Stratigraphic Nomenclature Committee.

In the Ranken Sheet area, the Burton Beds occur between Buchanan Creek and the Playford River, and northwards from the Playford River, and on the sandstone ridge south of Alexandria Homestead. Outcrops are generally poor, and consist of loose fragments of silicified shale and siltstone and cherts in a red soil. Large blocks of fossiliferous limestone occur in the bed of the Playford River and in the black soil plain surrounding it. Many low rises in the area are covered by fossiliferous chert rubble.

The Burton Beds contain lateritised shale and mudstone, siliceous in part, chert, limestone and siltstone; carbonate rocks are frequently fragmented and often are coquinites; oolitic rocks are common. Dolomite has been reported from a well south-east of Alexandria. The rocks are richly fossiliferous; Opik (1957) lists trilobites, brachiopods, cystids and hyolithids. No detailed sections have been measured. Opik (1957) refers to an old well 7 miles north-west of Alexandria Homestead where 120 feet of bituminous shale and mudstone rest directly on Precambrian rocks; bore No.37 Alexandria (Plate 2) records at least 160 feet of limestone.

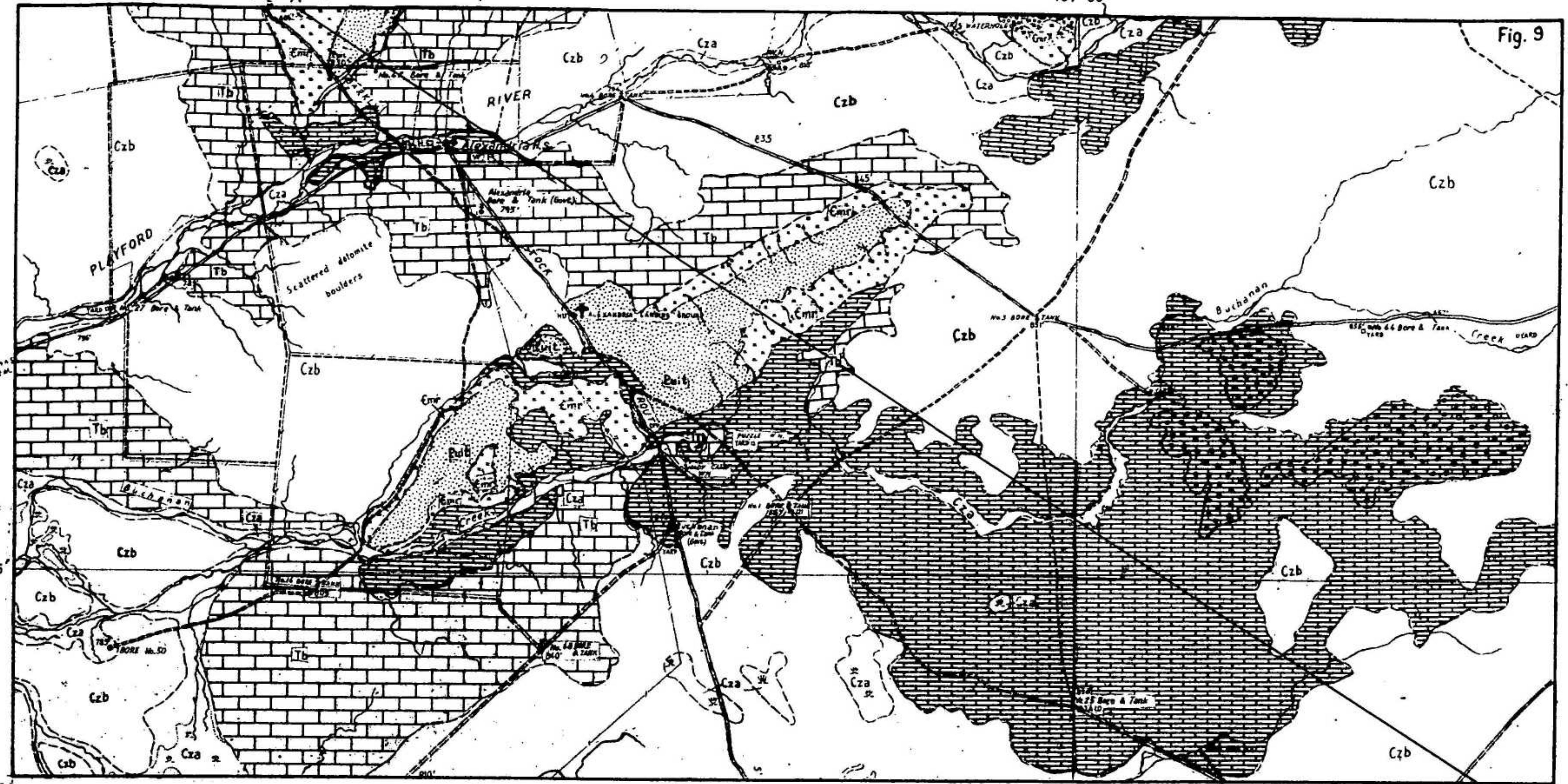
The Burton Beds were laid down on the flanks of the anticline of Mittiebah Sandstone; they probably fill depressions in the basement surface between Buchanan Creek and the Mittiebah Range. Opik (1957) considers the limestone is interbedded with the shale and mudstone, but away from the Alexandria area, the two may be lateral equivalents. The distribution of the limestone is shown in Figure 9.

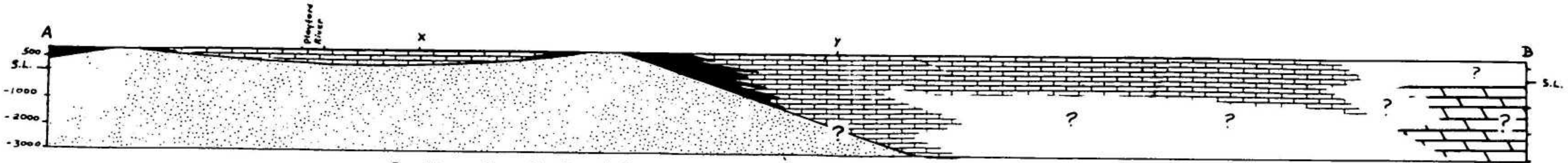
The rocks are lower Middle Cambrian - continuity with the Wonarah Beds is possible but not proven. The thickness of the Burton Beds is not known; Smith and Roberts (1960) record 75 feet in the Mount Drummond area, Opik (1957) records at least 120 feet, Alexandria Bore No.37 penetrates 300 feet of probable Cambrian sediments.

Undifferentiated Middle Cambrian

On the headwaters of Lorne Creek, chert nodules in a coarsely crystalline speckled dolomite contain abundant remains of hyolithids and fragments of trilobites and brachiopods. Hyolithids have been found in a similar lithology at Weaner Waterhole a few miles further upstream. The relationship between these outcrops and the surrounding Camooweal Dolomite is obscure.

GEOLOGY OF THE ALEXANDRIA AREA
showing
the siltstone and carbonate facies of the Burton Beds





Section along the line A-B

X = *projection of Bore No. 37*
Y = *projection of Bore No. 1.*

SCALE

5 4 3 2 1 0 5 *10 Miles*

Vertical Scale

5000 4000 3000 2000 1000 0

REFERENCE

Cz	*Alluvium and blacksoil*
Tb	*Brunette Limestone*
(laterite symbol)	*Laterite*
Ꞓmr	*Burton Beds - Shaley Facies (shown black on section)*
(carbonate symbol)	*Burton Beds - Carbonate facies.*
Puit	*Mittebah Sandstone*

Bureau of Mineral Resources, Geology and Geophysics.

To accompany Record No. 1962/55

E53/16/1

MESOZOIC

Rocks of Mesozoic age form a thin veneer over Palaeozoic rocks in the southern part of the Ranken Sheet area. They occur between Lorne Creek in the west and north, and Six-Mile Creek in the east; they extend southwards onto the Avon Downs Sheet area.

The rocks occur as scattered rubble and residual sand on low rises; quartz sandstone and pebble conglomerate boulders are common. Poor outcrops makes it difficult to reconstruct the structure of these remnants. Their thickness is unknown; the topographic variation of the surface is about 50 feet.

The rocks are regarded as Mesozoic because of lithological similarity to known Mesozoic rocks to the north, near Creswell Downs, and to the east, between Camooweal and Yelvertoft.

CAINOZOIC

Brunette Limestone

Tertiary limestone and (?)Tertiary gypsum deposits occur as a thin veneer over much of the western part of the Sheet area. The limestone is lithologically similar to the Austral Downs Limestone on the Avon Downs Sheet area (Randal and Brown, 1962b) and is probably a continuation of the Brunette Limestone described by Noakes and Traves (1954).

Noakes and Traves (1954) used Brunette Limestone to describe a white nodular limestone which crops out near Brunette Downs, Alroy Downs and Rockhampton Downs. There are no type sections.

The Brunette Limestone crops out in the north-western part of the Ranken Sheet area as scattered boulders in the black soil, particularly in topographic depressions. The boulders have probably not been transported far, which could be evidence to suggest that much of the black pedocalcic soil formed by the weathering of both Tertiary and Palaeozoic carbonate rocks. The outcrops are generally confined to the river valleys and the low-lying swamp areas; limestone pavements are present in some of the watercourses.

The Brunette Limestone is a white to brown, fine-grained to coarsely crystalline limestone and dolomite; no fossils have been found. The rock is siliceous, containing chert and opaline nodules; the limestone is often irregularly nodular. Some lenses of fine brown and fractured siltstone are present near Alexandria Homestead.

Gypsum appears to be associated with the limestone in the Alexandria area; it is a common constituent in the black soil, and at Ten Mile Waterhole, on the Playford River, a bank of gypsum six feet thick contains slabs of dolomite similar to that in the Brunette Limestone. Gypsum is not recorded in the Tertiary limestones elsewhere by Noakes and Traves. The gypsum may be derived from Palaeozoic rocks in the area, but it has not been seen in situ in these rocks. Bores in the older rocks are known to contain some sulphates.

Bedding is poorly developed in the Brunette Limestone; the few solid outcrops are rounded and irregularly jointed.

The Brunette Limestone is probably a thin surface deposit unconformably laid down on the Lower Palaeozoic rocks. Noakes and Traves (1954) consider that the Tertiary limestones were laid down contemporaneously with the lateritisation of the older rocks and that the leaching of silica and lime from these rocks provided the source for the younger siliceous limestones.

The Brunette Limestone was deposited in a series of freshwater or brackish lakes, remnants of which exist in the present land surface near Brunette Downs. The lithology and environment of the unit are similar to the Austral Downs Limestone with which it is correlated.

GEOLOGICAL HISTORY

The area contains many rocks of doubtful stratigraphic position; it is therefore not possible to evaluate with certainity the history and structure of the Ranken Sheet area. Extensive sedimentation occurred in the adjoining areas to the north during Upper Proterozoic time and extensions of these rocks probably form the basement in the Ranken Sheet area. Upper Proterozoic deposition was followed by uplift and moderate folding and erosion in the northern parts of this Sheet area - the ridge south of Alexandria is a shallow anticline,and,probably,a syncline exists in the valley of the Playford River. Early Middle Cambrian seas transgressed the area and deposited essentially carbonate rocks in depressions in the basement surface; sediments were draped on some of the basement "highs". The thickness of Cambrian sediments is variable - Opik (1957) records 120 feet resting on Precambrian sandstone, Bores 1 and 37 Alexandria penetrated 1760 and 330 feet respectively of Cambrian rocks; an aeromagnetic survey south of this Sheet area shows "estimated basement depths" varying between 300 and 800 feet (Jewell, 1960). The Cambrian rocks are generally flat-lying; the low dips recorded may be depositional.

Upper Middle Cambrian fossils in the fragmented upper beds of the Ranken Limestone suggests a late Middle Cambrian ingression, presumably from the east (Opik, 1957). It is not certain if this was immediately followed by uplift or by continuing sedimentation, the remnants of which are the boulders which contain younger fossils and which have been reported from the area. The Cambrian sediments then emerged and were slowly eroded from the low relief areas. In the Mesozoic the area was again partly submerged, and isolated lakes developed in which arenaceous sediments were deposited. This was probably contemporaneous with the widespread Mesozoic transgression over large parts of Australia.

Differential warping proceeded during the late Mesozoic or Tertiary with the development of freshwater lakes between divides of some elevation. Lateritisation proceeded on the higher ground and silica and lime leached from the rocks were deposited in the lakes and submerged river valleys. This warping is still reflected in the present land surface in the Barkly Internal Drainage Basin. Slight rejuvenation of the streams has produced the present cycle of erosion.

ECONOMIC GEOLOGY

Petroleum Prospects

No reliable assessment can be made of the oil prospects until the structural and stratigraphic problems are resolved by adequate subsurface work. Stratigraphic drilling and geophysical surveys are essential in this area, as further surface mapping is not likely to solve the problems.

Fossiliferous, fine-grained, marine Middle Cambrian sediments in the western part of the Sheet area and in surrounding Sheet areas may provide source beds; bituminous beds have been reported from some bores in the Barkly Region and some of the silty limestones have yielded residual hydrocarbons on toluene extraction tests. The Camooweal Dolomite and associated dolomites could form reservoirs for oil or gas; the large quantity of sub-artesian water produced from these rocks is proof of their porosity. Some of the rocks in the Camooweal Dolomite are very hard and compact, and drillers' logs frequently record "very tight rock" and "close rock"; these rocks might form a cap to any deeper reservoir beds. However, the structure and the lithological sequence of these potential source, reservoir, and cap rocks are not well known.

The thickness of the Cambrian rocks in this area must be known before the oil prospects can be assessed. Only in the Alexandria No.1 Bore (T.D.1760 feet) has the full thickness been penetrated. The aeromagnetic survey between Tennant Creek and Cloncurry gives 800 feet as the depth to magnetic basement near Wonarah Telegraph Station (Jewell, 1960).

Probably the magnetometer survey is the best geophysical tool to use at this stage. The disadvantage of gravity methods is that in many areas the density of the sediment (dolomite) is greater than that of the underlying basement (sandstone and schist); however, gravity would give the trend of basement features. Seismic work is difficult to carry out successfully in an area of mainly carbonate rocks and a great deal of costly experimentation will probably be necessary before understandable results are obtained.

Although a magnetic survey is probably the best and most economical method, the effect of Upper Proterozoic sediments on the calculations to magnetic basement is a problem to be overcome. It is not sure what effect these sediments will have, or how extensive they will be in the sub-surface. It will be necessary to carry out readings over the Upper Proterozoic Mittiebah Sandstone in the north and extend this survey south over the Barkly Tableland. Magnetic basement crops out at Tennant Creek in the west and at Thorntonia east of the Undilla Basin, but the distribution of these magnetic rocks under the Barkly Tableland is not known. If the Mittiebah Sandstone shows some magnetic effects, then the interpretation of "basement" as far as oil search is concerned will be easier.

Stratigraphic drilling should be tried before any gravity or seismic work is undertaken, and several sites for shallow drilling are suggested at this stage, on the understanding that they may be better positioned if any magnetometer results become available.

1. A cored hole to 500 feet on the Ranken River east of Alexandria Bore No.18 should give the stratigraphic relationship between the Wonarah Beds, the Ranken Limestone and the Camooweal Dolomite.

2. A cored hole to 500 feet near Weaner Waterhole in the centre of the area may give the relationship of the fossiliferous dolomite to the Camooweal Dolomite. The relationship of these possible source beds with the wide-spread unfossiliferous dolomite must be clearly understood before possible migration paths can be traced.

3. A cored hole to at least 1000 feet near Bore 3 Alexandria should penetrate a similar sequence of Cambrian sediments as did Alexandria Bore No.1; it would provide accurate information on lithologies in what may be the deepest part of the Cambrian sequence and reveal the relationship between the Burton Beds and the Camooweal Dolomite.

These bores should also provide a guide for an interpretation of the drillers' logs of the surrounding water bores. The best site for a deep stratigraphic bore is outside the area, and, on present knowledge would be either on the Lake Nash Anticline (Avon Downs Sheet area) or near Morstone (Camooweal Sheet area).

Water Resources

Surface water resources in the Ranken Sheet area are inadequate for the present level of cattle stocking. None of the watercourses are perennial and few waterholes are premanent because of the low rainfall, low relief and high evaporation. Consequently, the development of the cattle industry in this area is dependent on the availability of underground water.

Within the Ranken Sheet area, there are over seventy known water bores, about sixty are in good working order. Very few of the non-working or abandoned bores have failed because of hydrological reasons. When station paddocks are changed, working bores are often no longer required and are at least temporarily abandoned. In other cases, bores are damaged through silting or mechanical breakdown which has forced their temporary abandonment. Some bores have not been completed because of drilling difficulties caused by technical and labour problems. None of the bores are artesian; early in the 1900's Alexandria Bore No.1 was drilled to tap artesian water in the wrong belief that the Barkly Tableland was a continuation of the Queensland Mesozoic Great Artesian Basin. The bore tapped good water from an aquifer at 238 feet, five feet below the local water pressure surface (Randal, 1962).

The quality of the sub-artesian water is variable but it is generally fit for consumption by humans and stock. Few chemical analyses are available but the waters contain varying amounts of calcium, magnesium, sulphates, carbonates and chlorides.

So far it has not been possible to determine the type and number of aquifers in the region; drillers' logs give scanty lithological information (Plate 1) and little information on structure is available from surface mapping. Most bores in the dolomite areas have provided a good supply of water from aquifers between 635 and 245 feet above sea-level; an exception is Alexandria Bore No.17, where the aquifer is 30 feet below sea-level. The water pressure surface (standing water level) ranges from 540 feet to 645 feet above sea level (Randal, 1962). The yield of most bores is determined largely by the capacity of the pumping equipment; most have been tested at 2000 g.p.h. but pastoralists generally regard the supply as being "unlimited" as far as their requirements are concerned.

The hydrology of the Ranken area cannot be dealt with as a separate entity; it must be considered in relation to the surrounding areas of the Barkly Tableland. This problem is discussed in a progress report on the Hydrology of the Eastern Barkly Tableland (Randal, 1962).

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APPENDIX I

FOSSIL LISTS

Fossil lists from each locality are not yet prepared. A resume of the forms from a number of areas are given below (Öpik, 1957).

Burton Beds

Old well, 7 miles north-west of Alexandria :

"Xystridura" browni

Xystridura, two species

Lyriaspis alroyensis

Eurostina trigona

Pageta significans

Oryctocephalus

Peronopsis elkedraensis

Peronopsis sp.

Beyrichona

Stenotheca

Obulus

Acrotreta

Lingulella

Acrothele

Biconulites

Alexandria Homestead :

Hyolithes, Eurostina

East of Alexandria :

Xystridura
Pagetia
Kootenia
Fuchonia(?)
Peronopsis
Lyriaspis

North-east of Alexandria :

Redlichia
Pagetia
Peronopsis
Biconulites
Xystridura
Oryctocephalus
Archaeocyathus

The Burton Beds contain no species in common with the Middle Cambrian Xystridura-Dinesus fauna of Queensland.

Wonarah Beds

"Xystridura" browni

Xystridura sp.

Pagetia significans

Oryctocephalus

ptychoparids

Peronopsis sp.

Helcionella

brachiopods

No Queensland species appear, but the fauna of the Burton Beds is well represented.

Ranken Limestone

Kootenia
Asaphiscus
Peronopsis
Archaeocyathus
Biconulites
Hyolithes
Helcionella
Cymbionites
Peridionites
Eocystis
Acrothele
Lingulella
Bohemiella
Nisuia(?)

At a single locality in the Ranken Limestone:

Asthenopsis
Papyriaspis

APPENDIX 2

Notes on the Petrology of the Burton Beds and the Ranken Limestone

Burton Beds

The Burton Beds contain siltstone, chert, calcareous or silicified coquinites, pellet and oolitic limestones, intraformational pebble conglomerates, and fine and coarse-grained crystalline limestones.

The crystalline limestones contain complete fossils and fossil fragments. The shells are filled with fine-grained calcite which represents an original lime mud. The fine-grained limestones contain oolites and pellets in addition to the shelly fragments.

In some specimens fine-grained calcite has recrystallised into coarse, clear calcite. The process started from scattered centres and has isolated areas of dark fine-grained calcite which gives the rock the appearance of a pellet limestone with a sparry calcite cement (Plate 1, Figure 2). The recrystallisation has not completely obliterated fossils or oolites but may have removed other primary structures. In some instances the fossils appear as ghosts due to a variation in grainsize between the calcite replacing them and the calcite of the matrix.

Coquinites and biocalcarenites are common in the calcareous rocks of the Burton Beds. The coquinites are mainly composed of trilobites and hyolithids cemented by sparry calcite; brachiopod and echinoid coquinites have a matrix of fine-grained dark brown calcite. The interiors of the shells are filled with sparry calcite (Plate 2, Figure 1).

Dolomite rocks occur in an old well east of Alexandria. They are pale grey to green and are very finely crystalline. They may represent either an original dolomite mud or a dolomitised lime mud.

Silicification is common in rocks which occur as scattered scree in the black soil. It is not known if it is a diagenetic feature or caused by the weathering of rocks under laterite conditions. Laterite remnants are common in this area. The silicification is often complete, but it has not entirely destroyed the original limestone texture. Very fine-grained chert in the rocks retains the original organic and clastic structure; detrital material appears dark due to organic inclusions or is outlined by dark matter forced out during silicification. The original voids between the detrital fragments are lined with brown, colloform, fibrous chalcedony (Plate 4, Figure 2). This type of silicification is generally found in the coquinites in which weathering has left the fossils in relief.

In the pellet and oolitic limestones, silicification has proceeded somewhat differently. The oolites and pellets are replaced by a fine mosaic of chert and the original voids between them by a coarser chert mosaic; the chert in the centre of the voids is more coarsely crystalline than near the edges.

The silica is not a primary cement but replaces an original cement of sparry calcite. The replacement is complete, but it is not controlled by the original carbonate grainsize. The outline of the original sparry calcite cement can be seen in the chert; it lined the voids but it did not completely fill them. The remaining space was filled with iron oxides or carbonates, and these now outline the ghosts of the calcite crystals in the chert.

Ranken Limestone

The Ranken Limestone consists of fine-grained limestone, crystalline limestone and coquinites. Some dolomitic rocks occur. The rocks are petrologically similar to the carbonate rocks of the Burton Beds.

The fine-grained limestones consist of pellets and fossil fragments in a matrix of optically dense, fine-grained calcite. Terrigenous material of silt size is present in pellets as quartz, feldspar and mica. The fine-grained sediments were originally lime muds and vary in grainsize due to either a variation in the size of the original mud particles, or to later recrystallisation.

Echinoid plates and spines are found in the fine muds, trilobites are present in the coarser sediments. Silty lime muds contain siliceous spicules and calcispheres. In one specimen this type of sediment grades into opaline silica which contains euhedral dolomite rhombs. Some of the limestones have been replaced in part by chert and fibrous chalcedony.

PLATE 1

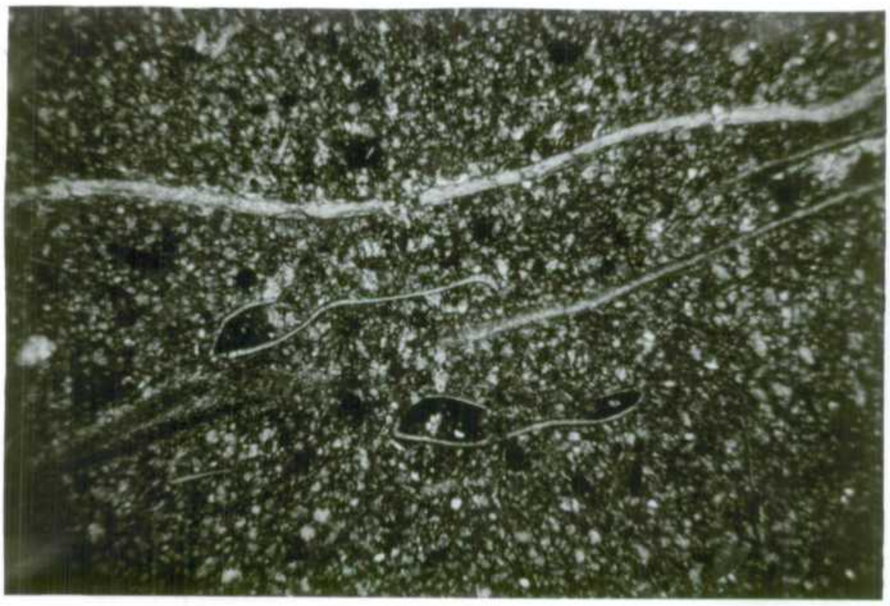


Figure 1. Fossil remains in a fine-grained calcite (lime mud) matrix.

M/197/7/21/RK-F

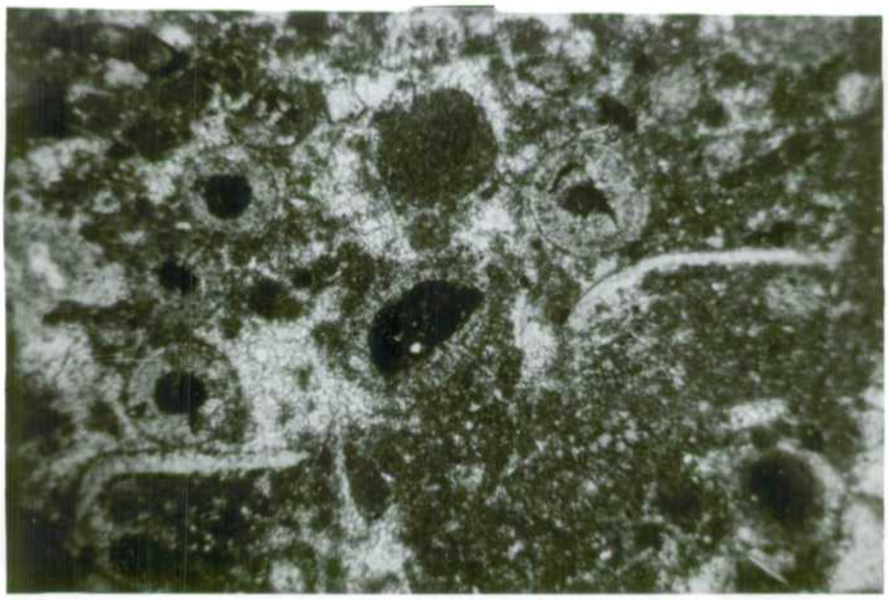


Figure 2. Oolites, fossil fragments, and pellets in a lime mud matrix, which is recrystallising to a clear calcite mosaic. The recrystallisation isolates small areas of mud which have the appearance of pellets.

M/197/7/27/RK130.

PLATE 2

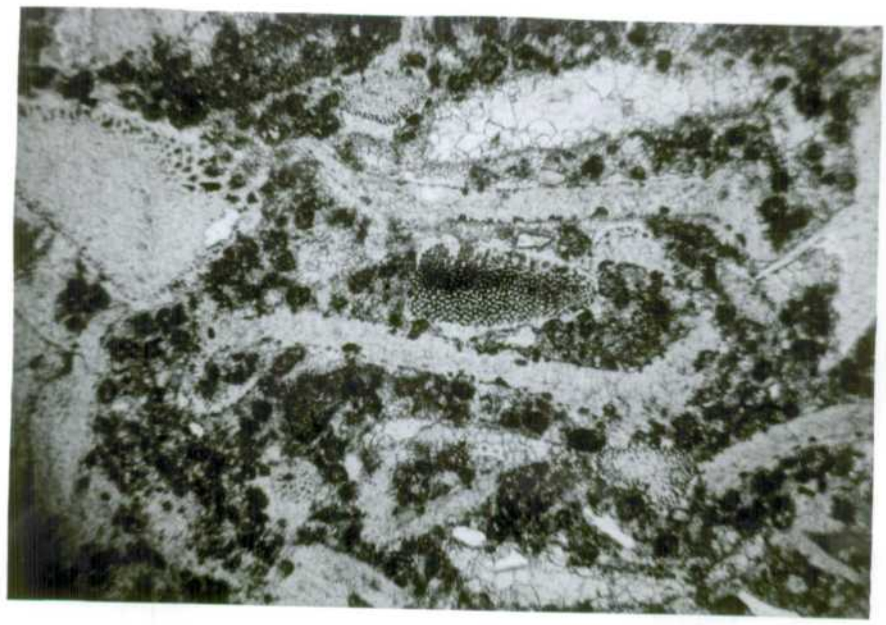


Figure 1. Coarse coquinite of brachiopod and echinoid(?) fragments in a lime mud matrix with pellets.

M/197/8/1/RK109

Figure 2. Crystalline echinoid biocalcarenite. The dark areas may be original lime mud matrix or more probably irregular lime mud pellets washed in from outside the area of deposition.

M/197/7/25/RK131

PLATE 3

Figure 1. Recrystallised calcarenite with pellets and oolites. Note the radial calcite crystals of the recrystallised oolites.

M/197/8/2/RK107

Figure 2. Recrystallised limestone, with all structures obliterated except the fossil fragments. Note the dolomite crystals (euhedral rhombs) formed during the recrystallisation, probably from high-magnesian organic calcites.

M/197/7/30/RK121

PLATE 4

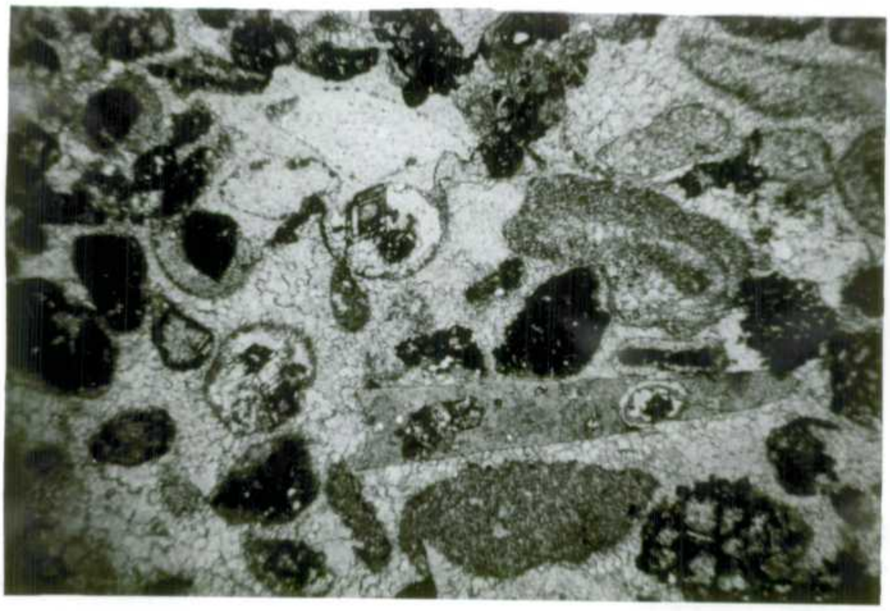


Figure 1. Biocalcarenite of coarse detrital pellets, oolites, echinoid plates and organic remains, cemented by sparry calcite. Note the solution of oolites due to pressure, and the replacement of the detrital grains by zoned siderite rhombs.

M/197/7/26/RK131

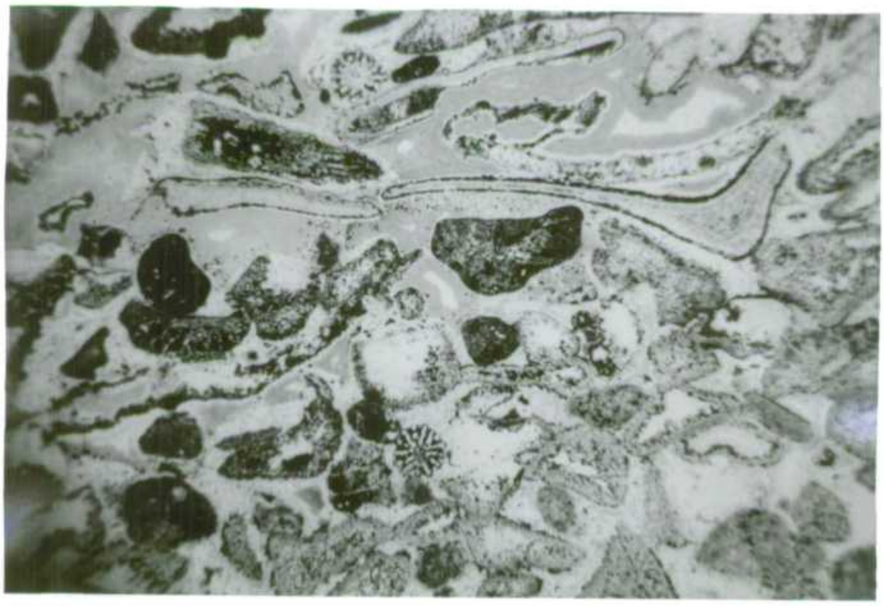


Figure 2. Silicified biocalcarenite of fossil fragments and pellets. Note the fibrous brown chalcedony lining the original voids between the detrital grains.

M/197/7/22/RK145

PLATE 5

Figure 1. Silicified biocalcarenite of fossil fragments and pellets.

M/197/8/3/RK101

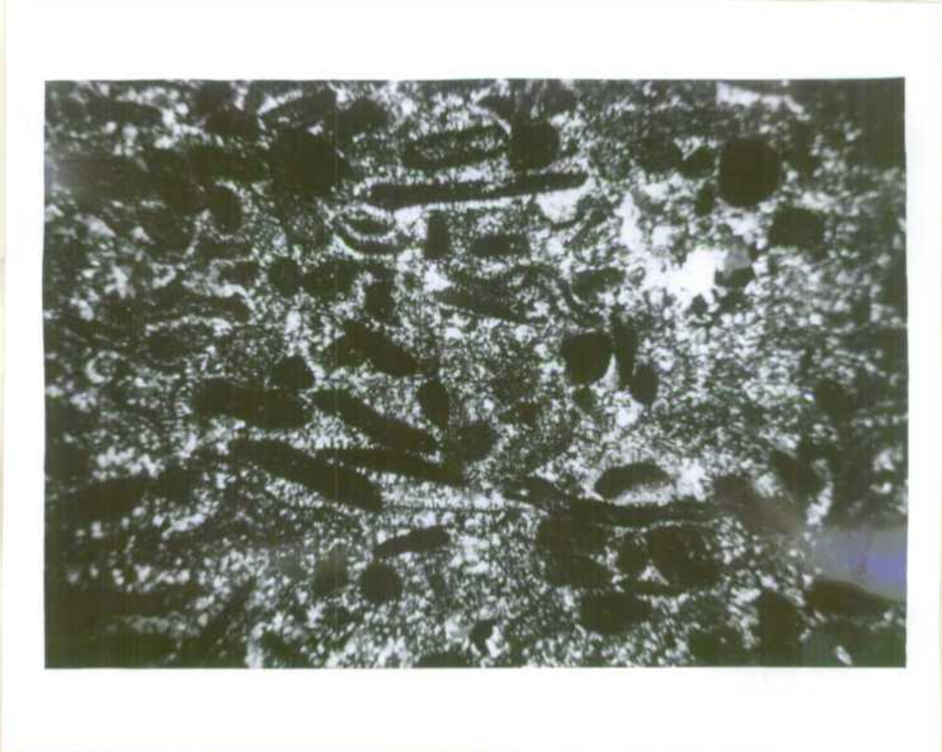


Figure 2. As above, crossed nicols. The fragments are replaced by fine-grained chert, and the cement is replaced by coarser fibrous chalcedony and quartz.

M/197/8/4/RK101.

PLATE 6

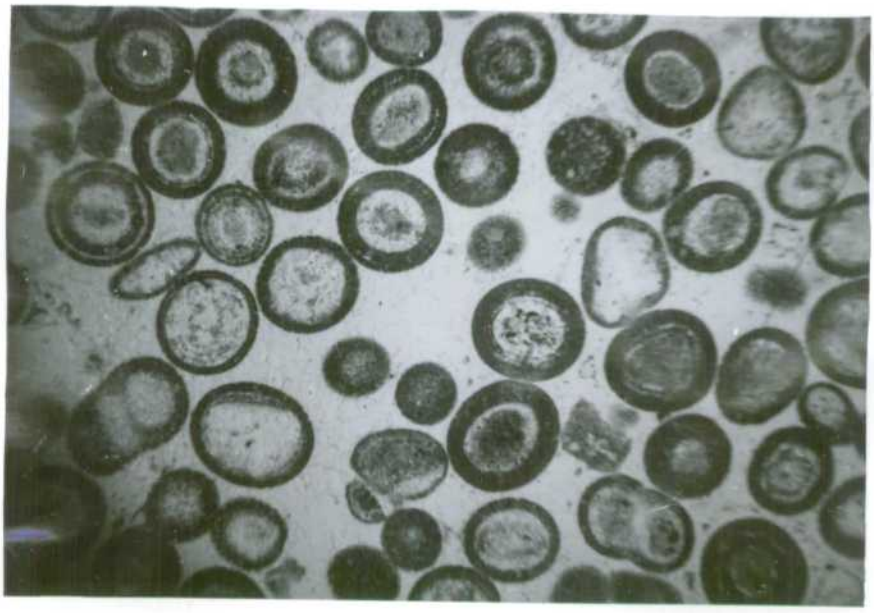


Figure 1. Silicified oolite. The oolites are partly replaced by very fine-grained chert, and the cement by coarser quartz.

M/197/7/34/RK114

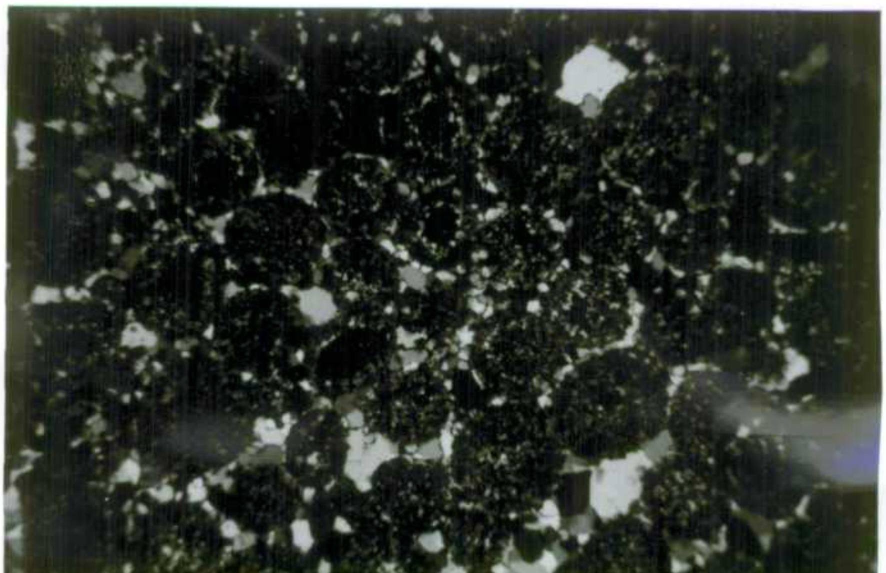


Figure 2. Silicified oolite, crossed nicols. The oolites have been partly replaced by a mosaic of chert, and the cement by a mosaic of quartz which increases in grainsize away from the boundaries of the oolites.

M/197/7/33/RK11

PLATE 7

Figure 1. Silicified coquinite, partly replaced by fine-grained chert, with a cross section of a trilobite.

M/197/7/36/RK111

Figure 2. Silicified coquinite. The fossil fragments are replaced by fine-grained chert, and filled with fibrous chalcedony. The matrix or cement is replaced by fine to coarse-grained chert and chalcedony.

M/197/7/31/RK117

PLATE 8

Figure 1. Lime mud deposit with silty terrigenous material and organic remains.

M/197/8/6/RK70

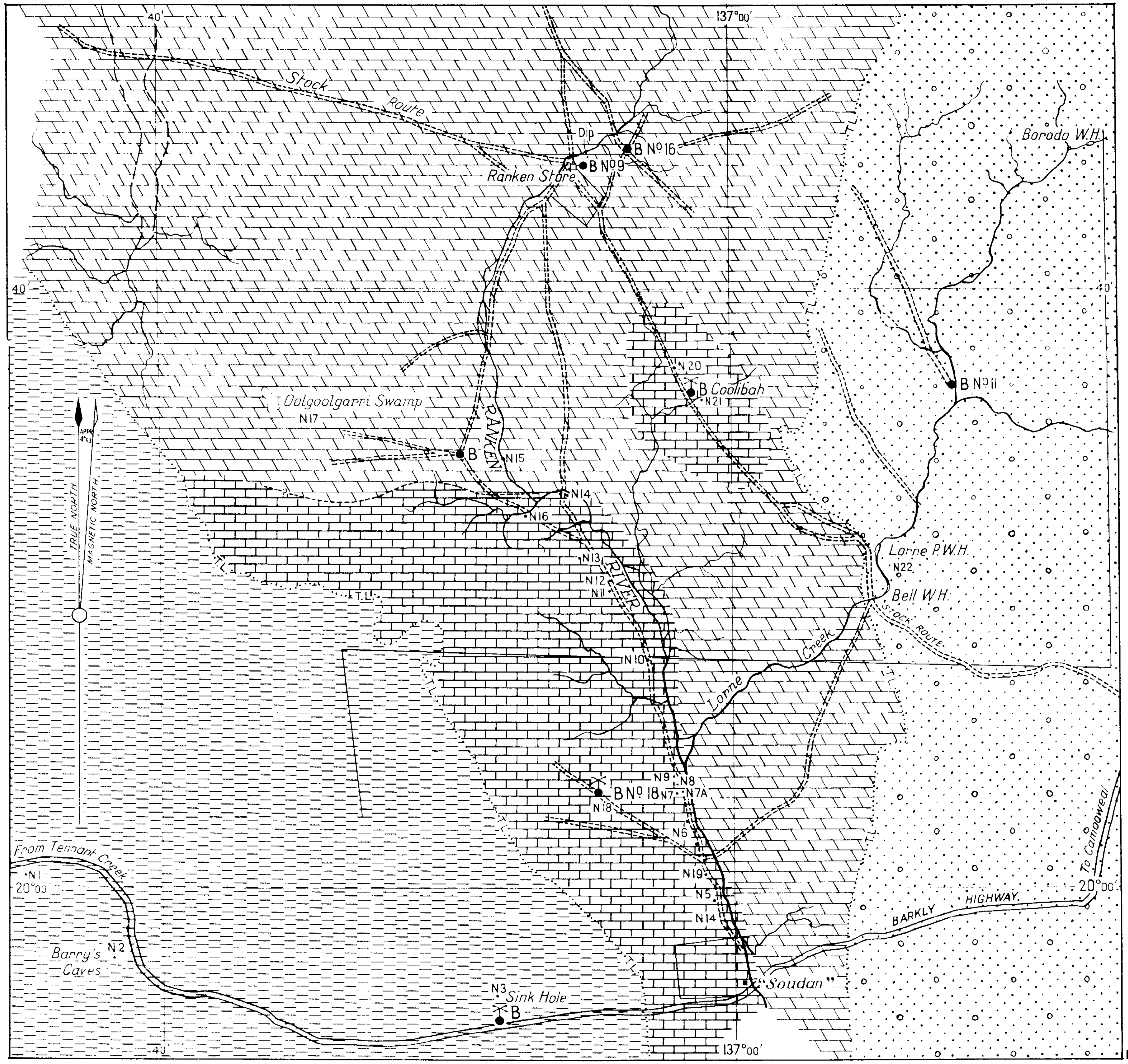
Figure 2. Fragmental pellet limestone with recrystallised cement. The pellets, pebbles, and organic remains are also recrystallising.

M/197/8/9/RK68

GEOLOGY
OF
THE RANKEN RIVER AREA
NORTHERN TERRITORY
RANKEN AND AVON DOWNS 4 MILE SHEETS

SCALE

5 4 3 2 1 0 5 10 MILES



REFERENCE

Sandstone and conglomerate (Mesozoic)

Shale, chert etc ("Wonarah beds") Middle Cambrian

Ranken Limestone (Middle Cambrian)

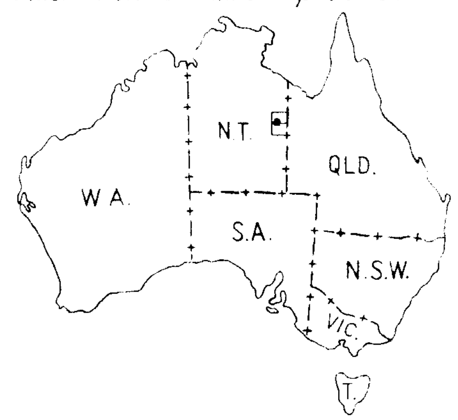
Camooweal Dolomite

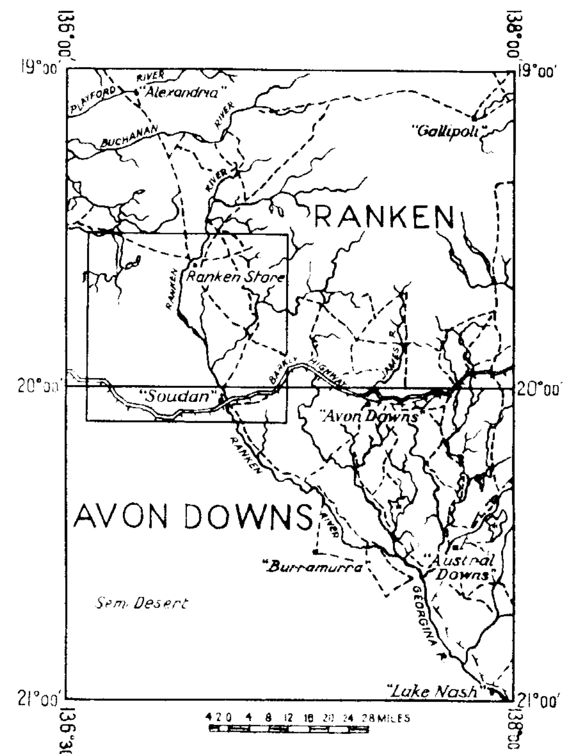
T.L. "Timber Line"

·N22 Recorded locality

• B Bore

Locality Map showing area dealt with in report and reference to Australian Four Mile Map Series.





NT 72-1

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS. MARCH 1955

A Reduce AC (12") to AB (9⁶⁄₁₀") B C

INTERPRETATION OF DRILLER'S LOGS IN THE RANKEN SHEET AREA.

Bureau of Mineral Resources, Geology and Geophysics. April 1962

To accompany Record 1962/55, 61

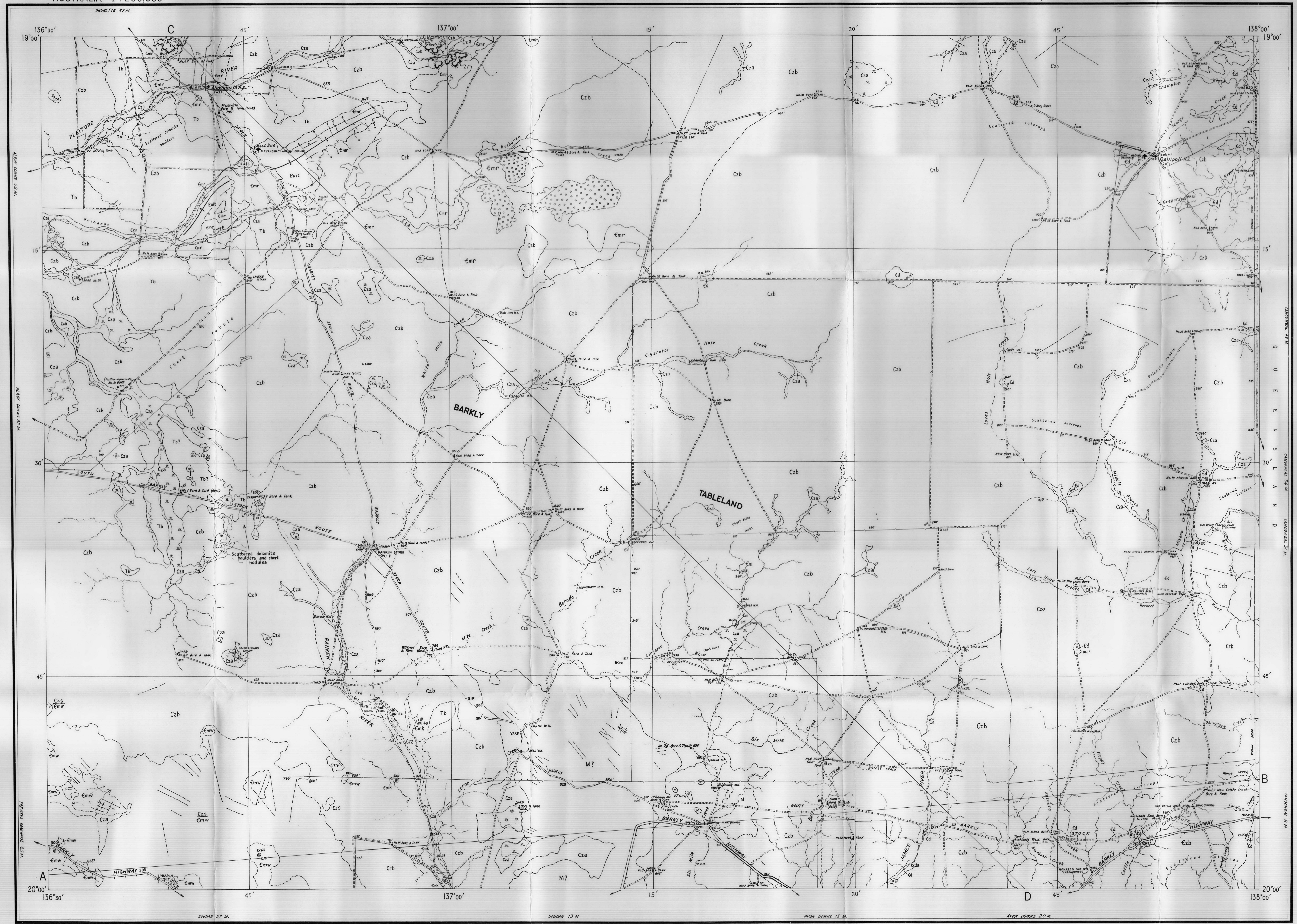
E 53/16/3

RANKEN

NORTHERN TERRITORY

AUSTRALIA 1 : 250,000

1 : 250,000 GEOLOGICAL SERIES SHEET SE 53-16



PRELIMINARY EDITION, 1962

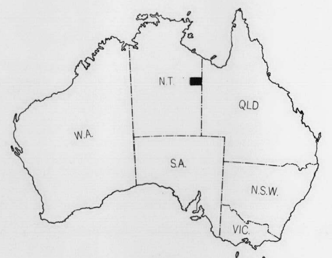
SUBJECT TO AMENDMENT

Reference

CAINOZOIC			Cza	*Alluvium and gravel*
			Czb	*Black soil, clayey soils, minor sand and gravel*
			Czs	*Residual sand, minor black soil and gravel*
			(stippled)	*Laterite*
	Tertiary	Brunette Limestone	Tb	*White nodular limestone and dolomite with siltstone and gypsum, some chert*
MESOZOIC		Undifferentiated	M	*Quartz sandstone, silicified in part; some pebble conglomerate*
PALAEOZOIC	Middle Cambrian	Undifferentiated	€m	*Fossiliferous crystalline dolomite and chert*
		Burton Beds	€mr	*Fossiliferous siltstone and chert, calcarenite, coquinite, crystalline limestone*
		Wonarah Beds	€mw	*Fossiliferous silicified limestone, siltstone, chert, silicified shale*
		Ranken Limestone	€mk	*Fossiliferous and crystalline limestone, some chert nodules*
	Cambrian	Camooweal Dolomite	€d	*White crystalline dolomite with chert nodules and bands*
PRECAMBRIAN	Upper Proterozoic	Mittiebah Sandstone	Ꝑuit	*Cross-bedded quartz sandstone, glauconite sandstone, rare pebbles and cobbles*

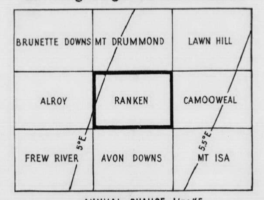
Geological boundary, position approximate
Strike and dip of strata
Horizontal bedding
Dip < 15°
Bedding trend lines
Joints
Anticlinal fold axis
Fault
(Dip < 15° to Fault: *Air-photo interpretation*)
Macrofossil locality
× RK 60 *Specimen locality and number*
· 860′ *Barometric spot height in feet*
Sealed or graded road
Vehicle track
Track (4 wheel drive vehicles only)
Fence
Telephone line
Homestead
Yard
Airfield
Dam on stream
W.H. *Waterhole*
Bore
Abandoned bore
Windpump
N.M.H. 50 *Astro station*

Compiled and published by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development. Topographic base compiled by the Division of National Mapping, Department of National Development. Aerial photography by the Royal Australian Air Force; complete vertical coverage at 1:46.500 scale. Transverse Mercator Projection.



INDEX TO ADJOINING SHEETS

Showing Magnetic Declination



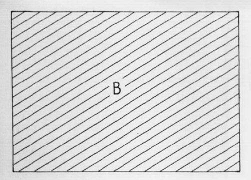
ANNUAL CHANGE 1′30″E

Scale 1 : 250,000

5 0 5 10 15 MILES

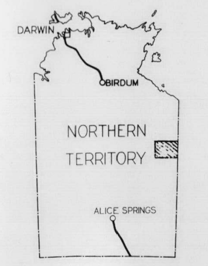
5 0 5 10 15 20 25 KILOMETRES

GEOLOGICAL RELIABILITY DIAGRAM



B *Reconnaissance, numerous traverses and air-photo interpretation*

Geology by: M.A. Randal, G.A. Brown, and A.A. Öpik
Compiled 1961 by: M.A. Randal and G.A. Brown
Drawn by: G. Matveev



Sections

Scale $\frac{V}{H} = 4$