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COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.
BUREAU OF MINERAL RESOURCES
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RECORDS.

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EXPLANATORY NOTES ON ROBINSON RIVER
1:250,000 GEOLOGICAL SHEET. N.T.

by

K.R. Yates.

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

YATES - ROBINSON RIVER (1962)

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INTRODUCTION.

The Robinson River Sheet area lies within the latitudes $16^{\circ}00'$ and $17^{\circ}00'S$, and longitudes $136^{\circ}30'$ and $138^{\circ}00'E$ on the south-western coast of the Gulf of Carpentaria, Northern Territory. The eastern boundary is the Queensland Border.

Access to the area is by graded unsealed road west from Borroloola, which is situated fourteen miles to the west, and which is connected by a newly constructed unsealed road from Daly Waters on the Stuart Highway. Roads of similar quality to the Borroloola road link the area with Calvert Hills and Wollogorang Homesteads to the south and south-east respectively. There is an unsurfaced airstrip at Robinson River Homestead, which is visited by a weekly light aircraft service from Mount Isa, Queensland.

The five white people in the population live at Robinson River and Manangoora, which are the only permanent habitations.

The photographs and maps covering the Robinson River Sheet area are: air photographs at a scale of 1:50,000, flown by the R.A.A.F. during 1947 and 1952; photo-mosaic map (1 inch to 4 miles), prepared in 1952 by the Division of National Mapping, Canberra; dyeline maps (1:46,500) with principal points and topography controlled by slotted-template assembly, by the Division of National Mapping, Canberra; McArthur River 8-mile military series E53-3-4-7-8, prepared in 1941 by the A.H.Q. Cartographic Company; Robinson River, SE53/4, 1:250,000 planimetric map prepared in 1961 by the Division of National Mapping, Canberra.

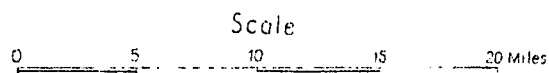
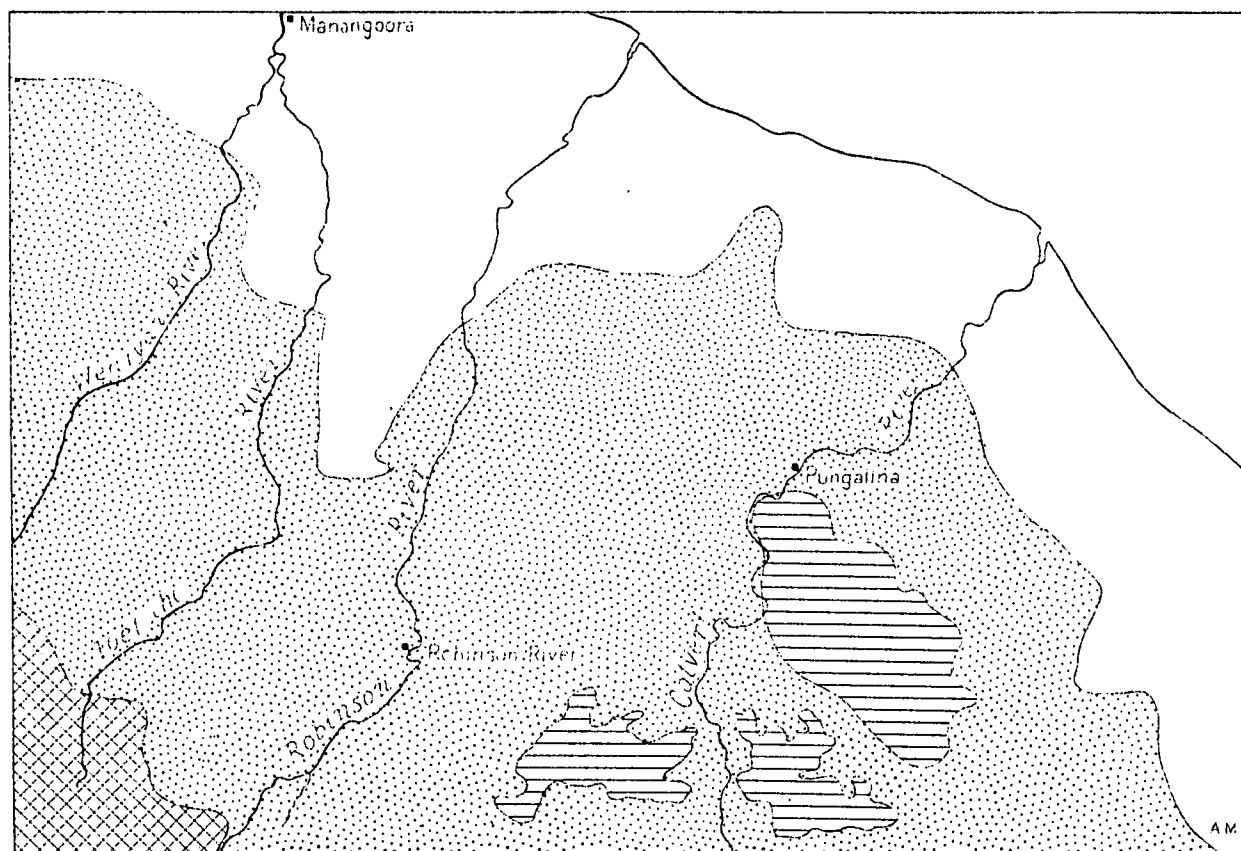
Slatyer & Christian (1954) state that the area has a subhumid climate with a rainfall of 25 to 30 inches a year, which is almost entirely confined to the monsoon period, December to March; the maximum monthly rainfall is about 8 inches in January. The mean summer temperature is $80^{\circ}F$ to $85^{\circ}F$, and the winter mean temperature is $70^{\circ}F$ to $75^{\circ}F$. The annual range in temperature is $40^{\circ}F$.

The vegetation is dominated by open Eucalyptus woodland and a ground layer of sclerophyllous tussock grasses, mainly spinifex.

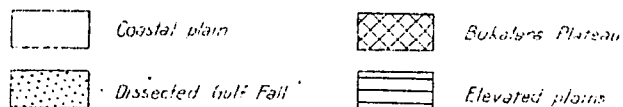
PREVIOUS INVESTIGATIONS.

The first geological account of rocks in the neighbourhood of the Robinson River Sheet area was made by Jensen who described the present Gold Creek Volcanic Member and sandstone of the Masterton Formation in the Redbank copperfield about thirteen miles south of the south-eastern edge of the Sheet area. Jensen (1940) recognised the

PHYSIOGRAPHIC DIVISIONS OF ROBINSON RIVER SHEET AREA



Reference



present 'Wollogorang Formation', two stages of sandstone within the Masterton Formation, and five main stages within the Gold Creek Volcanic Member at the same locality.

From photo-interpretation in the headwaters of the Robinson River, Noakes & Traves (1954) identified well-jointed sandstone, which they called the 'Robinson Beds'.

In the period 1956 to 1957, Mount Isa Mines Limited held Authorities to Prospect which included about 650 square miles in the south-western corner and 400 square miles in the south-eastern corner of the Sheet area. Preliminary photo-interpretation was carried out by M. Kriewaldt, and some geology by Haney (1957) and Battey (1956 and 1958).

The Bureau of Mineral Resources made a short survey of the region in 1957 and a provisional map was compiled in 1958 by J.B. Firman, (1959). During 1959, geophysicists of the Bureau of Mineral Resources made a reconnaissance gravity survey through the area.

In 1961, the Bureau of Mineral Resources mapped the Robinson River Sheet area as part of a programme of regional mapping of the Carpentaria Upper Proterozoic Province.

PHYSIOGRAPHY.

Four major physiographic divisions are recognised in the Robinson River area: Coastal Plain; Dissected Gulf Fall; Bukalara Plateau; and Elevated Plains.

The Coastal Plain is a flat to gently sloping surface covering the entire northern section of the Sheet area. It is bounded to the south by the Gulf Fall and extends for forty miles inland, rising from sea level to 150 feet. The surface consists essentially of sand and soil, covering laterite which is exposed to a depth of about 30 feet in the Foelsche River.

Most of this surface was exposed in Recent times by a eustatic fall in sea level, which established a well-developed emerged coastline and relict coastal physiography for ten miles inland. The coastline has a shelving beach and numerous sand-dunes on the seaward side of lagoons, which are intermittently flooded and evaporated. This regression has also resulted in the entrenchment of northerly flowing streams, so that alluvium is deposited only on and near the coast.

The drainage pattern is dendritic and stream gradients are low.

Dissected Gulf Fall. The area of the Gulf Fall (Stewart, 1954) is bounded to the north by the Coastal Plain and to the south by the Barkly-Beetaloo Tableland (Dunn, Smith & Roberts, 1962). The topography is hilly to gently undulating and dissected by northerly flowing rivers,

whose headwaters have cut V-shaped gorges up to 200 feet deep. The north elevation of the region ranges from 150 feet near the Coastal Plain to the east, to 600 feet near the Bukalara Plateau to the south-west. The gradient of the Gulf Fall is gradual from south-west to north-east, and local relief rarely exceeds 200 feet.

The less resistant beds are generally not preferentially eroded due to the gentle to horizontal dip. This preferential erosion has only affected outcrops of the Roper Group and Tawallah Group at the headwaters of the Foelsche River. Some of the subsidiary drainage on the Masterton Formation has been controlled by the jointing.

The broad plateau of the sandstone of the Masterton Formation is the most distinctive physiographic feature in the Gulf Fall division. It is bounded by escarpments 100 feet to 200 feet high at its junction with the Coastal Plain. The topography of the remainder of the Gulf Fall is mostly gently undulating and developed on the Karns Dolomite.

The Bukalara Plateau is an elevated region in the south-western corner of the Sheet area. It occupies 200 square miles and is the highest physiographic feature within the Sheet. It extends over about 1,000 square miles in Bauhinia Downs Sheet area (Smith, 1962) and a smaller area in the Calvert Hills and Wallhallow Sheet areas. Elevation ranges from 600 to 800 feet. The drainage pattern is controlled by the joints of the Bukalara Sandstone, which is the local rock formation. At the headwaters of the Foelsche River, the Bukalara Sandstone has been completely eroded and the drainage superimposed on the underlying Tawallah Group.

The Elevated Plains are flat plains lying 500 feet above sea level. Their surfaces consist of sand cover over laterite which formed on Karns Dolomite, Lower Cretaceous sediments, and sandstone of the Masterton Formation. Stewart (1954) suggested that the Plains represent remnants of a once extensive laterite surface.

STRATIGRAPHY.

The Robinson River Sheet area consists of three major rock groups of Upper Proterozoic age: the Tawallah, McArthur, and Roper. The Tawallah Group is a sequence of arenite, carbonate, and volcanic rocks; the McArthur Group represents a period of carbonate sedimentation; and the Roper Group one of alternating arenite and lutite deposition.

The Upper Proterozoic is unconformably overlain by the Lower Cambrian Bukalara Sandstone.

Mesozoic (Lower Cretaceous) freshwater and marine sediments locally unconformably overlie the Precambrian and Palaeozoic sequences.

PRECAMBRIAN.Age of Units.

Jensen (1940) tentatively assigned the rocks of the 'Redbank system' (on north-eastern Calvert Hills Sheet, approximately 13 miles south of the southern boundary of Robinson River Sheet area) to the Cambrian, and correlated volcanics there with the Edith River Volcanics of the Katherine-Darwin Region. The age of both these rocks he regarded as Lower Cambrian. In a later publication Jensen (1942) made more detailed correlations and divided the rocks of the Redbank sequence into two groups: Middle Cambrian and Lower Cambrian. The ages of the rocks now known as Karns Dolomite and the sandstone of the Masterton Formation overlying the 'Gold Creek Volcanic Member' were said to be Middle Cambrian, and the Gold Creek Volcanic Member and Wollongorang Formation were Lower Cambrian. David (1950) also correlated the units at Redbank with Cambrian rocks elsewhere in Australia.

The rocks of the same area were included by Noakes & Traves (1954) in the 'Carpentaria Complex', which was considered to be of Lower Proterozoic age. The 'Robinson Beds', which unconformably overlies the Carpentaria Complex and are now known as the 'Bukalara Sandstone' were designated as Upper Proterozoic.

Hossfeld (1954) used the term 'Carpentaria Group' for the entire sequence, which he considered to be Middle Proterozoic; however, the white quartzite forming caps of mesas and tablelands between Borroloola and Wollongorang was placed provisionally within the Upper Proterozoic. This may correspond to the sandstone of the Masterton Formation or the Bukalara Sandstone. In 1956, Noakes agreed with Hossfeld that most of the sequence belonged to the lower part of the Upper Proterozoic.

The units of the Tawallah Group on Westmoreland Sheet area, Queensland, were regarded by Carter (1959) as Upper Proterozoic by direct correlation with strata in the Constance Range, which unconformably overlies Lower Proterozoic sediments.

On the Calvert Hills Sheet (Roberts et al., 1962) the basal unit of the Tawallah Group unconformably overlies the Nicholson and Norris Granites, Clifffdale Volcanics, and Murphy Metamorphics. Potassium-argon dating of the Norris Granite has shown an age of 1841 m.y., which is within the Lower Proterozoic era. Dunn et al., (1962) have shown the age of Bukalara Sandstone, which unconformably overlies the Roper Group, to be Lower Cambrian.

UPPER PROTEROZOIC.Tawallah Group.

Less than half the total thickness of the Tawallah Group crops out in the Robinson River Sheet area: the full sequence is present in both the Calvert Hills and Pauhina Downs Sheet areas. The units present are, in ascending stratigraphic order, the Aquarium Formation, the Settlement Creek Volcanics, the Wollogorang Formation, and the Masterton Formation, which contains three members.

The sediments were deposited on a stable shelf, which continuously and slowly subsided, and on which volcanics were periodically extruded.

The Aquarium Formation outcrops more extensively in the adjacent Calvert Hills area, where it is 550 feet thick and conformably overlies the Sly Creek Sandstone (Roberts et al., 1962). On the uppermost section is exposed in the Robinson River Sheet area; it consists of micaceous glauconitic siltstone, dolomite, and dolomitic siltstone, and constitutes only a small percentage of the unit, which consists dominantly of fine-grained glauconitic sandstone. Since the Aquarium Formation contains glauconite and conformably overlies the Sly Creek Sandstone, Smith (1962) has correlated it with the Rosie Creek Sandstone in the Tawallah Range west of Borroloola.

The abundance of glauconite suggests that these sediments accumulated in a neritic environment where the conditions were reducing, deposition was slow, and turbulence low.

The basalt within the Settlement Creek Volcanics commonly contains interstitial micrographic intergrowths of quartz, potash feldspar, and plagioclase, which is invariably andesine. Magnetite may be locally abundant, and pyrite is commonly an accessory constituent. Mostly the rock is partly or completely altered to an assemblage of chlorite, calcite, and uraltic amphibole. The presence of quartzofeldspathic residuum suggests that the basalt was derived from a tholeiitic magma.

Vesicular and amygdaloidal basalts occur locally, and amygdaloids may contain a green mineral similar to that in the Gold Creek Volcanic Member. W.M.B. Roberts (pers. comm.) determined this mineral by X-ray analysis to be celadonite (micaceous glauconite). Some of the volcanics contain quartz-haematite, fibrous amphibole, or serpentine veinlets.

In the Hopplestrap Creek area, the igneous rock has incorporated irregularly arranged slabs of fissile, finely laminated purple to green siltstone, which occurs elsewhere within the formation as thin interbeds. It is not evident whether this igneous rock is extrusive or intrusive; but the presence of local coarse grainsize (up to 3.5 mm)

and large micrographic quartz-orthoclase intergrowths elsewhere within the formation suggests the probable local occurrence of dolerite sills or dykes.

This volcanic succession is absent from the Tawallah Group sequence in the adjacent Bauhinia Downs Sheet area (Smith, 1962), except for several small areas on the southern border.

The full sequence of the Wollogorang Formation occurs in the Robinson River Homestead area. The stratigraphic succession at the headwaters of the Foelsche and Robinson Rivers is similar, except for the presence of a distinctive bed of dolomitic siltstone near the base of the unit. This siltstone contains ovoid nodules of dolomite, the long axes of which parallel the bedding, and is a prominent stratigraphic marker in the Calvert Hills Sheet area (Roberts et al., 1962).

Chemical analysis of a dolomite from the Robinson River Homestead area shows 78.9 per cent dolomite, 4.4 per cent calcite, and 0.53 per cent siderite by weight.

Masterton Formation: Firman (1959) recognised the 'Gold Creek Volcanics', which were overlain conformably by the 'Masterton Sandstone'.

In the Redbank-Wollogorang area in the Calvert Hills Sheet area the volcanics are underlain by the Wollogorang Formation. This is not the case farther west, for example at the headwaters of the Robinson River, where the volcanics are considerably thinner and both underlain and overlain by sandstone of relatively uniform lithology.

Two miles south-east of Robinson River Homestead there is about 10 feet of basic volcanics underlain by about 50 feet of sandstone. This exposure suggests that in some sections of the sandstone succession the volcanics may be absent. Because the volcanics are lenticular and the sandstones above and below them are similar to each other the term 'Masterton Formation' is preferred to 'Masterton Sandstone' for the sedimentary and volcanic unit. One of the volcanics is named the Gold Creek Volcanics Member; other members of the Masterton Formation are the Hobblechain Rhyolite Member and the Pungalina Member.

Sandstone constitutes most of the Masterton Formation. The total thickness of sandstone is greater than the total thickness of included members, except in the south-eastern corner of the Sheet area where the Hobblechain Rhyolite Member occurs and the Gold Creek Volcanic Member is thickest.

The arenaceous sediments are characterised by well developed traction current structures such as current beds and ripple marks. Quartz is the dominant constituent, but some white to yellow kaolin matrix, probably feldspar, is ubiquitous. Sandstone and siltstone fragments occur occasionally and secondary silica cement is invariably present.

The presence of thin small lenses of polymictic conglomerate,

which contain sandstone and igneous rock pebbles and cobbles, suggests a granitic acid volcanic sandstone provenance.

The Gold Creek Volcanic Member consists of basic volcanics, dolomitic lithic sandstone, dolomitic sandstone, tuffaceous siltstone, and volcanic breccia and agglomerate. It varies in thickness:

<u>Locality</u>	<u>Thickness in Feet</u>
2 miles south-east of Robinson River Homestead	10
4 miles south of Robinson River Homestead	25
Headwaters of Robinson River	100
Gold Creek area	150 (+)
10 miles south-east of Redbank Mine, Calvert Hills Sheet area (measured)	430

In the Bauhinia Downs Sheet area (Smith, 1962) the Gold Creek Volcanic Member occurs only in the extreme south-east. The increase in the thickness eastwards suggests that the major site of vulcanism was in or near the Gold Creek area.

Some of the sandstone interbedded with the volcanic sequence is distinctive in texture and composition; it consists of subrounded to subangular medium-grained fragments of quartz, basic volcanics, microcline, and sandstone in a dolomite cement. In the Gold Creek area, where these interbeds occur, the volcanics rest conformably on the Wollogorang Formation (Roberts et al., 1962). Thus the presence of dolomite cement in these sandstones indicates that carbonate deposition did not completely cease at the onset of vulcanism.

The basic volcanics are saussuritized and uralitized and amygdales are characteristically filled by chalcedonic silica, hematite and celadonite. Highly fissile laminated greenish-grey tuffaceous siltstone constitutes between 25 and 30 per cent of the total thickness in the Gold Creek area and volcanic breccia and agglomerate occur in lesser amounts.

The Hobblechain Rhyolite Member contains quartz, potash feldspar phenocrysts and few ferromagnesian minerals, which are altered to clay minerals and hydrated iron oxide. Flow banding is locally well developed and may be contorted or planar. The Member crops out over about 50 square miles. It is exposed in Hobblechain Creek, where a conglomerate is exposed containing angular to subrounded fragments of rhyolite in a sand-sized matrix of volcanic detritus. Boulders of rhyolite up to one foot in diameter occur locally within this bed. Immediately to the north-west the Pungalina Member replaces the rhyolite in the Masterton Formation succession.

Small inliers of Hobblechain Rhyolite Member within the sandstone of the Masterton Formation show a uniform lithology of similar conglomer-

ate less than fifteen feet thick. These may also mark the lateral limits of extrusion, in which case the western-most outcrop corresponds to the original western limit of extrusion.

The sedimentary structures and petrography of the red micaceous sandstone and siltstone within this thin lenticular succession of the Pungalina Member are indicative of evaporite conditions. Halite pseudomorphs, mud cracks, ripple marks, flow casts, and laminated beds are widespread.

The Pungalina Member may have been deposited in a lagoon near the north-eastern shoreline of the basin of deposition, because similar lithologies are not exposed in the Masterton Formation in the southern and central parts of the Sheet area.

McArthur Group.

The Karns Dolomite overlies the sandstone of the Masterton Formation with an abutment unconformity, the intensity of which decreases westward from Robinson River Homestead. Irregularly disposed steep-sided hills of sandstone up to 200 feet high project through the Karns Dolomite, which dips up to 10° off them. The basal dolomite incorporates many blocks of sandstone derived directly from the underlying Masterton Formation. The relationships imply that the carbonate rocks were deposited on a stable submarine shelf from which projected submarine rises, and possibly islands, of sandstone.

The following are chemical analyses of the Karns Dolomite. The figures are quoted as weight per cent of the theoretical carbonate molecules.

Dolomite	Calcite	Siderite	Rock Name
61.7%	7.3%	2.42%	* Silty Dolomite
60.0%	9.9%	3.2%	* Silty Dolomite
38.1%	45.3%	3.01%	Dolomitic limestone
22.3%	8.2%	0.47%	Oolitic chamosite dolomite

* Silty dolomite contains > 10% silt-sized detrital quartz.

In the south-eastern Bauhinia Downs Sheet area the basal units of the McArthur Group conformably overlie the Masterton Formation (Smith, 1962); but after the deposition of the Masterton Formation most of the Robinson River Sheet area was raised above sea level and eroded until the land surface was depressed or the sea level rose. During the erosion abundant carbonate sedimentation continued in the McArthur River district to the west, where the McArthur Group now shows a maximum thickness of about 15,000 feet. This is in contrast with the 300 feet maximum visible thickness of the Karns Dolomite at the headwaters of Robinson River.

The deposition of the Karns Dolomite probably represents the time equivalent of the middle and upper units of the McArthur Group in the McArthur Basin.

Roper Group.

The limited outcrop of the Roper Group represents the most easterly exposure of a sequence widely distributed to the west and north-west (Dunn et al., 1962).

There is no recognisable unconformity between the basal Limmen Sandstone and the underlying Karns Dolomite, although Smith (1962) reports an unconformity with the McArthur Group in the Bauhinia Downs Sheet area.

The thicknesses of the individual units correspond approximately with those quoted by Smith (1962) for the eastern Bauhinia Downs Sheet area, except for a thinning of the Crawford Formation from 430 feet to 200 feet and a probable thinning of the Mainoru Formation.

The Roper Group is correlated with the South Nicholson Group, which occurs in the southern Calvert Hills and Mount Drummond Sheets area (Dunn et al., 1962).

LOWER CAMBRIAN.

Bukalara Sandstone.

The age of the unfossiliferous Bukalara Sandstone is probably Lower Cambrian (Dunn et al., 1962). It was originally named the 'Robinson Beds' and regarded as Upper Proterozoic by Noakes & Traves (1954).

The Bukalara Sandstone in the Bukalara Plateau is friable, massive, and cross-bedded on a large scale. To the east of Robinson River Homestead, the facies is different. It is distinguished by its arcuate and lenticular outcrop and variable lithology, and by the fact that in many places the rocks fill channels incised into the Karns Dolomite surface. These channels appear to indicate the presence of ancient river courses defined by the present outcrop.

The dominant lithology of this facies of the Bukalara Sandstone is a massive chert cobble and pebble conglomerate with a medium-grained quartz sandstone matrix. The maximum diameter of the cobbles is 12 inches. They are generally well-rounded laminated grey and white chert with subordinate pink to red medium-grained sandstone. The conglomerate grades vertically or wedges horizontally into large cross-bedded massive, buff to white, pebbly or medium-grained sandstone with a clay matrix. This gradation is due to an increase of the quartz sandstone matrix of the cobble conglomerate.

LOWER CRETACEOUS.

The Lower Cretaceous in the Robinson River Sheet area is represented by isolated remnants of a once extensive blanket of sediments now preserved in the Barkly-Beetaloo Tableland, unconformably overlying the Upper Proterozoic and Cambrian sequence.

Skwarko (1962) has determined the age of marine fossils from Calvert Hills and Bauhinia Downs Sheet areas as Lower Cretaceous.

CAINOZOIC.

Approximately half of the Robinson River Sheet area is covered by residual and transported unconsolidated deposits. Table 1 lists the various types.

INTRUSIVE ROCKS.

The Packsaddle Microgranite crops out mostly in the north-eastern corner of Calvert Hills Sheet area. It is elongated north-west and is 14 miles long and 3 miles wide. The total area of outcrop is about 25 square miles, only one square mile of which occurs in the Robinson River sheet area.

In the Calvert Hills Sheet area the intrusion has domed up the enclosing Gold Creek Volcanics, which dip radially from the dome at angles up to 20° at the contacts. Vertical flow banding is exposed at the chilled contacts and dolomite is crystallized in the Wollogorang Formation. The petrography of the Microgranite is uniform. It contains orthoclase and quartz phenocrysts in a micrographic intergrowth of the same minerals. Alteration has removed any trace of ferromagnesian minerals and formed montmorillonite, kaolin, white mica, and hydrated iron oxides.

Mapping in the Calvert Hills Sheet area showed that the Packsaddle Microgranite is the intrusive equivalent of the Hobbblechain Rhyolite Member, and that it differs from the latter by its coarser grainsize and joint pattern. The pronounced north-west trend of the microgranite suggests that it intrudes a wrench fault-line similar to the Calvert Fault (Roberts et al., 1962).

STRUCTURE.

The Robinson River Sheet area represents a stable tectonic block. The overall structure is a broad asymmetrical arch or monocline with an axis trending approximately north through Robinson River Homestead: the western limb shows dips about 5° westwards, whereas the eastern limb is almost horizontal. The presence of the axis could account for the high Bouguer anomalies encountered by Bureau geophysicists in 1959, Newman & Lonsdale, near Robinson River Homestead.

Stratigraphical evidence in the McArthur Group indicates that this axis marked the boundary between subsiding-basin and stable-shelf conditions, the eastern limb being stable after the epeirogenic uplift of the Tawallah Group. It is probable that this line also marked the most easterly extension of the Roper Group.

The sedimentary bedding in most of the Sheet area is horizontal, but west of longitude $137^{\circ}00'E$ regional dips range from 5° to 10° and occasionally to 15° . Local steep dips may occur in the vicinity of faults or rare flexures. Sedimentary dips within the Karns Dolomite at the junction with the unconformity surface of the Masterton Formation range up to 10° .

In the headwaters of Hobbiechain Creek and Running Creek small local flexures occur within the Gold Creek Volcanic Member with axes trending north and north-west. These may be the result of penecontemporaneous movements associated with the vulcanism.

Faulting.

All major faults trend north-west and are confined to the southwestern corner of the Sheet, west of Robinson River Homestead. The marked line along the headwaters of the Foelsche River is the northern continuation of the Calvert Fault, which extends at least a hundred miles farther south on constant strike. Evidence on the Calvert Hills Sheet suggests that this is a major left-lateral wrench-fault. The remaining north-west-trending faults may be similar and sympathetic to this major lineament. The faults in the vicinity of Pungalina Homestead appear to have small to negligible tensional displacement.

About thirty miles west of Robinson River Homestead the faulting of the Karns Dolomite against the Bukalara Sandstone indicates movement on the Calvert Fault line in post-Cambrian times. (On the Calvert Hills Sheet the Calvert Fault has displaced Mesozoic sediments.)

The southern extension of the Packsaddle Microgranite shows a long axis parallel to the lineament, i.e. north-west. This suggests that the extrusion and synchronous intrusion of acid magma was controlled by a fault of this type.

Jointing.

Joints are developed in the Bukalara Sandstone, Limmen Sandstone, and sandstone of the Masterton Formation.

North-west-striking joints are best developed in the Bukalara Sandstone, where joints up to one mile long, ten to fifteen feet wide, and thirty feet deep are not uncommon. These joints may be tensional and related to the stress field, which induced the wrench-fault tectonics, as there appears to be an increase in intensity of jointing near the Calvert Fault.

ECONOMIC GEOLOGY.Salt.

In a small tidal salt pan one mile east of Manangoora, salt has been mined intermittently for a number of years by A. Anderson. There are no official records of production, but unofficial reports suggest that in one pre-war year approximately 300 tons were recovered. The site of the mine is a small tidal arm, which floods during rare high tides. The salt is concentrated by natural evaporation after tidal recession, and is collected by simple scraping.

Salt could be concentrated by more refined methods anywhere along the coastline; but the isolation of the area and the small local demand militate against development.

Copper.

An abandoned copper mine on a flat north of Running Creek was recorded by Battey (1958), who reported a shaft sunk to a depth of twenty-five feet, and an open cut fifteen feet by ten feet with a depth of eight feet, and an ore consisting of malachite and azurite in kaolin. The ore occurrence is similar to that at Redbank on the Calvert Hills Sheet. The exact location of this mine is not known and it is not shown on the map.

Further deposits of the Redbank type may exist in the Gold Creek Volcanic Member in the southern eastern corner of the Sheet, but the area of outcrop of the unit is very limited.

During 1957 Mount Isa Mines Limited geochemically sampled the headwaters of Gold, Mountain, and Running Creeks, but according to Battey (1958) no copper anomalies were discovered.

Disseminated chalcopyrite occurs in the Karns Dolomite in the Calvert Hills area and detailed prospecting in the northern extension of this unit may reveal the mineral in greater concentration.

Lead.

In the Calvert Hills area the Karns Dolomite contains disseminated galena, which appears to have a stratigraphic control in that it is

confined to specific beds.

Exploration within the Karns Dolomite could reveal one or more similar beds with the mineralization in more economic concentration.

Water Resources.

There are no water bores in the Sheet area. Surface water is relatively plentiful: during the wet season (approximately 9 weeks), all major streams contain flowing water. During the dry season, however, these streams are reduced to a series of waterholes which, in the Robinson, Calvert, Wearyan and Foelshe Rivers may be regarded as permanent. Running Creek is a perennially flowing stream whose source is a spring within the Masterton Formation.

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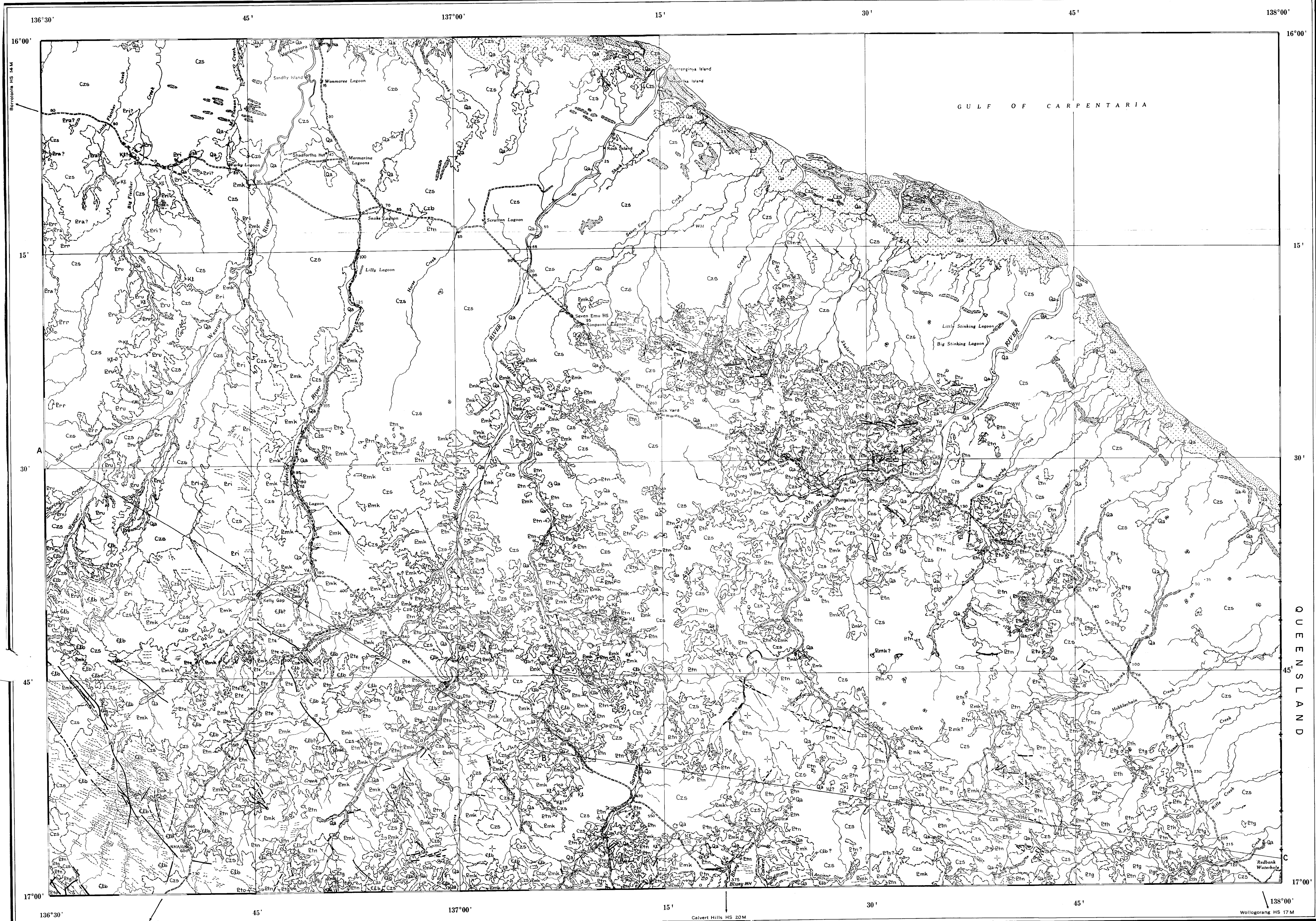
TABLE 1.

STRATIGRAPHY OF ROBINSON RIVER 1:250,000 SHEET.

ERA	PERIOD	ROCK UNIT and SYMBOL	THICKNESS IN FEET	LITHOLOGY	DISTRIBUTION	PHYSIOGRAPHIC EXPRESSION	STRATIGRAPHIC RELATIONSHIPS AND REMARKS.
C	Q						
	U	Alluvium	0-100	River transported sand, silt, clay and gravels.	Narrow elongated areas adjacent to and in the beds of all major water-courses. Claypans.	Level to gently sloping plains	
	A	(Qa)					
A	E						
	R	Fine coastal deposits	Unknown	Evaporite, brown silt and sand.	Fringes entire coastal area with width up to 5 miles.	Very flat salt pans, occasional sand rises, mud beaches with mangroves.	
	N	(Qa)					
I	A						
	R						
	Y						
N		Residual soils	Generally < 10	Red-brown and grey soils, yellow sand, ferruginous cemented detritus.	Universal. Extensive deposits over coastal plain, Karns Dolomite and Masterton Formation.	Mainly flat areas on coastal plain and inland plateau.	
		(Czs)					
O		Coarse coastal deposits	Unknown	Light brown sand and ferruginous cemented detritus.	Along entire coastline. Numerous longitudinal dunes. Cemented dunes parallel to present coastline and up to 10 miles inland.	Longitudinal crested dunes and low sand rises. Low elongated rises.	
		(Czs)					
I		Black soil	Unknown	Black soil of clay grade.	Two small areas east of Foolshe River on road to Pungalina.	Flat gilgai plains.	
		(Czb)					
C		Laterite and Lateritic soils	< 30	Ferruginous horizon of laterite profile, lateritic soils.	Small areas 14 miles north-north-west and 18 miles south-west Robinson River Hs. and in river beds and banks on coastal plain.	Flat areas on coastal plain and high points of plateau.	Not differentiated on map where exposed only in banks of watercourses.
		(Czl)					
M E S O Z O I C	C R E T A C E O U S	Undifferentiated	< 50	White sandy claystone, clayey sandstone, and quartz sandstone.	Small outcrops on and near road S.E. Robinson River Hs., headwaters of Camel Creek in vicinity of Big Fletcher Creek, and headwaters of Kangaroo Creek.	Small low mesas, hill cappings and exposures at base of laterite profile.	Unconformably overlies Cambrian and Upper Proterozoic rocks.
	L O W E R	(Kl)	Top not exposed				

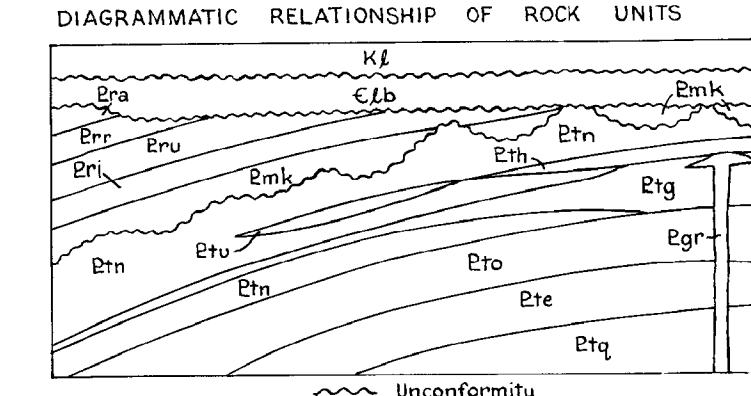
ERA	PERIOD	ROCK UNIT and SYMBOL	THICKNESS IN FEET	LITHOLOGY	DISTRIBUTION	PHYSIOGRAPHIC EXPRESSION	STRATIGRAPHIC RELATIONSHIPS AND REMARKS.
UNCONFORMITY.							
P A L A E O Z O I C	C A M B R I A N	BUKALARA SANDSTONE (Clb)	200 (+) Top not exposed	Massive, buff, medium to coarse quartz sandstone and feldspathic sandstone. Chert pebble and cobble conglomerate.	Elevated plateau with small outliers in south-western cor- ner of Sheet. Arcuate areas east of Robinson River Hs. and Bluey W.H.	Flat-lying, very jointed plat- eau, dissected by major rivers. Joint pattern controls much of minor drainage system. Out- lying mesas and elongated sub- rounded arcuate ridges.	Unconformably overlies Upper Proterozoic rocks. Overlain unconformably by Mesozoic on Bauhinia Downs and Mount Young 1:250,000 Sheets. Arcuate out- crops appear to represent the residuals of stream channels incised into Upper Proterozoic rocks.
UNCONFORMITY.							
U P P E R	R O P E	ABNER SANDSTONE (Era)	Upper part not exposed. 220 on Bauhinia Downs Sheet.	Massive to blocky, jointed, white, friable medium quartz sandstone with thin interbeds of coarser- grained sandstone and ferruginous siltstone.	North-south striking belt west of Big Fletcher Creek.	Low plateaux capping Crawford Formation.	Conformably overlies Crawford Formation. Overlain conformably by Corcoran Formation on adjoin- ing Bauhinia Downs Sheet.
	G R O	CRAWFORD FORMATION (Err)	200	Blocky, purple micaceous glauconitic feldspathic sandstone and micaceous siltstone.	Several small outcrops in the vicinity of Big Fletcher Creek.	Escarments beneath Abner Sandstone plateaux.	Conformably overlain by Abner Sandstone and conformably under- lain by Mainoru Formation.
	U P	MAINORU FORMATION (Eru)	< 800	Fissile, laminated, purple, green and grey micaceous siltstone and fine-grained sandstone.	North-south striking belt between Wearyan River and Big Fletcher Creek.	Low rounded rubble-covered rises. Non-resistant unit.	Conformably overlain by Craw- ford Formation and conformably underlain by Limmen Sandstone.
E R O Z O I C		LIMMEN SANDSTONE (Eri)	About 200	Massive white or yellow- brown to purplish-brown fine to medium quartz sand- stone. Micaceous silt- stone.	North-south striking belt between Cow Creek and Foelshe River.	Low asymmetrical cuesta with broad dip slope.	Possible unconformity with underlying Karns Dolomite. Conformably overlain by Mainoru Formation.
	M C C A R T H U R	KARNS DOLOMITE (Bnk)	300 (+)	Dolomite; algal dolomite; dolarenite; laminated, oolitic and algal chert; dolomitic siltstone and sandstone; silty and sandy dolomite. Oolitic chamosite dolomite.	Widespread in belt bounded by Karns Creek in the east, Bukalara plateau in the west and Lat. 16°20'S in the north.	Low undulating hills with dendritic drainage and pronounced resistant benches.	Possible unconformity with overlying Roper Group. Marked abutment unconformity with under- lying Tawallah Group. Polymictic conglomerate locally at base. Stratigraphic equivalent of part or whole of McArthur Group on adjacent Bauhinia Downs Sheet.

ERA	PERIOD	ROCK UNIT AND SYMBOL	THICKNESS IN FEET	LITHOLOGY	DISTRIBUTION	PHYSIOGRAPHIC EXPRESSION	STRATIGRAPHIC RELATIONSHIPS AND REMARKS.
U P P E R P R O T E R O Z O I C	T A W A L L A H G R O U P	MASTERTON FORMATION (Etn)	500 (+). Maximum observed. Base and top not exposed.	Red medium quartz sandstone, locally feldspathic, with polymictic conglomerate lenses; white massive medium feldspathic sandstone.	Extensive throughout the eastern sector of the area and as small inliers in the south-western corner.	Highly resistant elevated plateaux and subrounded hills up to 100 feet in height surrounded by Karns Dolomite.	Overlain by Karns Dolomite with abutment unconformity. Conformably overlies Wollogorang Formation at some localities, while in others rests conformably above and below one of the included members, which are local or lenticular in distribution.
		PUNGALINA MEMBER (Etu)	Lenticular. Maximum thickness 120.	Flaggy, laminated, red fine- grained micaceous sandstone and siltstone, probably feldspathic.	North-westerly trending belt from Running Creek to Seven Emu.	Escarments of plateaux capped with Nathan Formation and thin, poorly outcropping veneer over Nathan Formation.	Lenticular unit. Lenses out against Hobblechain Rhyolite Member to the south. Thins in north-westerly direction. Completely absent in southern part of the Sheet.
		HOBBLECHAIN RHYOLITE MEMBER (Eth)	50-100	Porphyritic rhyolite, rhyolite cobble to boulder conglomerate.	In south-eastern corner of Sheet in belt bounded by Gold Creek and Hobblechain Creek.	Relatively level surfaced plateau.	Lenticular unit overlain conformably by sandstone of Masterton Formation and underlain conformably by Gold Creek Volcanic Member. Extrusive equivalent of Red bank Creek Packsaddle Microgranite. Southerly extension on to Calvert Hills Sheet.
U P P E R P R O T E R O Z O I C	T A W A L L A H G R O U P	GOLD CREEK VOLCANIC MEMBER (Etg)	Very variable 10-150. Base not exposed in area of greatest thickness.	Basalt, dolomitic lithic sandstone, dolomitic sand- stone, volcanic agglomerate and breccia, tuffaceous siltstone.	In north-westerly trending belt from Gold Creek to Mountain Creek, 4 miles south of Robinson River Hs. and headwaters of Robinson and Foelshe Rivers.	Well rounded, moderately elevated hills, escarpment below resistant Hobblechain Rhyolite Member and thin dipping veneer on Nathan Formation.	Lenticular unit with wide variation in thickness. May be overlain by Masterton Formation sandstone, Hobblechain Rhyolite Member or Pungalina Member. Underlain conformably by sandstone of Nathan Formation or, on adjoining Calvert Hills Sheet, by Wollogorang Formation.
		WOLLOGORANG FORMATION (Eto)	200-250	Dolomitic siltstone, dolomitic feldspathic sand- stone, silty and sandy dolomite, algal dolomite, nodular dolomitic siltstone.	In the vicinity of Robinson River Hs. and Hopplestrap Creek, Headwaters of Foelshe and Robinson Rivers.	Escarment at Robinson River Hs. marked by resistant sandstone beaches.	Overlain conformably by Masterton Formation and underlain conformably by Settlement Creek Volcanics. Overlain unconformably by Karns Dolomite in Hopplestrap Creek region.
		SETTLEMENT CREEK VOLCANICS (Ete)	About 300	Andesine basalt, volcanic agglomerate, laminated, ferruginous tuffaceous siltstone.	In the vicinity of Robinson River Hs. and Hopplestrap Creek.	Poorly outcropping low, deeply weathered, hills and soil covered flats.	Overlain conformably by Wollogorang Formation and underlain conformably by Aquarium Formation.
		AQUARIUM FORMATION (Eti)	Unknown. Base not exposed.	Micaceous glauconitic siltstone, flaggy, fine- grained quartz sandstone, minor dolomite and dolomitic siltstone.	One outcrop on Hopplestrap Creek 16 miles west of Robinson River Hs.	Poorly outcropping, forming low rubble-covered rises.	Overlain conformably by Settlement Creek Volcanics. Stratigraphic equivalent of Rosie Creek Sandstone on Bauhinia Downs Sheet.
		PACKSADDLE MICROGRANITE (Egr)		Porphyritic microgranite	Small outcrop on southern boundary of Sheet near Gold Creek.	High sub-rounded, strongly jointed resistant hill.	Intrudes Gold Creek Volcanic Member with doming of enclosing strata. Intrusive equivalent of Hobblechain Rhyolite Member. The majority of the intrusive outcrops on Calvert Hills Sheet to the south.

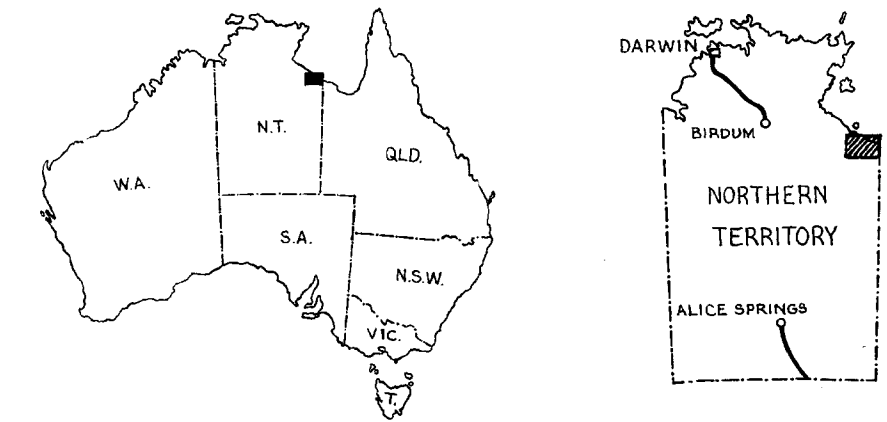


Reference	
Qa	Alluvium
Qa	Coastal silt, sand and evaporite deposits
Czs	Soil, sand, ferruginous cemented detritus
Czs	Coastal sand dunes and cemented dunes
Cxb	Residual black soil
Cxl	Laterite and lateritic soil
QUATERNARY	
LOWER CRETACEOUS	
Undifferentiated	Kf Sandy claystone, quartz sandstone, clayey sandstone
LOWER CAMBRIAN	
Bukalara Sandstone	Cjb Massive jointed, medium to coarse-grained quartz and feldspathic sandstone, minor pebble and cobble conglomerate
UPPER PROTEROZOIC	
PRECAMBRIAN	
ROPER GROUP	
Abner Sandstone	Bra Massive, medium-grained quartz sandstone
Crawford Formation	Ern Blocky micaceous glauconitic feldspathic sandstone, micaceous siltstone
Mainoru Formation	Eru Laminated micaceous siltstone and fine-grained sandstone
Ummen Sandstone	Eri Massive fine to medium-grained quartz sandstone, micaceous siltstone
McARTHUR GROUP	
Karns Dolomite	Emk Dolomite, algal dolomite, dolarenite, laminated, oolitic and algal chert, dolomitic siltstone and sandstone, silty and sandy dolomite, oolitic chamositic dolomite
TAWALLAH GROUP	
Masferton Formation	Etn Red, medium-grained quartz sandstone, locally feldspathic, with polymictic conglomerates; white massive medium-grained feldspathic sandstone
Pungalina Member	Etl Red-brown flaggy fine-grained sandstone and siltstone
Hobbschain Rhyolite Member	Etlh Porphyritic rhyolite
Gold Creek Volcanic Member	Etlg Basalt, dolomitic lithic sandstone, tuffaceous siltstone, volcanic agglomerate and breccia
Wolligorang Formation	Eto Dolomitic siltstone and feldspathic sandstone, algal dolomite, dolarenite, silty and sandy dolomite, nodular dolomitic siltstone
Settlement Creek Volcanics	Ete Andesite basalt, laminated ferruginous tuffaceous siltstone, volcanic agglomerate
Aquarium Formation	Etg Micaceous glauconitic siltstone, fine-grained quartz sandstone, minor dolomite, dolomitic siltstone
Igneous Rocks	
PRECAMBRIAN	
Packsaddle Microgranite	Egr Porphyritic microgranite

- Geological boundary
- Fault
- Synclinal axis
- Where location of boundaries, faults and folds is approximate, line is broken; where inferred, ground is dotted; where concealed, boundaries and folds are dotted, faults are shown by short dashes.
- Strike and dip of strata
- Horizontal strata
- Trend of bedding showing direction of dip
- Horizontal strata
- Joint pattern
- Mine
- Salt
- Sand dune
- Vehicle track
- Fence
- Homestead
- Yard
- Waterhole
- Soak
- Airfield
- Spot height in feet (datum: mean sea level)
- Astro station
- Escarpment



ROBINSON RIVER
SHEET SE 53-4

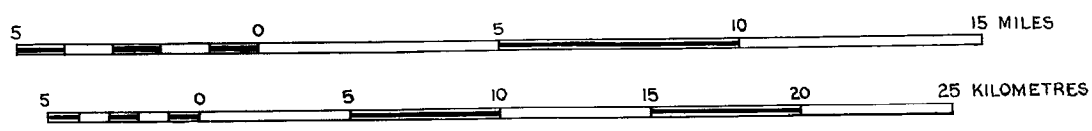


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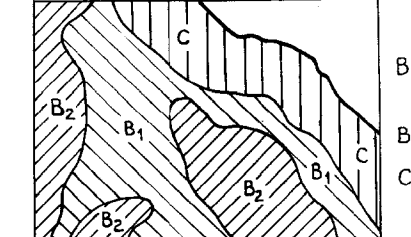
INDEX TO ADJOINING SHEETS
Showing Magnetic Declination

MT YOUNG	PELLEW
BAUHINIA DOWNS	ROBINSON RIVER
WALLALLA	CALVERT HILLS
WEST-MORELAND	MORNING-TON

Scale 1:250,000



GEOLOGICAL RELIABILITY DIAGRAM



Geology, 1961, by: H.G. Roberts, A.G.L. Paine, K.R. Yates
Compiled, January 1962, by: F.J. Roberts, A.S. Mikolajczak
Drawn, 1962, by: F.J. Roberts

Section A-B-C
SCALE 1/10
(Cainozoic sediments omitted from section)

