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BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

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1962/62

EXPLANATORY NOTES ON THE KATHERINE GEOLOGICAL SHEET.

Compiled by

M.A. Randal.

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EXPLANATORY NOTES ON THE KATHERINE GEOLOGICAL SHEET

INTRODUCTION

The Katherine 1:250,000 Sheet area occupies the south-eastern portion of the Katherine - Darwin region in the Northern Territory of Australia. It lies between longitudes 132°E. and 133° 30'E. and latitudes 14° S. and 15° S.

The area is wholly covered by vertical air photographs at a scale of 1:30,000. In 1952 the Division of National Mapping produced, at a scale of 1:63,360, uncontrolled photo-mosaics of the twelve 1-mile areas within the Sheet area. In 1958 the Division produced topographic base maps of the 1-mile areas from air-photographs, with astrofixes for control.

The main roads and important vehicle tracks are shown in Figure 1. The administrative centre of the area is Katherine township, 220 miles south of Darwin. The Stuart Highway and the North Australian Railway, both of which bisect the area from north-west to south-east, pass through the road junctions of Katherine, Maranboy Siding, and Mataranka. The Stuart Highway, which links Darwin to Alice Springs, is the only bitumen road in the area. The only other all-weather road is the gravelled fire-ploughed track which connects Maranboy Tinfield to Maranboy Siding; all other tracks and the main roads to Wyndham and Wave Hill are impassable after heavy rain.

The climate is monsoonal with a short wet season from early December to late March and a long dry season for the remainder of the year. In the dry season, days are warm and nights relatively cool; humidity is low. The coolest period is a few weeks late in July and early in August. Early morning dews are frequent during the first three months of the dry season. The prevailing winds in the dry season are from the south-east, but occasionally winds from the north-west bring clouds and a few light showers. Towards the end of the dry season temperature and humidity rise, and cloudy days are more frequent; wind directions become variable, with winds from the north-west predominating. Early storms begin in October and by late November rain is frequent and heavy. The annual rainfall in the area ranges between 30 - 40 inches. Rainfall is the major climatic feature affecting plant growth, and consequently growth is generally restricted to the short wet season.

Geological Investigations

Until the Bureau of Mineral Resources commenced the regional mapping of the Sheet area in 1951, geological work, except detailed work on mining fields, had been of an exploratory and reconnaissance nature only.

In 1886, Tenison Woods explored portions of the Katherine River and Maude Creek area, and passed through Katherine township and the Driffield area en route to Pine Creek. Brown, in the course of exploratory trips in 1895 and 1905, examined and reported on the country in the north-western sector of the Sheet area. Woolnough included parts of the Katherine Sheet area in his geological reconnaissance of the Northern Territory (1912). Jensen in 1913 and Gray in 1914 mapped the Maranboy Tinfield (Gray & Jensen, 1915). Jensen, in 1916, investigated the Agicondi Province (Jensen, 1919), the southern tip of which lies in the north-western sector of the Katherine 1:250,000 Sheet area. In the same year, Gray and Winters (1916) reported on the Yenberrie Wolfram Prospect. In 1937 and 1938 geologists of the Aerial, Geological and Geophysical Survey of Northern Australia examined and reported on the mineral deposits at Maranboy, Yeuralba and Ludan.

In 1946, L.C. Noakes of the Bureau of Mineral Resources (Noakes, 1949) made a reconnaissance geological survey of the Katherine - Darwin region. This survey included the western and south-western portions of the Sheet area. Between 1950 and 1959 geologists of the Bureau of Mineral Resources have been engaged at various times in examinations of numerous mineral deposits in this area and in the regional geological mapping of the Sheet area. Walpole's (1958) account of the Maranboy Tinfield is the only published record of this work.

PHYSIOGRAPHY

The Katherine Sheet area is drained by two river systems; one flows into the Gulf of Carpentaria to the east, the other into the Timor Sea to the west. The divide which separates the two systems is not well defined; it cuts across the Arnhem Land Plateau in the north and the Daly River Basin in the south. The drainage appears to be consequent on the warping of the Katherine-Darwin region, probably in Miocene time (Noakes, 1949).

Five morphological divisions are recognised in the Katherine Sheet area (Figure 1); their development is controlled by the lithology of the contained rocks.

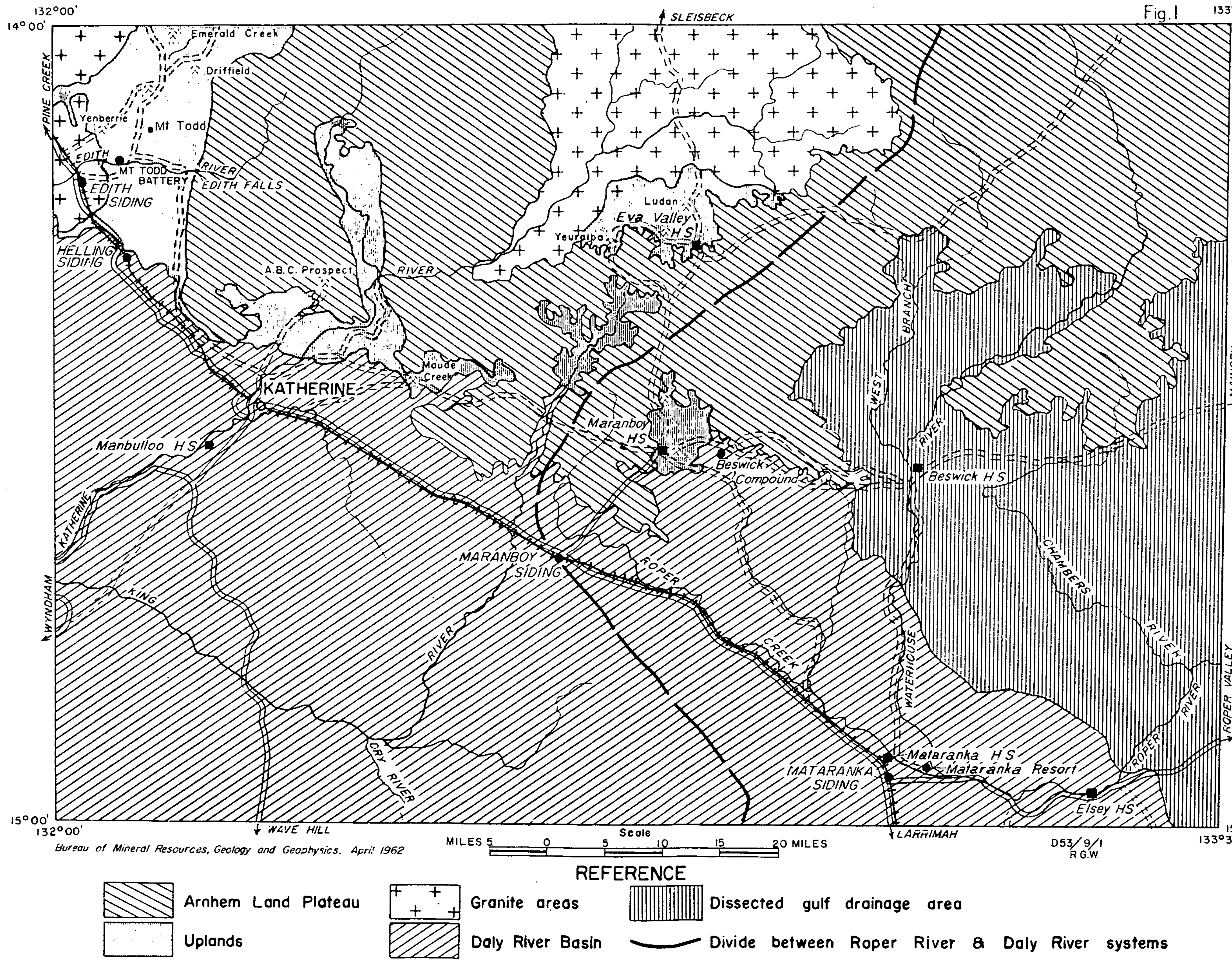
Fig. 1
132°00'
14°00'
133°30'
14°00'
SLEISBECK
Emerald Creek
Driffield
PINE CREEK
Yenberrie
Mt Todd
EDITH
MT TODD BATTERY
RIVER
EDITH FALLS
EDITH SIDING
HELLING SIDING
A.B.C. Prospect
RIVER
Ludan
Eva Valley H S
Yeuralba
Maude Creek
KATHERINE
Manbulloo H S
Maranboy H S
Beswick Compound
Beswick H S
WEST BRANCH RIVER
MAINORU
KATHERINE
WYNDHAM
KING
RIVER
MARANBOY SIDING
ROPER
CREEK
CHAMBERS RIVER
WATERHOUSE
ROPER VALLEY
RIVER
DRY RIVER
Mataranka H S
Mataranka Resort
MATARANKA SIDING
ROPER
Elsey HS
15°00'
132°00'
WAVE HILL
LARRIMAH
15°00'
133°30
Bureau of Mineral Resources, Geology and Geophysics. April 1962
Scale
MILES 5 0 5 10 15 20 MILES
D53/9/1
R G.W.
REFERENCE
Arnhem Land Plateau
Uplands
Granite areas
Daly River Basin
Dissected gulf drainage area
Divide between Roper River & Daly River systems

The Daly River Basin * occupies the southern half of the Sheet area and extends for one hundred miles to the north-west; it is drained in the west by tributaries of the Daly River, and in the east by tributaries of the Roper River. Because of the inconspicuous nature of the divide and the marked similarity of land form and vegatation on both sides of it, no morphological division can be made on the basis of drainage. The soluble limestones and soft friable sandstone and shale of the Daly River Group have offered little resistance to the erosion of the Daly River Basin. The basin is not fully mature; it consists of mainly broad plains and low rises, covered by low scrub or open savannah. The streams have cut steep banks and channels deep into the alluvium. Red soil is developed over much of the basin and outcrop is scarce. Its northern boundary is mainly adjacent to the Arnhem Land Plateau.

The Arnhem Land Plateau forms the northern and central portions of the Sheet area. It is mainly composed of volcanic rocks and arenaceous sediments of the Katherine River Group. The plateau is cut by deep gorges eroded along joint and fault planes. Much of the plateau is covered by a thin veneer of Lower Cretaceous rocks, the lateritization of which in early Tertiary times has presumably prevented a more extensive erosion of the Plateau, through the formation of a hard siliceous capping on the Mesozoic rocks.

The folded greywackes and siltstones of the Burrell Creek Formation and the gently folded rocks of the Edith River Volcanics have produced areas of medium elevation around the western and southern margins of the Arnhem Land Plateau. These areas have been termed Uplands; they are characterized by steep-sided hills and narrow valleys. Near Yeuralba and Maranboy they merge into the Arnhem Land Plateau.

Erosion of granite rocks has produced areas of low-lying undulating country in the northern and north-western parts of the Sheet area. The Granite Areas consist of rocky rounded hills with expanses of bare rock, and a typical drainage pattern of converging alluvial and eluvial flats. The main drainage is by means of well defined watercourses with steep low banks.

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* The same name has been given to the depositional basin in which the Middle Cambrian Daly River Group was laid down. The physiographic and depositional basins are approximately co-extensive.

The Dissected Gulf Drainage Area consists of sediments and volcanics of the Mount Rigg and Roper Groups, together with a few small patches of rocks of the Katherine River Group. This area is drained by the Chambers and Waterhouse Rivers, which flow into the Roper River. The physiography shows a progressive increase in maturity from west to east; however, nowhere on this Sheet area has it attained the same degree of maturity as the Daly River Basin. The rocks of the Chambers River Formation are in this area the most resistant to erosion; they contain steep, rocky gorges and form high hills and small dissected tablelands. The thin-bedded arenites have been eroded to low rounded rubble-covered rises; the more competent sandstones form long hog-backed ridges. The streams have developed broad flat valleys where they traverse the soft siltstone and calcareous formations.

STRATIGRAPHY

The stratigraphy and lithologies are summarised in Table1 units have been named in accordance with the Australian Code of Stratigraphic Nomenclature. Full definitions will be given in Bulletins on the Katherine-Darwin region (Walpole et al, in preparation) and the Carpentaria region (Dunn et al., in preparation). Intrusive rocks are dealt with on page 8 .

Rocks of Proterozoic, Cambrian, and Cretaceous ages crop out in the area, though all are in part covered by alluvium.

LOWER PROTEROZOIC

Agicondian System: The oldest rocks in the area are contained in the folded and sheared Burrell Creek Formation, which crops out at Maranboy, Yeuralba, and north-west and north-east of Katherine township. They were laid down in the trough of the Pine Creek Geosyncline, and consist mainly of greywacke and siltstone, with subordinate sandstone, conglomerate, tuff, shale, and calcilutite. The formation attains a thickness of 4500 feet in the Maranboy Anticline (its maximum thickness north of the Sheet area is 8000 feet), and has there been subdivided (Walpole, 1958) into two members : the Ibis Member and the overlying Dillons Member, distinguished by the greater competence of the Ibis Member and the presence of fine-grained sediments in the Dillons Member. This subdivision has not been mapped elsewhere in the Pine Creek Geosyncline; it is important at Maranboy because most of the tin lodes occur in the Dillons Member. The subdivision covers too small an area to be shown at 1:250,000 scale.

Near Maude Creek, the Burrell Creek Formation is overlain by a sequence of basic lavas and pyroclastics which is strongly folded and intruded by diorite. They are petrologically distinct from the Edith River Volcanics and have been named the Dorothy Volcanics.

UPPER PROTEROZOIC

The Upper Proterozoic is represented by the Katherine River, Mount Rigg and Roper Groups.

The Katherine River Group, which crops out extensively in the northern half of the Sheet area, consists of alternating volcanic and arenitic rocks. The basal unit, the Edith River Volcanics, unconformably overlies the Agicondian System. It contains acid to intermediate lavas, with tuffaceous sediments and conglomerate at the base. West of the Edith Falls Basin the basal sediments unconformably overlie the Burrel Creek Formation and have been named the Phillips Creek Member; north-east of Yeuralba the sediments overlie the Grace Creek Granite and have been named the Hindrance Creek Member. In the Waterhouse River area the base of the formation is not exposed.

The Edith River Volcanics are overlain by the Kombolgie Formation, which is a sequence of alternating greywacke, sandstone, conglomerate, and volcanics, laid down in a system of depositional basins interconnected by shallow platforms. The contact between the two formations in this Sheet area is in places marked by local unconformities and disconformities (Rattigan & Clark, 1955; Ruker, 1959); Walpole (1962) records a similar relationship between these formations to the north in the adjoining Mount Evelyn Sheet area.

A study of the spatial relationships of the two formations in these Sheet areas leaves little doubt that in the regional sense, at least, the two units are conformable. Walpole (1958, and 1962) considers that the local discordance is due to irregular sedimentation, caused by local variations in the basement profile; by the irregular thickness and distribution of the Edith River Volcanics; and by the instability of the depositional zone during sedimentation. The instability is shown by the occurrence of slump breccias and syngenetic folding within both formations.

In the Katherine Sheet area the volcanics of the Kombolgie Formation have been mapped as three distinct members : the McAddens Creek Volcanic Member, the Birdie Creek Volcanic Member and the Henwood Creek Volcanic Member.

The McAddens Creek Volcanic Member crops out in the Edith Falls Basin; it is probably the equivalent of the Birdie Volcanic Member which crops out around the headwaters of the Waterhouse River. The Birdie Creek Volcanic Member extends on to the Mount Evelyn Sheet area, where it is the equivalent of the Plum Tree Volcanic Member (Walpole, 1962). The Henwood Creek Volcanic Member is restricted to the Edith Falls Basin and is approximately 650 feet stratigraphically higher than the McAddens Creek Volcanic Member.

The Kombolgie Formation is conformably overlain by the Diljin Hill Formation of medium to fine arenites, lavas, and pyroclastics; it crops out in the north-eastern part of the Sheet and extends on to the Mount Evelyn and Urapunga Sheet areas. Lithology changes markedly between the lower beds of the Diamond Creek Member and the underlying Kombolgie Formation; and the Diamond Creek Member is not disturbed by faults which affect the Kombolgie Formation. The Diamond Creek Member is conformably overlain by the Gundi Greywacke Member, which represents a phase of rapid deposition of detrital material.

The contact between the Gundi Greywacke Member and the overlying West Branch Volcanic Member is in places marked by conglomerate and coarse sediments. Faults which affect the greywacke member do not displace the volcanics. Ruker (1959) considers that the contact is disconformable; however, the two units appear to be conformable in the regional sense. This is a repetition of the relationship between the Edith River Volcanics and the Kombolgie Formation and emphasises that the Katherine River Group was deposited in an unstable environment.

The West Branch Volcanic Member has been subdivided into three lithological parts which have been shown on the 1:250,000 Sheet as they emphasise the structure of the member.

The contact between the Katherine River Group and the overlying Mount Rigg Group is unconformable; it is marked by conglomerate and coarse sediments - the Margaret Hill Conglomerate and the Bone Creek Formation. The Mount Rigg Group crops out in the Beswick area and near Diljin Hill. It contains the Margaret Hill Conglomerate, the Bone Creek, Dook Creek, and Beswick Creek Formations, all in conformable sequence. Walpole (1958) placed the rocks of the Mount Rigg Group in the Middle Cambrian Daly River Group but more extensive later mapping (Ruker, 1959) showed their relationship to other Upper Proterozoic units in the area. *Collenia*-type algae have been found in limestone beds within the Dook Creek Formation.

Both the Dook Creek Formation and the overlying Beswick Creek Formation have been subdivided into a number of lithological parts which have been shown on the 1:250,000 map. However, twelve miles south-east of Maranboy a large area of sandstone and volcanic scree has been shown as undifferentiated Beswick Creek Formation as it is difficult to determine exactly where the rocks fit into the sequence.

The Mount Rigg Group is unconformably overlain by the Roper Group in the Urapunga Sheet area; the contact between these groups in the Katherine Sheet area is along the Morey Fault Hinge-line. On the Katherine Sheet the Roper Group is represented by undifferentiated sandstone and siltstone, the Bessie Creek Sandstone, and the Maiwok Sub-group. The Bessie Creek Sandstone is a massive friable quartz sandstone; in the Urapunga Sheet area it is 3000 - 4000 feet above the base of the Roper Group. The Bessie Creek Sandstone is conformably overlain by the Maiwok Sub-group, which contains the Velkerri, McMinn, and Chambers River Formations in conformable sequence.

Outcrops of the Velkerri Formation are generally poor; the predominantly siltstone rocks weather quickly to a loose rubble. The McMinn Formation is a sequence of arenitic, lutitic, calcareous and ferruginous rocks; it contains the Moroak / Sandstone Member, the Sherwin Ironstone Member, the Kyalla Member, and /the Bukalorkmi Sandstone Member.

The Chambers River Formation is the topmost Upper Proterozoic formation in the Katherine - Darwin region. Walpole (1958) considered that the formation was unconformably overlain by the rocks in the Beswick area - now named the Mount Rigg Group. However, recent mapping in the Katherine Sheet area and in the north-western part of the Urapunga Sheet area (Ruker, 1959) has given additional information on these rocks. The Mount Rigg Group is overlain by the basal rocks of the Roper Group in the area near Flying Fox Creek. In the Chambers River area Ruker (1959) has shown that the Chambers River Formation is the youngest formation of the Roper Group and is faulted against the older Mount Rigg Group by the Morey Fault Hinge-line.

CAMBRIAN

Basic lavas and tuffaceous sediments crop out in a discontinuous line from Helling Siding to east of Elsey Homestead. They unconformably overlie both Lower and Upper Proterozoic rocks and are in turn disconformably overlain by rocks of the Daly River Group: these volcanics are petrologically identical with the Antrim Plateau Volcanics, which crop out in the Fergusson River Sheet area and occupy the same stratigraphical position. The Antrim Plateau Volcanics occupy a large area south of the Fergusson River Sheet area, and the volcanics in the Katherine area probably form part of them.

Calcareous and arenitic rocks of the Daly River Group occupy the south-eastern part of the Daly River Basin. The basal unit - the Tindall Limestone - is fossiliferous; the assemblages indicate an age of lower Middle Cambrian and allow the formation to be correlated with the Gum Ridge Formation at Tennant Creek (Opik, 1959). In the western area of the Sheet the Tindall Limestone is overlain by the Jinduckin Formation or its lateral equivalent the Manbulloo Limestone Member. The uppermost formation is the Oolloo Limestone.

LOWER CRETACEOUS

The Mullaman Beds unconformably overlie units of all Groups and are widespread over the area. The Lower Cretaceous rocks in this area have not been studied in detail; however, recent work has shown the presence of a lacustrine facies at the base of the sequence.

IGNEOUS ROCKS

The Cullen Granite crops out in the extreme north-west of the Sheet area; it extends fifty miles north and north-west beyond the Sheet boundaries. The Granite is transgressive: it cuts across the fold pattern of the Burrell Creek Formation. The contact is well defined and there is little granitization and hybridization. Angular stoped blocks and hornfelsic xenoliths occur near the contact. In rock type the mass ranges from sodaclase granite through granite to adamellite: textural variations are common. Radioactive age determinations by the K/A method on biotite concentrates indicate an age of 1695 my.

The Yeuralba Granite crops out sixteen miles north of Maranboy Tinfield. It is bounded to the north-east and north-west by faults, and to the south it is covered by the Mullaman Beds. The rock is an adamellite; it is poor in ferromagnesian minerals. The Yeuralba Granite intrudes the Burrell Creek Formation; contact effects are slight, but the intrusion has produced quartz-tourmaline-cassiterite hornfels lodes in the sediments. Secondary alteration of the granite has produced four distinctive rock types: quartz-wolframite greisen, cassiterite-bearing tourmalinite, cassiterite-wolframite-bearing topazite, and quartz-mica greisen. These secondary rocks occur as masses of altered rock or as groups of veins formed at the intersection of major fractures in the granite. The fractures are a regional feature of the area, so mineralization may persist at depth. Detailed descriptions of the greisens and schorl rocks are given by Walpole & Drew (1953).

In the South Field at Maranboy hornblende-bearing adamellite porphyry intrusions have been found in the Dillons Member of the Burrell Creek Formation. Associated with them are greisens and schorl rocks similar to those at Yeuralba. Secondary alteration is also extensive in the North Field. The intrusion of the porphyry has produced cassiterite-bearing quartz-tourmaline hornfels lodes in the Dillons Member. The occurrence at Yeuralba and Maranboy of similar schorl rocks and greisens and identical hornfels lodes suggests a genetic relationship between the Yeuralba Granite and the igneous rocks at Maranboy.

The Grace Creek Granite has been previously referred to as the Mount Harvey Porphyry and the Grace Creek Porphyry. Earlier workers have reported the occurrence of quartz-feldspar porphyry, granite porphyry, and granite in the mass. The rocks intrude, but apparently have not mineralized, the Lower Proterozoic sediments.

Diorite intrudes the Burrell Creek Formation east of Yeuralba, around Maude Creek, and in the Carpentaria Mine area, and is accompanied by minor gold and copper mineralization. It is tentatively correlated with the rocks of the Zamu Complex in the South Alligator area.

Sediments of the Burrell Creek Formation have been cut by dykes of acid to intermediate rocks, which appear to have been feeders for the Upper Proterozoic porphyritic lavas (Rattigan & Clark, 1955) that overlie the Formation. Upper Proterozoic dolerite dykes cut all rocks of the Agicondian System and the Edith River Volcanics in the north-west of the Sheet area; the dolerite sills intrude the Roper Group.

STRUCTURE

The structural framework of the Katherine Sheet area is shown in Figure 2. The Mesozoic cover is omitted and the probable extent beneath this cover of the major rock units is shown. On the Pine Creek and Mount Evelyn Sheet areas, the Agicondian rocks are seen to rest on an Archaean basement; but no Archaean rocks crop out in the Katherine Sheet area.

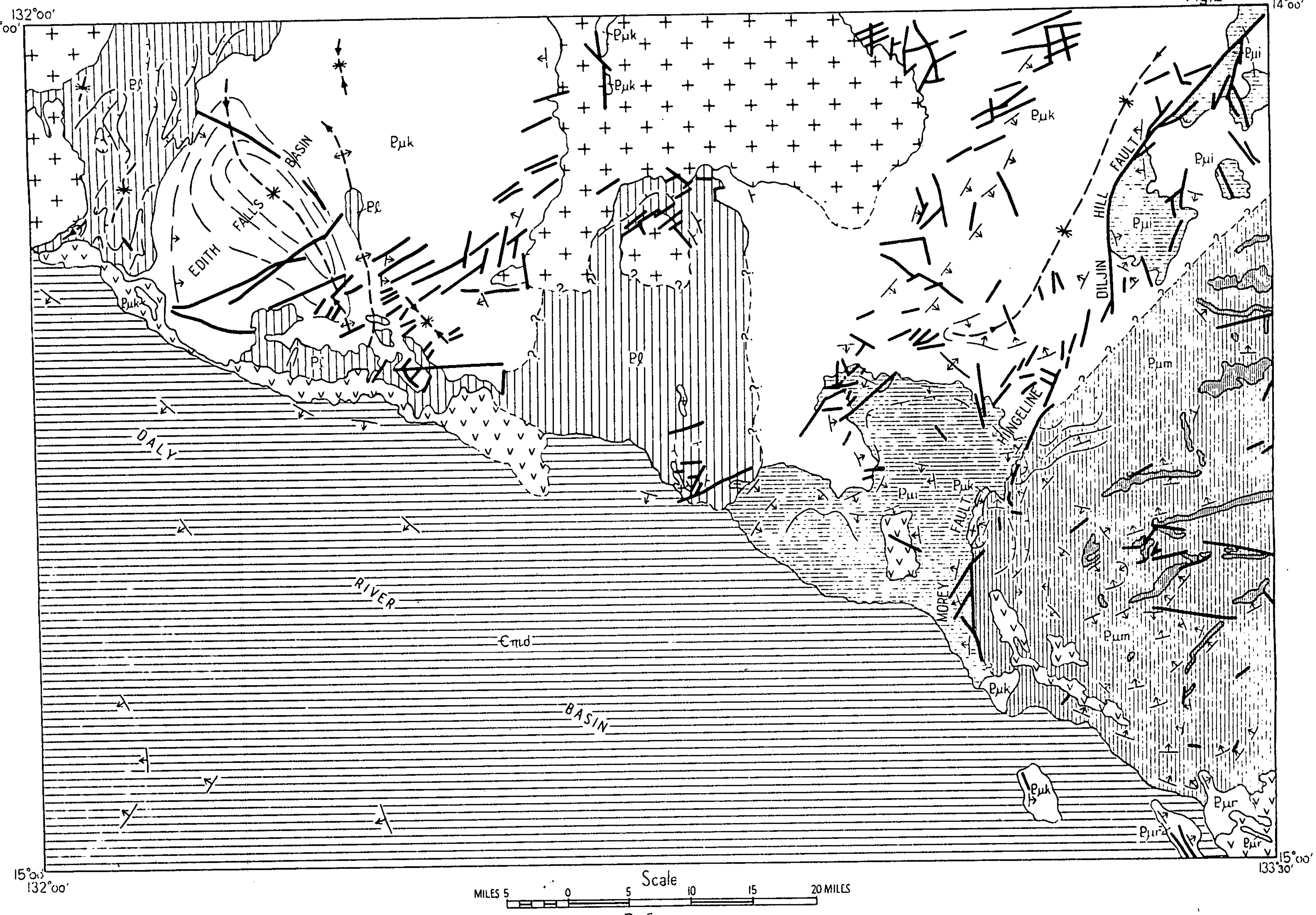
Agicondian

The rocks of the Burrell Creek Formation are part of the main trough sediments of the Pine Creek Geosyncline. Elsewhere in the Katherine - Darwin region, the axial planes of fold axes trend north-west and reflect the north-westerly trend of the geosyncline; however, in the Katherine Sheet area, granite intrusions have modified the axial trends. In the Maranboy - King River area the plunge of the folds is generally south-east; but near Yeuralba it is north owing to the intrusion of the Yeuralba Granite, and near Edith Falls the fold axes trend north to north-easterly owing to the transgressive intrusion of the Cullen Granite.

Upper Proterozoic

The gentle folding of the Katherine River Group appears to be controlled by the structure and the uneven surface of the underlying Agicondian rocks: the folds are primarily depositional but have been amplified by slight tectonic activity with associated faulting; the axis of the Edith Falls Basin is warped and offset by three strong cross-faults. East of this Basin, the underlying Edith River Volcanics are exposed in an eroded anticline, the axis of which trends at 340°; the axis is apparently controlled by the structure of the Burrell Creek Formation, which forms the core of the anticline. Rocks of the Kombolgie and Diljin Hill Formations are folded into a broad syncline in the north-eastern part of the Sheet area; the axis trends north-east. The rocks are displaced by the Diljin Hill Fault; they are unconformably overlain by rocks of the

Fig.2



Reference

MIDDLE CAMBRIAN	Ꞓmd	DALY RIVER GROUP
LOWER CAMBRIAN	v v v	ANTRIM PLATEAU VOLCANICS
UPPER PROTEROZOIC		DOLERITE SILLS
	Pμm	MAIWOK SUB-GROUP } ROPER GROUP
	Pμr	UNDIFFERENTIATED } ROPER GROUP
	Pμi	MT. RIGG GROUP
	Pμk	KATHERINE RIVER GROUP
LOWER PROTEROZOIC	+ +	GRANITES
	Pl	FOLDED SEDIMENTS AND VOLCANICS

- Boundary, exposed
- Boundary, position inferred, beneath Mesozoic cover
- Fault, established
- Axis of anticline (approximate)
- Axis of syncline (approximate)
- Trend lines showing prevailing dip
- Regional dip
- Vertical bedding

D53/9/2
P.A.B.

A C B

REDUCE AB (10½") to AC (6")

KATHERINE 1:250,000 STRUCTURE MAP

Mount Rigg Group, which obscure the effect of the Morey Fault Hinge-line on the eastern margin of the syncline. The Katherine River Group is strongly jointed: directions are north-west, north-east, north, and east by north. The joints are controlled by tension, and many develop into faults.

The Mount Rigg Group is folded into a broad south-plunging syncline in the Dook Creek - Beswick area. In the north-east of the Sheet it is folded into a syncline which has been extensively faulted by the Diljin Hill Fault and affected by secondary faulting and folding; the Mesozoic cover obscures the structure.

The Roper Group - in particular the Maiwok Sub-group - is folded into gently undulating basins and monoclines. A strong tectonic influence was exerted on the deposition of the Maiwok Sub-group by the Morey Fault Hinge-line. This hinge-line, which marks the western limit of the Maiwok Sub-group, was active before and during the sedimentation of the Group: it acted as a longitudinal hinge, leaving the western block unmoved, allowing the eastern block to sag. It permitted the subsidence of the Roper Group; because subsidence exceeded or at least equalled the deposition of the younger group, the hinge acted as shore-line for the Maiwok Sub-group in the Dook Creek - Beswick area. It is probable that most of the Maiwok Sub-group is present at depth immediately east of the hinge-line; however, it is considered that the remainder of the Roper Group is considerably thinned out here. Near the Morey Fault Hinge-line dips in the Sub-group are steepened and even reversed.

Cambrian

The basal rocks in the Daly River Basin are the Antrim Plateau Volcanics, which unconformably overlie both the Agicondian System and the Upper Proterozoic sequence. The Daly River Basin contains the Middle Cambrian Daly River Group, which disconformably overlies the basal volcanics and unconformably overlies the Proterozoic rocks. Unlike the Upper Proterozoic basins, which are numerous and small, the Daly River Basin is broad and uncomplicated.

The upper formations of the Group show closure in the King River area, but the Tindall Limestone becomes a broad sheet deposit extending southward, where it apparently joins with Cambrian rocks near Tennant Creek and on the Barkly Tableland.

GEOLOGICAL HISTORY

Little is known of the Archaean rocks which form the basement for the Pine Creek Geosyncline and which crop out in adjoining areas in the Katherine - Darwin region (Walpole, 1962; Malone, 1962; Randal, 1962).

The greywacke and siltstone of the Burrell Creek Formation were deposited in the trough zone of the Pine Creek Geosyncline, which was mainly developed to the north and north-west. At the end of sedimentation, local volcanic activity produced the Dorothy Volcanics, which were then folded and sheared with the Burrell Creek Formation. Then followed the intrusion of granitic and dioritic rocks which mineralized the sediments in the Maramboy, Yeuralba, Maude Creek, and Edith River areas.

On uplift, rapid erosion of these rocks and widespread volcanic activity produced the clastic, pyroclastic, and volcanic rocks of the Edith River Volcanics. Slump folding was common. Rapid erosion and volcanic activity continued throughout the deposition of the Kombolgie and Diljin Hill Formations, in an unstable shelf environment which gave rise to local unconformities between formations and small diastems within them. Irregularities in the surface of the Agicondian rocks produced numerous depositional basins, which were later affected by warping and strong faults. The Morey Fault Hinge-line probably developed during the deposition of the upper parts of the Diljin Hill Formation.

The deposition of the Diljin Hill Formation was followed by the transgressive deposition of the basal marls and limestone sediments of the Mount Rigg Group in the Diljin Hill and Beswick areas. Then minor volcanic activity produced the pyroclastic and basaltic rocks of the Beswick Creek Formation. After deposition and subsequent consolidation of the Mount Rigg Group, the area east of the Waterhouse River slowly subsided, hinged on the Morey Fault Hinge-line; this was followed by the deposition of the Roper Group. During sedimentation of the upper part of the Roper Group (i.e. Maiwok Sub-group) the hinge-line was strongly active, resulting in the faulted contact between the upper parts of the Roper Group and the Mount Rigg Group.

Towards the end of the Upper Proterozoic and during the Lower Cambrian the western and south-eastern parts of the area were gently downwarped; and in the upper Lower Cambrian the Antrim Plateau Volcanics were extruded over wide areas.

In the lower Middle Cambrian a shallow epicontinental sea transgressed much of the Katherine - Darwin region and in it were deposited the fine to medium-grained rocks of the Daly River Group. The subsequent uplift brought in a period of high stability, as shown by the absence of folding in the Cambrian rocks. Because of this stability the area never had high relief, and so the Cambrian rocks, which had no protective cover until the Lower Cretaceous transgression, were little affected by erosion.

Towards the end of the Jurassic, or early in the Cretaceous, freshwater material was deposited in isolated lakes which were subsequently flooded by an epeiric sea in which fine-grained sediments were deposited. Uplift and erosion followed.

During Tertiary time the climatic conditions were favourable for the formation of a laterite profile. This developed readily on the soft Lower Cretaceous sediments, which blanketed much of the area. Post-Tertiary warping produced the present elevation and initiated the present cycle of erosion (Noakes, 1949). This warping explains the development of the two drainage systems in the south-eastern part of the Daly River Basin.

ECONOMIC GEOLOGY

The Katherine Sheet area contains the Mount Todd, Driffield, and Maude Creek Goldfields, the Horseshoe Creek, Emerald Creek, Maranboy, and Yeuralba Tinfields, the Yenberrie Wolfram Field, the Carpentaria Copper Mine, and a number of small prospects.

Tin, gold, and wolfram are the only minerals of economic importance, though small deposits of uranium, copper, and silver-lead occur.

Tin

The Maranboy Tinfield is the most important mineral field in the area: tin deposits have been worked at Mount Todd, Emerald Creek, Horseshoe Creek, Yeuralba, and Maude Creek, but production from these fields has been sporadic and records are incomplete (see Tables 2 & 3).

TABLE 2 - TIN PRODUCTION FROM MARANBOY
(taken from Walpole, 1958)

Year	Concentrates	Value
1915-16	84.12 tons	£A 10,359
1916-17	130.8	17,852
1917-18	90.75	16,177
1918-19	78.3	19,353
1919-20	66.24	13,856
1920-21	53.13	12,602
1921-22	46.24	6,308
1922-23	14.6	1,845 ?
1923-24	17.1	2,796
1924-25	48.85	9,800
1925-26	35.9	7,496
1926-27	59.65	13,302
1927-28	48.47	10,682
1928-29	38.4	6,871
1929-30	37.5	59,967 ?
1930-31	not available	2,207
1931-32	11.27	1,001
1932-33	9.9	1,067
1933-34	49.57	7,572
1934-35	30.6	5,288
1935-36	22.16	4,001
1936-37	25.08	3,815
1937-38	12.53	2,478
1938-39	19.47	3,045
1939-40	21.0	3,752
1940-41	26.75	5,517
1941-42	32.6	6,893
1942-43	26.5	5,157
1943-44	3.7	658
1944-45	8.29	1,830
1945-46	12.41	2,756
1946-47	11.73	3,147
1947-48	13.47	4,525
1948-49	21.58	8,516
1949-50	24.12	9,256
1950-51	16.18	8,817
1951-52	19.31	19,115
1952-53	12.84	
1953-54	30,75	
1954-55	7.67	
1955-56	0.65	

Walpole (1958) has described the Maranboy Tinfield. The ore mineral is cassiterite, occurring in fine-grained quartz-tourmaline hornfels fissure lodes which are infillings in a conjugate system of shear fractures in the Burrell Creek Formation. On the North Field at Maranboy, the cassiterite also occurs in quartz-mica greisen bodies. A Government battery was erected in 1916, but was inadequate for the full development of the field. This resulted in haphazard and wasteful mining.

The tin deposits at Horseshoe Creek, Mount Todd, and Emerald Creek are somewhat similar to each other: cassiterite occurs as small shoots in quartz ironstone reefs parallel to the bedding in the Burrell Creek Formation.

At Maude Creek cassiterite is distributed through auriferous quartz ironstone reefs which cut the Dorothy Volcanics and the diorite at Maude Creek.

At Yeuralba cassiterite-bearing tourmalite and cassiterite-wolframite-topazite occur as groups of veins, as irregular bodies within the granite mass, in quartz-mica greisens, and in greisenized granite. They probably represent the end phase of hydrothermal alteration of the Yeuralba Granite. Small leaders and lodes of cassiterite-bearing quartz-tourmaline rock occur in the sediments of the Burrell Creek Formation adjacent to the granite, but they are of minor importance. On all fields minor alluvial deposits occur in small creeks near the hills.

TABLE 3 - TIN PRODUCTION (excluding Maranboy).

Year	Field	Amount
1902	Mount Todd	50 tons ore
1905	Horseshoe Creek & Mount Todd	66 tons
1906	Horseshoe Creek	122.25 tons
	Mount Todd	57.50 tons
1907	Horseshoe Creek	+133.50 tons
	Mount Todd	80.00 tons
1908	Horseshoe Creek & Mount Todd	91.00 tons
	Emerald Creek	8.00 tons
1909	Horseshoe Creek	+ 50.4 tons
	Mount Todd	24.0 tons
	Emerald Creek	10.1 tons
1910	Horseshoe Creek & Mount Todd	73.00 tons
	Emerald Creek	6.05 tons
1911	Horseshoe Creek & Mount Todd	40.00 tons
	Emerald Creek	4.00 tons
1912	Horseshoe Creek & Mount Todd	40.00 tons
	Emerald Creek	9.00 tons
1913	Horseshoe Creek	30.70 tons
	Mount Todd	33.00 tons
	Emerald Creek	4.50 tons
1914-15	Horseshoe Creek	17.75 tons
	Mount Todd	36.25 tons
1915-16) 1916-17)	Horseshoe Creek	13.50 tons
1919-20	"	11.75 tons
1921-22	"	20.86 tons
1922-23	"	14.35 tons
* 1923-24	"	10.27 tons
	Yeuralba	6.15 tons
1924-25	"	1.10 tons (plus 1½ bags alluvial)
1925-26	"	0.60 tons
1927-28	"	0.56 tons
1928-29	"	0.35 tons
1929-30	"	0.47 tons
1934-35	"	2.25 tons
1938-39	"	0.59 tons
1940-41	"	0.19 tons
	Horseshoe Creek	0.18 tons
1944-45	Maude Creek	0.15 tons
1945-46	Yeuralba	0.11 tons
	Horseshoe Creek	0.24 tons
1946-47	Yeuralba	0.19 tons
1948-49	Horseshoe Creek	0.35 tons
1949-50	Yeuralba	0.08 tons
1951-52	Horseshoe Creek	0.60 tons
1952-53	Mount Todd	4.02 tons
	Yeuralba	0.12 tons
1953-54	"	0.05 tons
	Mount Todd	3.35 tons
1957-58	" "	2.60 tons
1958-59	" "	0.33 tons
1958-59	Edith River	0.5 tons
	TOTAL ..	1082.86 tons

+ = estimated
* = includes Umbrawarra

Gold

Gold deposits have been worked at Driffield, Mount Todd, and Maude Creek; minor deposits occur at Maranboy, Yeuralba, and Ludan. Production records for all fields are incomplete. They are summarized in Table 4.

From the available records, it appears that the Driffield Goldfield was the most productive. There, the gold occurs in quartz reefs in the folded sediments of the Burrell Creek Formation. The weathering of these reefs has produced some alluvial concentrations.

Near Mount Todd, auriferous quartz-ironstone reefs occur parallel to the bedding in the Burrell Creek Formation. The field was worked from 1908 to 1919, both gold and tin ore being treated at a battery near Mount Todd. Various syndicates have attempted to revive the field, but current activity is restricted to reworking old dumps for their tin content.

At Maude Creek gold occurs in quartz-ironstone reefs which cut the Dorothy Volcanics and the diorite at Maude Creek. Known activity on the field was restricted to the periods 1887 to 1892 and 1932 to 1934. Few records are available.

TABLE 4 - GOLD PRODUCTION.

Year	Field	Amount	Value
1887	Maude Creek	No records available	
1892/1901	Driffield	54 oz.	
1902	"	22 oz.	
1903	"	748	£A 2618
1904	"	243	850
1905	"	95	285
1906	"	220	
1907	"	1045	3657
1908	"	1200	
	Mount Todd	128	
1909	Driffield	1091	
	Mount Todd	217	
1910	Driffield	332	
	Mount Todd	332 (?)	
1911	Driffield	131	
	Mount Todd	190	
1912	Driffield	192	
1932-33	Maude Creek	7	
1934-35	"	8.89	
1938-39	Driffield	0.84 fine oz.	8
1939-40	Maude Creek	16.51 fine oz.	173
	Maranboy	7.16 fine oz.	75
1940-41	"	0.87 fine oz.	9
1949-50	Mount Todd	31.7	491
	Yeuralba	3.53	55
1950-51	Mount Todd	17.2	266
	TOTAL ..	6458.66	

Wolfram

Wolfram deposits have been worked at Yenberrie Wolfram Field and Yeuralba Mineral Field. Production records are incomplete and are summarized in Table 5.

At Yenberrie, wolfram associated with molybdenite and copper occurs in greisen bodies in a small cupola of the Cullen Granite intruding the Burrell Creek Formation. The field was worked sporadically from 1911 to 1930. During the Korean War the price of tungsten was high, and the field was re-opened in 1950 and abandoned again in 1953.

At Yeuralba, wolfram occurs with cassiterite in topazite and greisen bodies associated with the Yeuralba Granite. Several good parcels of ore have been won, but as yet the field is undeveloped.

TABLE 5 - WOLFRAM PRODUCTION

Year	Field	Amount	Value
1911	Yenberrie	6.25 tons	
1912	"	11.27	
1913	"	no records available	
1914-15	"	" " "	
1916-17	"	" " "	
1917-18	"	6.0	
1918-19	"	no records available	
1919-20	"	24.5	£A 4228
1929-30	"	1.1	
1934-35	Yeuralba	1.5	
1936-37	"	3.83	
1937-38	"	6.8	
1938-39	"	6.18	
1939-40	"	0.5	77
1940-41	"	0.38	73
	Maranboy	0.07	13
1942-43	Yeuralba	3.07	
1943-44	"	3.78	
1944-45	"	2.22	798
1945-46	"	0.15	
1946-47	"	0.04	
1947-48	"	1.15	521
1948-49	"	0.7	133
	Yenberrie	0.35	143
1950-51	Edith River	0.10	
1950-51	Yeuralba	2.28	3476
1951-52	"	3.65	6121
	Yenberrie	0.14	273
	Edith River	0.31	387
1952-53	Yeuralba	3.45	
1952-53	Yenberrie	530.75 tons	
1953-54	Yeuralba	0.2	158
1955-56	Edith River	0.09	79

Uranium

Radioactive mineralization in the area is restricted to the Cullen Granite and the McAddens Creek Volcanic Member of the Kombolgie Formation.

Autunite, meta-autunite, and torbernite occur in quartz-hematite and quartz-limonite reefs associated with shearing and alteration in the Cullen Granite. All the known occurrences lie within a few miles of the Edith River railway siding. They have been examined by geologists of the Bureau of Mineral Resources, but at present have no economic possibilities (Fisher, 1952; Gardner, 1953; Jones, 1953).

In 1953 radioactive deposits were discovered in McAddens Pocket, 12 miles north-north-east of Katherine township. At this deposit, known as the A.B.C. Prospect, secondary uranium minerals, consisting mainly of phosphouranylite with autunite and torbernite, have been deposited in fractures caused by a series of en-echelon faults. The host rock is an ashstone in the McAddens Creek Volcanic Member of the Kombolgie Formation. The deposit has been extensively tested by geologists of the Bureau of Mineral Resources. Ore reserves have been estimated to be 1000 tons of 0.4% eU_3O_8 with an additional 900 tons of 0.075% eU_3O_8. Apart from extensive testing, no developmental work has been done at this prospect.

Copper

Minor copper deposits occur at Ludan, Yenberrie, Maude Creek, and Yeuralba, and in the Edith River area. None of these deposits is of economic interest. Copper deposits were worked in the Carpentaria Valley north of Maude Creek between 1905 and 1919. The copper occurs as carbonates disseminated or along shears in sheared and veined rocks of the Dorothy Volcanics.

Silver-lead

Traces of silver and lead occur at Ludan, seven miles east of Yeuralba.

Molybdenite

At Yenberrie small pockets of molybdenite occur associated with the wolfram deposits in the Cullen Granite.

Water

Only the Katherine and Roper Rivers are perennial. The other major watercourses normally flow during the wet season and for only a few weeks at the beginning of the dry season; however, they contain numerous large waterholes, most of which are permanent and adequate for stock. Even the Katherine River and the lower reaches of the Roper River, after abnormally short wet seasons, may cease to flow for a few weeks late in the dry season; but they always contain very long and deep permanent waterholes. Numerous permanent and ephemeral waterholes occur in the minor streams.

Because of the normally adequate supplies of surface water, few bores have been put down for pastoral purposes. Thirty-two bores have been plotted; most of these were put down by the military forces, during the 1939-45 war, along the Stuart Highway or where surface water supplies were unreliable. Most have now been abandoned.

The bores at Venn Airstrip, at Katherine School, and at the C.S.I.R.O. farm at Katherine, have been put down since the war.

Seven bores were dry holes; the remainder gave reasonable yields, mainly from Cambrian sediments and mainly at shallow depths; only two bores are deeper than 250 feet and one of these was a dry bore. Hydrological information and generalized logs are given in Table 6.

TABLE 6. WATERBORES, KATHERINE AREA.

Water Resources Reg. No.	Total Depth (feet)	Standing Water Level (feet)	Depth of Aquifer (feet)	Supply galls/hr	Log.
64	72	18	19	1600	0-6: Limestone gravel 6-21: Clay & sand 21-33: Limestone 33-37: Conglomerate 37-72: ?
131	116	37	82-88 96-101	1400	0-33: Clay 33-36: Conglomerate 36-80: Limestone, siliceous & argillaceous 80-100: Sandstone and clays. 100-116: Massive limestone.
148	65	45	-	1500	
150	116	51	54 100	1700	0-14: Red sand 14-76: Limestone 76-116: Sandy limestone & sandstone.
154	135	100	101-110 115-130	1800	0-15: Clay 15-65: Sand & gravel 65-100: Clay 100-110: Gravel 110-135: Siliceous limestone.
159	115	25	-	1800	0-20: Sandstone 20-65: Sandstone with some clay. 65-90: Limestone. 90-100: Red sandstone. 100-106: Shale 106-110: Limestone
309	128	55	56	2000	0-56: Sandstone and some clay. 56-125: Limestone
312	93	-	-	4000	0-90: Limestone
314	71	26	43-62 65-70	1400	0-19: Gravel & sandy clay. 19-34: Conglomerate 34-37: Clay 37-43: Sandstone 43-55: Limestone 55-62: Gravel 62-71: Limestone

Water Resources Reg. No.	Total Depth (feet)	Standing Water Level (feet)	Depth of Aquifer (feet)	Supply galls/hr	Log.
325	206	60	180-190	450	
408	68	53	-	1000	
409	70	43	-	1500	
596	121	70	70	720	
659	60	Dry to depth drilled.			
660	405	Regarded as dry		100	
661	120		23;54;120	600	
1445	200	28	-	1500	
1450	58	-	-	1500	
1451	203	-	-	1800	
1452	250	-	-	800	
1453	180	101	100-150 170-180	1200	0-6: Soil & clay 37-100: Clay 100-150: Sand 150-180: Clay with sand.
1821	112	36	112	1200	
1827	114	103	-	1300	
1900	85	54	69	1760	0-70: Soil clay and gravel. 70-71: Hard sandstone. 71-80: Limestone 80-85: Limestone and sandstone.
1901	600	-	550-600	good	
1999	80	53	-	4000	
2522	153	54	63	25,000 ?	0-15: Clay 15-56: Limestone 56-71: Limestone and sandstone. 71-153: ?
2719	190	Dry hole			0-35: Ferruginous sand. 35-185: White and grey flaggy limestone.

Water Resources Reg. No.	Total Depth (feet)	Standing Water Level (feet)	Depth of Aquifer (feet)	Supply galls/hr	Log.
2720				dry	0-15: - 15-22: Porcellanite, laterite gravel & sand 22-100: Siliceous limestone. 100-105: Clay - may be cavity. 105-120: Limestone 120-125: Calcareous shale. 125-185: Limestone. 185-200: Ferruginous sandstone.
2721	156			dry	0-20: Ferruginous material. 20-40: Mottled porcellanite. 40-90: Pallid " 90-125: Ferruginous sandstone. 125-156: Buff sandstone and shale.
2722	60			dry	0-20: Sandy, ferruginous material. 20-42: Siliceous limestone. 42-60: Sandy limestone.
2723	84			dry	0-20: Red sandy soil. 20-65(?) Sandstone 65(?)-80 : Limestone.

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TABLE 1 - STRATIGRAPHY OF KATHERINE SHEET AREA.

AGE	ROCK UNIT	LITHOLOGY	THICKNESS (feet)	STRATIGRAPHIC RELATIONSHIPS	STRUCTURE	PALAEONTOLOGY & CORRELATION	ECONOMIC GEOLOGY
QUATERNARY	ALLUVIUM (Qa)	Alluvial deposits. Soil, silt and sand cover.	20-100				Tin
				– – – – – – – – – – U N C O N F O R M I T Y – – – – – – – – – –			
LOWER CRETACEOUS	MULLAMAN BEDS (Klm)	Freshwater and marine sediments. Sandstone, conglomerate, grit, siltstone and porcellanite. Commonly lateritized.	Variable up to 100	Unconformable on all units.	Horizontal sheet deposits.	Marine organisms and plant remains.	
				– – – – – – – – – – U N C O N F O R M I T Y – – – – – – – – – –			
MIDDLE CAMBRIAN	OOLLOO LIMESTONE (Ꞓmo)	Silicified limestone, cherty in places.	100	Conformably overlies Jinduckin Formation.	Depositional dips.	No fossil record in this Sheet but algae recorded elsewhere.	
DALY RIVER GROUP	JINDUCKIN FORMATION (Ꞓmj)	Fine to medium ferruginous quartz sandstone and siltstone with halite pseudomorphs. Some marl and silicified and dolomitic limestone.	200	Conformably overlies Tindall Limestone.	Depositional dips.		
	MANBULLOO LIMESTONE MEMBER (Ꞓmu)	Silicified flaggy limestone	200	Local development of limestone lenses in Jinduckin Formation.	Depositional dips.		
	TINDALL LIMESTONE (Ꞓmt)	Lutitic and crystalline limestone with chert nodules and bands. Some sandstone.	500	Unconformably overlies Antrim Plateau Volcanics and Upper Proterozoic rocks.	Depositional dips.	<u>Girvanella</u>, <u>Helcionella</u>, <u>Hyolithes</u>, <u>Biconulites</u>, <u>Lingulella</u>, <u>Acrotreta</u>, <u>Redlichia</u> and ptychopariids. Equivalent to Gum Ridge Fm. at Tennant Creek. (Opik, 1959).	
				– – – – – – – – – – U N C O N F O R M I T Y – – – – – – – – – –			
LOWER CAMBRIAN	ANTRIM PLATEAU VOLCANICS (Ꞓla)	Amygdaloidal basalt and dolerite. Tuffaceous sandstone, minor conglomerate at base.	100	Unconformably overlies Katherine River, Roper and Mount Rigg Groups. Previously referred to as Leight Creek Volcanics (Walpole, 1958).	Shallow dips, mainly flat-lying.		
				– – – – – – – – – – U N C O N F O R M I T Y – – – – – – – – – –			
UPPER PROTEROZOIC	ROPER GROUP (Bul)	Arenaceous sediments. Minor calcareous rocks. Some ironstone.	In this Sheet area up to 3,500. On Urapunga Sheet up to 6,000.	Unconformably overlies Mount Rigg Group. Represented in this area by the Maiwok Sub-group, Bessie Creek Sandstone and some undifferentiated friable quartz sandstone and siltstone.			
	MAIWOK SUB-GROUP	Mainly coarse to fine sandstone and siltstone with minor calcareous and iron-rich sediments.	up to 3,000	Unconformably overlies Mount Rigg Group; conformably overlies Bessie Creek Sandstone.			
	CHAMBERS RIVER FORMATION (Buc)	Ripple-marked medium quartz sandstone, quartz siltstone.	2,000	Conformably overlies McMinn Formation. Faulted against Mount Rigg Group along Morey Fault Hinge-line.	Locally folded into small basins.		
	McMINN FORMATION	Ripple-marked, friable quartz sandstone; flaggy sandstone and siltstone, and ironstone.	1,000	Conformably overlies Velkerri Formation. Subdivided into Bukalorkmi Sandstone, Kyalla, Sherwin Ironstone, and Moroak Sandstone Members.	Cuestas		

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	BUKALORKMI SANDSTONE MEMBER (Bubu)	Ripple-marked, friable quartz sandstone.	50-100	Conformably overlies Kyalla Member.	Cuestas		
	KYALLA MEMBER (Buky)	Flaggy micaceous quartz sandstone, siltstone and greywacke; calcareous siltstone and cone-in-cone limestone.	150-400	Overlies Moroak Sandstone Member and Sherwin Ironstone Member. In places is interbedded with these Members.			
	SHERWIN IRONSTONE MEMBER (Buz)	Pisolitic and oolitic ironstone; ferruginous sandstone.	25	Lenses within Moroak Sandstone Member and Kyalla Member.	Shallow dips.		Medium Grade iron ore in Urapunga Sheet.
	MOROAK SANDSTONE MEMBER (Bumo)	Blocky medium quartz sandstone, cross bedded and ripple-marked; shale and siltstone.	150	Base of McMinn Formation Conformably overlies Velkerri Formation.	" "		
	VELKERRI FORMATION (Buve)	Siltstone, calcareous siltstone and banded shale, some greywacke.	700	Base of Maiwok Sub-group Conformably overlies Bessie Creek Sandstone.	" "		
	BESSIE CREEK SANDSTONE (Bube)	Friable, massive fine to coarse quartz sandstone.	200	Lowermost identifiable unit of the Roper Group in the Katherine Sheet area. 3-4,000 feet above the base of the Roper Group on the Urapunga Sheet.	" "		
		- - - - - - - - - - U N C O N F O R M I T Y - - - - - - - - - -					
MOUNT RIGG GROUP	BESWICK CREEK FORMATION (Bui)	Marl; medium-grained pink quartz sandstone locally slumped and cross-bedded. Basalt and siltstone.	300	Conformably overlies the Dook Creek Formation. Has been divided into three distinctive lithological parts; however, near west of Mount Rigg this division is not clear.	Shallow dips, mainly depositional basin in Beswick area.		
	DOOK CREEK FORMATION (Buoo)	Dolomitic limestone with _Collenia_-type fossils, sandstone and chert. In places limestone is brecciated and glauconitic. Red and grey oolitic limestone, shale, siltstone and marl.	Variable up to 1,000	Conformably overlies Bone Creek Formation. Has been divided into four distinct lithological parts.	" "	_Collenia_	
	BONE CREEK FORMATION (Bun)	Oligomictic conglomerate and quartz sandstone.	500	Overlies Margaret Hill Conglomerate with a local disconformity.	" "		
	MARGARET HILL CONGLOMERATE (Buma)	Polymictic conglomerate and purple, tuffaceous greywacke, quartz greywacke.	up to 1,250	Basal unit of Mount Rigg Group. Unconformably overlies the West Branch Volcanic Member of the Diljin Hill Formation.	" "		
		- - - - - - - - - - U N C O N F O R M I T Y - - - - - - - - - -					

TABLE 1 - STRATIGRAPHY OF KATHERINE SHEET AREA.

AGE	ROCK UNIT	LITHOLOGY	THICKNESS (feet)	STRATIGRAPHIC RELATIONSHIPS	STRUCTURE	PALAEONTOLOGY & CORRELATION	ECONOMIC GEOLOGY
KATHERINE RIVER GROUP	DILJIN HILL FORMATION (Budj)	Medium to fine arenites volcanics and pyroclastics.	Variable up to 6,000	Overlies Kombolgie Formation.	Main structure is a syncline in north-eastern part of Sheet area.		
	WEST BRANCH VOLCANIC MEMBER (Buw)	Purple, tuffaceous greywacke arkosic sandstone, amygdaloidal basalt, conglomerate and quartz greywacke.	up to 5,300	Top member of the Diljin Hill Formation. Locally unconformable above the Gundi Greywacke Member. Unconformably overlain by the Mount Rigg Group and Mullaman Beds. Has been subdivided into three lithologically distinct parts.			
	GUNDI GREYWACKE MEMBER (Bugu)	Purple, tuffaceous quartz greywacke.	up to 450	Conformably overlies Diamond Creek Member. Local unit.			
	DIAMOND CREEK MEMBER (Budi)	Basalt and tuff with intercalated conglomerate, fine-grained chemical and ferruginous sediments.	up to 700	Lenticular local unit at base of Diljin Hill Formation.			
	KOMBOLGIE FORMATION (Buk)	Alternating sediments and volcanic rocks. Quartz greywacke, conglomerate, feldspathic sandstone, quartz sandstone, quartz siltstone and tuff.	5200	Overlies Edith River Volcanics with slight unconformity in places.	Shallow basins, mainly depositional.		
	HENWOOD CREEK VOLCANIC MEMBER (Buhe)	Basic and intermediate lavas and pyroclastics.	370				
	BIRDIE CREEK VOLCANIC MEMBER (Bub)	Mainly andesite, amygdaloidal in places, pyroclastics.	700	Probably equivalent to volcanic members of Kombolgie Formation in South Alligator.			
	McADDENS CREEK VOLCANIC MEMBER (Bum)	Amygdaloidal basalt acid volcanics & pyroclastics.	750	"			Uranium
	EDITH RIVER VOLCANICS (Bue)	Mainly acid to intermediate volcanics with lenses of sediments near base. Rhyolite, dacite, ashstone, tuff, tuffaceous sandstone, conglomerate. Minor basic volcanics.	4,000	Unconformably overlies Agicondian System.			
	HINDRANCE CREEK MEMBER (Buhi)	Purple tuffaceous sandstone.	50	Basal member of the Edith River Volcanics near Yeuralba. Unconformably overlies the Grace Creek Granite.			
	PHILLIPS CREEK MEMBER (Bupc)	Medium-grained purple greywacke, red and purple shale, conglomerate.	900	Basal member of Edith River Volcanics in area west of Edith Falls Basin. Unconformably overlies Burrell Creek Formation.			

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TABLE 1 - STRATIGRAPHY OF KATHERINE SHEET AREA

AGE		ROCK UNIT	LITHOLOGY	THICKNESS (feet)	STRATIGRAPHIC RELATIONSHIPS	STRUCTURE	PALAEONTOLOGY & CORRELATION	ECONOMIC GEOLOGY
LOWER PROTEROZOIC	AGICONDIAN SYSTEM	FINNIS RIVER GROUP			Represented in this Sheet area by Dorothy Volcanics and Burrell Creek Formation.			
		DOROTHY VOLCANICS (Bly)	Basic lavas and tuffs, tuffaceous sediments.	1,000	Locally developed unit. Relationships not certain, but probably overlies and folded with Burrell Creek Formation.			Tin, gold and copper.
		BURRELL CREEK FORMATION (Blb)	Medium to fine greywacke siltstone, greywacke.	4,500 in this area but elsewhere up to 8,000.	Trough sediments of the Pine Creek Geosyncline.	Strong folding		Tin, gold wolfram.