COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF NATIONAL DEVELOPMENT.

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS.

RECORDS.

1962/135

EXPLANATORY NOTES ON THE TANUMBIRINI 1:250,000 SHEET AREA, NORTHERN TERRITORY

Compiled by

A.G.L. Paine

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INTRODUCTION

The Tanumbirini Sheet area lies between latitudes 16°00' and 17°00'S and longitudes 133°30' and 135°00'E. It contains rocks of Upper Proterozoic, Lower Cambrian, and Lower Cretaceous age and lies to the south-west of the Gulf of Carpentaria between Daly Waters, which is 12 miles west of the western border, and O.T. Downs Homestead, which is 3 miles east of the eastern border of the sheet. The watershed dividing inland from seaward drainage traverses the area from north-west to south-east.

Tanumbirini Station Homestead is the only permanent dwelling, inhabited by one white man, the Station manager, and a number of aborigines. Pastoral development is restricted to the northern, north-eastern, and extreme western parts, the remainder being covered by scattered dense patches of Lancewood (Acacia shirleyi) and rather poor grass.

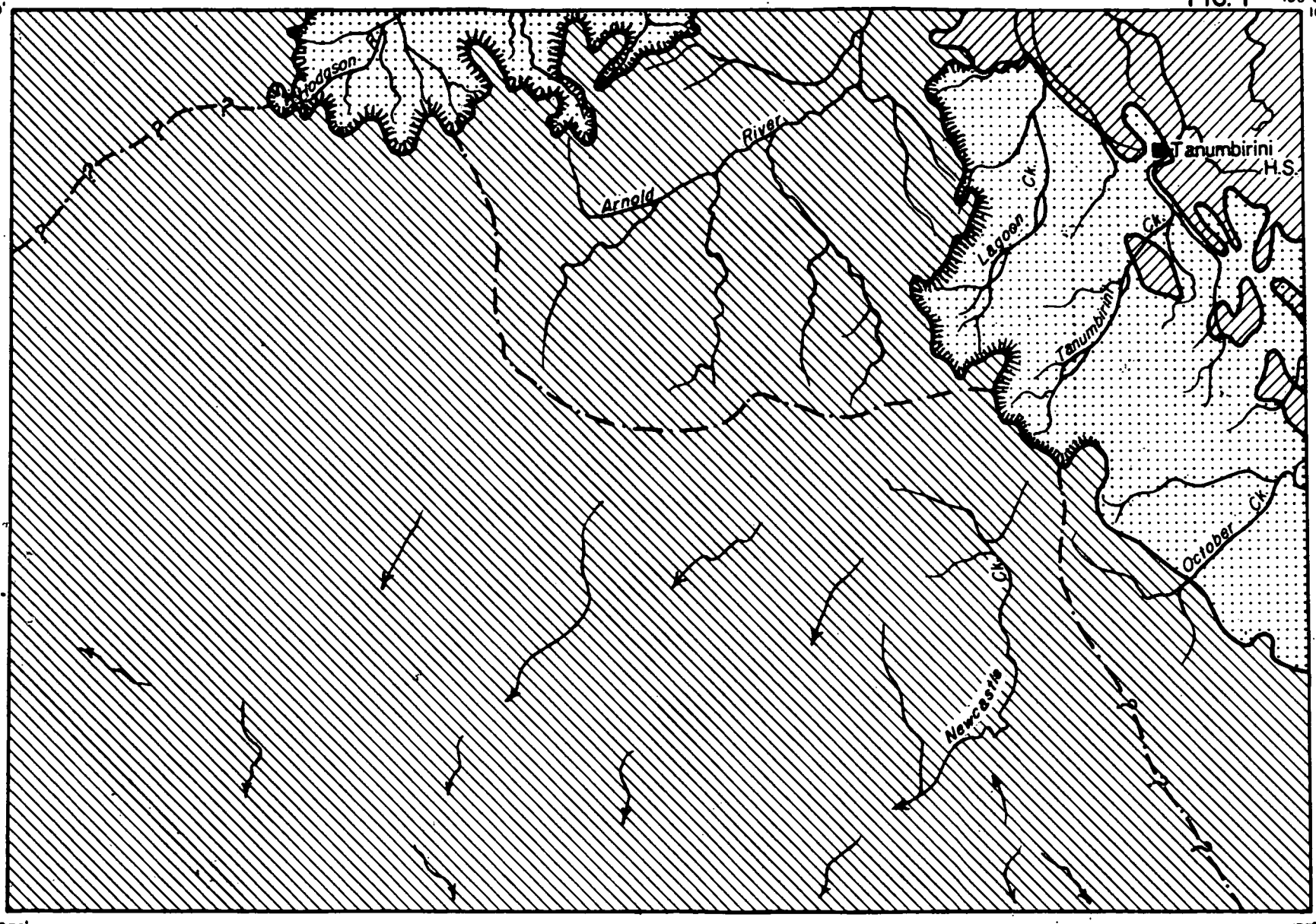
Rainfall is seasonal. At Daly Waters the average annual total is 26 inches; the average maximum temperature ranges between 105° (November) and 84° (July); the average minimum betweeen 76° (November) and 53° (July) (Atlas of Australian Resources, 1954).

A surveyed all-weather road, constructed in 1959-61 to connect Daly Waters with Borroloola, traverses the area from west to east. Graded and maintained roads cross the north-western and south-eastern corners of the Sheet area; these connect Daly Waters with Nutwood Downs Homestead and Newcastle Waters with O.T. Downs Homestead respectively. A road of similar quality links Nutwood Downs Homestead to the Arnold River. The road from O.T. Downs Homestead to Tanumbirini Homestead is now in disrepair and suitable only for four-wheel-drive vehicles. The track from Tanumbirini Homestead to the Arnold River is poorly defined and is not intended for use by vehicles.

There is no airstrip in the area.

Photographs and maps available for the area are: air photographs at 1:50,000 scale, flown by the Royal Australian Air Force in 1950;

FIG. 1



PHYSIOGRAPHICAL SKETCH MAP

TANUMBIRINI 1:250,000 SHEET AREA

Scale

MILES 10 0 10 20 30 MILES

Reference

- Tableland
- Mature Gulf Fall area
- "Younger" Gulf Fall area
- Inland seaward drainage watershed
- Physiographic / Geological boundary
- Escarpment
- ■ H.S. Homestead

Bureau of Mineral Resources, Geology and Geophysics. June 1962.

E53/2/1
R.G.W.

an uncontrolled photo-mosaic at 1 inch to 4 mile scale, prepared from these photographs by the Division of National Mapping, Department of National Development; a planimetric map at 1 inch to 4 mile scale, produced by the Division of National Mapping, from a controlled, photo-scale, slotted template assembly. The geological map accompanying these notes was plotted on a photo-scale trace of this assembly and reduced to 1:250,000 scale.

PREVIOUS INVESTIGATIONS

The first geological investigation was made by Woolnough (1912) who passed through the area on a reconnaissance traverse. He travelled from Nutwood Downs Station south-east through Tanumbirini to Old Bauhinia Downs Homestead, as part of a more extensive survey.

Jones (1955) and Mackay (1957) reported on the water resources of the Nutwood Downs Station, which extends onto the northern part of the Sheet area.

These notes, with map, are based on ground traverses by geologists of the Bureau of Mineral Resources in 1960-61, as part of a geological survey of the Carpentaria region. A helicopter was used to assist in the completion of the mapping in 1961.

In 1959 geophysicists of the Bureau of Mineral Resources carried out a gravity traverse from Normanton to Newcastle Waters, which passed through the south-east part of the area. A similar traverse was conducted in 1960 from Daly Waters to the Arnold River, via Nutwood Downs.

PHYSIOGRAPHY

Figure 1 illustrates the physiographic units of the area.

A major watershed of very low relief crosses the Sheet area from north-west to south-east, dividing inland from seaward drainage. The seaward drainage forms part of the Hodgson/Arnold and Limmen Bight/Cox River systems, which flow into the Gulf of Carpentaria. Inland drainage is poorly developed.

Watercourses flow at intervals after rain during the wet season, but are dry for most of the year. Large water-holes survive the dry season.

Physiographic Sub-divisions

Tableland. The Tableland, which forms part of the extensive Barkly-Beetaloo Tableland (Dunn, Smith, and Roberts, 1962) covers most of the Sheet area and is bounded on the north by a well-defined scarp about 200 feet high. The surface of the Tableland, which lies between 750 and 900 feet above sea level, is gently undulating and represents parts of an extensive laterite land surface which formerly covered the entire Sheet area.

Surface drainage on the Tableland is consequent and youthful; it has had little modifying effect on the original laterite land surface. Creeks are widely spaced, meandering, typically poorly defined, and discontinuous, for surface run-off plays an insignificant part in the drainage system. South of Woonalyaria water-hole Newcastle Creek flows for 20 miles at a gradient of three feet per mile, and near the southern margin of the Sheet area has no well-defined bed.

The Tableland scarp is retreating south-west and south through headward erosion by creeks draining the Gulf Fall Area (see below); creeks draining the Tableland are thus being successively captured by headwaters of the Gulf Fall drainage. At the present day the Arnold River and the headwaters of October Creek represent the only well defined seaward drainage on the Tableland in the Sheet area.

Gulf Fall Area. The remainder of the Sheet Area is essentially similar to the 'Gulf Fall Area' of Stewart (1954) to the south-east, and the term is used here as defined by Stewart. The Gulf Fall Area represents country from which the laterite has been stripped, and has two components.

The 'Younger' Gulf Fall Area is the recently stripped country bordering the laterite escarpment, where seaward drainage is developed on homogeneous Lower Cretaceous sediments, and therefore is not structurally controlled. Drainage base-level is 200 feet lower than

on the Tableland. The creeks are well defined, their headwaters are dendritic, and most are braided, with well developed small meanders. Scattered residual hills of easily eroded claystone rise to Tableland level and are locally capped by laterite outliers. They slope gently and merge into a plain, areas of which are shown as 'Czs' on the map and can be recognised as an old erosion surface; this has been recently rejuvenated and some of it is being bevelled by present-day stream action. This old erosion surface was developed on Lower Cretaceous claystone and now consists of residual brown soil with a veneer of lateritic buckshot gravel.

The Mature Gulf Fall Area is where the exposed Upper Proterozoic rocks have altered a drainage system inherited from the early Tertiary laterite surface. Relief in this area is locally 250 feet, but is generally 100 to 150 feet. The strike ridges and valleys in the Roper Group are a topographic expression of its simple structure and alternating lithologies. Numerous faults in the Tawallah Group have complicated its geomorphology. The most westerly exposures of the Masterton Sandstone of the Tawallah Group form an extensive strike-ridge, which is breached at its southern end by the Mallapunyah Fault (Plate 2). The topography of the other units of the Tawallah Group is expressed as rugged hills of volcanics, sandstone and conglomerate, with low rises and plains consisting of, and overlying, carbonate rocks. In the Mature Gulf Fall Area Lower Cretaceous rocks abut against ranges of Upper Proterozoic rocks, thin out on the ranges and thicken in the valleys; thus the present-day topography of this area is similar to that which existed before they were laid down. Tanumbirini Creek in the vicinity of the Homestead has been superimposed on Upper Proterozoic rocks, flowing north-east across two major sandstone strike ridges of Roper Group rocks.

STRATIGRAPHY

A condensed account of the stratigraphy is given in Table I. Rock units have been named in accordance with the Australian Code of Stratigraphic Nomenclature.

UPPER PROTEROZOIC

Though formerly considered to be Cambrian by Woolnough (1912) and Jensen (1914), and Lower Proterozoic by Noakes & Traves (1954), the Precambrian rocks of the Sheet area are now regarded as of Upper Proterozoic age. They are overlain with strong angular unconformity by the Bukalara Sandstone (see below), a relationship which is best seen on other Sheet areas in the Carpentaria region (e.g. Bauhinia Downs) (Smith, 1962). In the Calvert Hills Sheet area (Roberts, *et al.*, 1962) to the south-east, rocks of the Tawallah Group rest with strong unconformity on the Lower Proterozoic basement.

The Upper Proterozoic rocks, which crop out only in the north-east part of the Sheet area, belong to a thick sequence laid down in the McArthur Basin, which extended from Arnhem Land to the Queensland border. The sequence is divided into Tawallah, McArthur, and Roper Groups. The Tawallah and Roper Groups are represented in the Tanumbirini Sheet area.

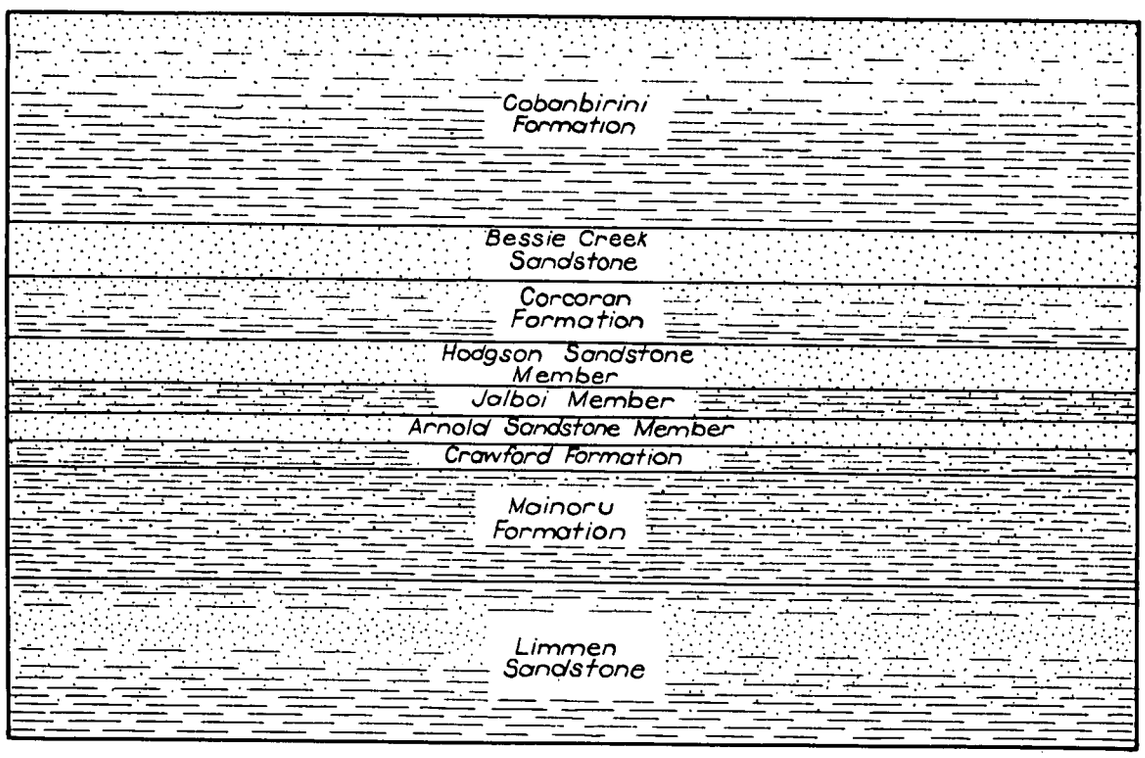
Tawallah Group. The Tawallah Group is best developed in the Mount Young (Plumb & Paine, 1962) and Bauhinia Downs Sheet areas to the east, where all the formations of the Group are present. The formations present in the Tanumbirini Sheet area are of the same order of thickness as in the Mount Young and Bauhinia Downs Sheet areas. The dominant lithology of the group is well-sorted arenite; carbonate rocks are subordinate. Approximately 2,800 feet are exposed.

The Rosie Creek Sandstone, which is best developed in the Mount Young Sheet area to the east, can be recognised in the Tanumbirini Sheet area by the presence of glauconite, its feldspar content and its position in the sequence. The lowest rock in the section is less feldspathic and glauconitic than the rest of the unit.

A small outcrop of altered dolerite/basalt was seen overlying glauconitic sandstone of the Rosie Creek Formation near Eight Mile Creek 7 miles north-east of Tanumbirini Homestead. On petrological and stratigraphical grounds this outcrop is assigned to the Settlement Creek Volcanics, which are best developed in the Calvert Hills Sheet area to the south-east.

TANUMBIRINI 1:250,000 SHEET

Diagrammatic Sketch
showing lithological pattern in the Roper Group



REFERENCE

Quartz Sandstone

Micaceous siltstone and shale

Alternating and mixed lithologies

Vertical Scale

5,000 0 5,000 10,000 FEET

In the extreme north-east of the area the top of the Wollogorang Formation consists of a 30-foot bed of coarsely crystalline magnesian dolomite; the carbonate part of a specimen from this bed has the chemical composition: $CaMg(CO_3)_2$ - 33.5%, $MgCO_3$ - 34.2%, $FeCO_3$ - 11.83%. This is unusually high in $MgCO_3$ content a composition typical of the unit as a whole is $CaCO_3$ - 10%, $CaMg(CO_3)_2$ - 52%, $FeCO_3$ - 6%.

The Masterton Formation consists of quartz sandstone, with interbedded acid volcanics (the Tanumbirini Volcanic Member) near the base and closely associated volcanic conglomerate, which was derived from the acid volcanics by contemporaneous erosion.

The Tanumbirini Volcanic Member is regarded as equivalent, in the time sense, to the Hobblechain Rhyolite Member of the Masterton Formation which crops out in the Robinson River (Yates, 1962) and Calvert Hills Sheet areas to the south-east.

McArthur Group

Rocks of the McArthur Group are absent from the Tanumbirini Sheet area, although present five miles to the east on Lansen Creek in the adjacent Bauhinia Downs Sheet area.

Roper Group (See Fig. 3.)

The rest of the Upper Proterozoic rocks belong to the Roper Group, and it is in the Tanumbirini Sheet area that this group is thickest (at least 15,700 feet). It is a clastic sequence, consisting of alternating micaceous lutite and well-sorted arenite rocks. The lowest unit, the Limmen Sandstone, is unconformable on the Masterton Formation; in the extreme north-eastern corner of the Sheet area it rests on beds low in the Masterton Formation, and probably on the Tanumbirini Volcanic Member. Here the Masterton Formation is only 200 feet thick.

More than half of the Roper Group consists of micaceous siltstone and shale, forming part of the Limmen Sandstone, Mainoru, Corcoran, and Cobanbirini Formations. Alternating with the fine-grained

rocks are typically well-sorted clean arenites comprising the rest of the Group. A lithological pattern can be discerned in this sequence: lutites overlie arenites abruptly, but pass up gradually, usually with inter-bedding lithologies, into the overlying units. (Figure 2). Individual units are described in Table I.

All arenite units display well developed sedimentary structures, cross-bedding and ripple-marking, implying shallow-water, well-circulated deposition. The lutite units show both small-scale cross-bedding and local graded bedding. They are mostly hematitic, and were probably deposited in deeper water with a more restricted and weaker circulation.

The units show no noticeable lateral variation in lithology. However, an outcrop of purple sandstone and conglomerate (chart pebbles and sandstone cobbles) 200 feet thick at the headwaters of Four Mile Creek is assigned to the Limmen Sandstone. It overlies micaceous siltstone and fine sandstone resting on sandstone of the Masterton Formation. The structural relationships of this outcrop are obscure.

CAMBRIAN

Referred to as the Robinson Beds by Noakes & Traves (1954), and regarded by them as Upper Proterozoic, the Bukalara Sandstone, though unfossiliferous, is now considered to be Lower Cambrian in age, as a result of evidence from the Hodgson Downs Sheet area to the north (Dunn, 1962). Its small outcrop on the Tanumbirini Sheet area is only a part of a vast outcrop area extending over 300 miles from the Strangways River in the north-west (Hodgson Downs Sheet area) to Old Benmara Homestead in the south-east (Mount Drummond Sheet area, Smith & Roberts, 1962.).

It is a typically massive cross-bedded rock, with foresets up to three feet thick, and can be easily recognized by its dark brown pitted weathered surface and tendency to erode into large slabs. The presence of occasional grains of microcline and orthoclase indicates granite in the provenance area.

Evidence from water bores on Nutwood Downs Station shows that younger Cambrian formations underlie the Lower Cretaceous rocks in the northern central part of the Tanumbirini Sheet area. Number 10 Bore intersected hard volcanics at 111 feet, after passing through an unspecified thickness of limestone, and was abandoned. The limestone is probably the Tindal Limestone of Middle Cambrian age, which can be traced to the Nutwood Downs neighbourhood from its type area near Katherine. The Nutwood Downs Volcanics underlie the Tindal Limestone in the vicinity of Nutwood Downs Homestead, and the volcanics in No. 10 Bore are probably part of that formation. Both No. 9 Bore and N.B. Bore intersected limestone, at greater depth in the former, confirming the gentle westerly dip of the Cambrian recorded from outcrop in the Hodgson Downs Sheet area.

The Tindal Limestone near Nutwood Downs Homestead is a fine-grained magnesian limestone, which emits a foetid odour when crushed. The Nutwoods Downs Volcanics consist chiefly of subophitic microgabbro, amygdaloidal.

LOWER CRETACEOUS

Skwarko (1961, 1962) studied the Lower Cretaceous rocks of the Carpentaria region as part of a survey of the Mesozoic rocks of the northern part of the Northern Territory.

Lower Cretaceous rocks, usually lateritized, cover most of the Sheet area; The sediments were laid down on a dissected surface, and rest with a strong abutment unconformity on older rocks. Individual sections are incomplete; the succession is locally-occurring white quartz sandstone and breccia-conglomerate with plant remains, overlain by more widespread impure red and yellow sandstone, which is overlain finally by an extensive blanket of rubbly claystone with minor clayey sandstone interbeds.

The white quartz sandstone occurs at isolated localities in the Mature Gulf Fall Area. Never more than 15 feet thick, it is typically very pure, friable and massive. Angular, locally derived breccia-conglomerate occurs in places abutting against faul scarps of

Upper Proterozoic rocks. Both sandstone and conglomerate contain poorly preserved plant remains. Plant fossils were collected from a low circular rise of white sandstone 8 miles north-north-west of Tanumbirini Homestead (referred to as locality TT 36 in White, 1961, q.v.). The age of the species is either Upper Jurassic or Lower Cretaceous.

Yellow and red mottled clayey sandstone crops out only in the Gulf Fall Area, but is considerably more extensive than the plant-bearing white sandstone. Only at one locality in the Tanumbirini Sheet area has it been observed to overlie the plant-bearing beds, but this relationship is consistent elsewhere in the Carpentaria region (Mount Young and Clavert Hills Sheet areas). Red clayey sandstone contains belemnites at a locality one mile north of the border of the Sheet area, but neither species nor genera can be determined. However, the beds are very like those observed overlying plant-bearing sandstone in the Mount Young Sheet area, where they contain a rich marine pelecypod fauna assigned by Skwarko (1961) to the Neocomian. Possible worm tubes were observed in these beds at the Lagoon Creek - Two Mile Creek confluence. Basal well-rounded cobble and boulder conglomerate occurs locally.

The highest beds of the Lower Cretaceous are also the thickest and most widespread. They consist of claystone with local thin clayey sandstone interbeds. These beds, which probably reach a thickness of 200 feet, were extensively affected by Tertiary lateritization (see below), and crop out best in the scarp below the Tableland. In most outcrops they show the effects of lateritization to a depth possibly as great as 100 feet, having been extensively leached and probably later silicified. The resultant rock is dominantly white, but in places multicoloured, rubbly claystone with conchoidal fracture and a close joint system. Bedding has only been observed in local clayey sandstone interbeds.

Unlateritized claystone crops out at low levels in the Younger Gulf Fall Area in small scarps bordering those creeks which are cutting into the old erosion surface (see PHYSIOGRAPHY). This rock is grey, only partly lithified, massive with conchoidal fracture, and contains scattered aggregates of gypsum crystals developed in joints. This soft grey claystone underlies the white harder leached claystone.

The unlateritized claystone weathers in situ to produce a grey-brown residual soil. At one locality 11 miles south-west of Tanumbirini Homestead, small ovoid calcareous nodules weather out in this soil; Lower Cretaceous foraminifera and some radiolaria were found in them (G.R.J. Terpstra, pers. comm.)

CAINOZOIC

The laterite which forms the Tableland is developed on Lower Cretaceous claystone. Its age is regarded tentatively as Miocene (Noakes & Traves, 1954). The semi-pisolitic ferruginous zone is well exposed round the margins of rare sinkholes in the south-west part of the Sheet area, where it is at least four feet thick.

A flat elongated plain, 30 miles long, on the Tableland near the western margin of the Sheet area, has a surface of black gilgai soil and has well-defined margins; this soil appears to post-date the laterite and is possibly the weathering product of lacustrine limestone.

Small outcrops of grey sandy limestone occur at plain level in the Younger Gulf Fall Area, 12 miles west-south-west of Tanumbirini Homestead between Two Mile and Lagoon Creeks. The limestone crops out in the lip of a circular depression about 10 feet deep and 100 yards in diameter, which may possibly be a sink-hole; the rock has a honeycomb texture, and contains abundant Tertiary gastroped and plant remains. This limestone is correlated, on fauna and lithology, with the Golliger Beds east of O.T. Downs Homestead on the Bauhinia Downs Sheet area.

The remainder of the Cainozoic deposits consist of residual soil, sand, and alluvial material; their characteristics are summarized in Table 1.

STRUCTURE

Folds and Faults

The Upper Proterozoic rocks are folded about north-west to north-north-west axes; the dominant structure is the Tanumbirini Anticline, which plunges gently to the north (Fig. 2.). Only the western limb of this structure is well developed in the Sheet area; a part of the

eastern limb is seen in the extreme north-east corner. Dips average 10° in the Masterton Formation near the core, steepening to 25° in the Cobanbirini Formation on the western limb. South of Baggy Lagoon the dip steepens progressively to the south-east along strike, and the western limb passes into the Mallapunyah Fault Zone.

The core of the Tanumbirini anticline is extensively fractured by a set of north-west-striking faults, with a subsidiary set striking north-east. The northern end of the Anticline is dislocated by a narrow extension of the faulted core, the Lagoon Creek Fault Zone, where dips are steepened locally to 65°. The apparent vertical displacement here is 9000 feet. (See section A.B.C., Plate 1.)

Slickensiding and displacement of beds in the Lagoon Creek Fault Zone indicate dextral wrench movement, and it is thought that this represents the major component of most north-west-striking faults in the area. The north-east faults have small apparent slip and are probably tension fractures.

The Bukalara Sandstone is mainly horizontal, but dips at 10° where affected by a fault at Eight Mile Creek.

No dips were recorded in Lower Cretaceous rocks throughout most of the Sheet area, owing to their massive or rubbly outcrop; they mostly form a horizontal blanket. However, at the headwaters of Tanumbirini Creek dips of up to 30° were recorded in Lower Cretaceous interbedded sandstone, and claystone, with a meridional strike; also a gentle dip, with north-west strike, at Top Yard Creek. North-easterly lineations apparent on air photographs bordering Tanumbirini Creek at the Bough Shed Creek confluence are interpreted as faults in Lower Cretaceous rocks. Sub-horizontal slickensides were observed on Lower Cretaceous breccia-conglomerate in the Lagoon Creek Fault Zone.

Joints

Joints trending north-west and north-east, typically rectilinear, are a feature of the Upper Proterozoic arenite units.

The Bukalara Sandstone is not noticeably jointed in the area, as it is elsewhere.

Air photographs show that Lower Cretaceous claystone may develop a reticulated pattern of somewhat curved joints, which in many places show through Cainozoic soil cover.

TECTONIC HISTORY

Sediments in the Upper Proterozoic sequence are at least 18,000 feet thick, implying a similar amount of contemporaneous subsidence in thebasin of deposition.

The presence of halite crystals and pseudomorphs in the Wollogorang Formation implies a period of lagoonal conditions.

In Masterton Formation times, when open sea conditions prevailed, a period of vulcanisn occurred during deposition of quartz sand; this produced the Tanumbirini Volcanic Member. Acid pyroclastics and lava were built up locally on the sea floor, to be quickly dispersed by wave action and redeposited as volcanic conglomerates.

Although the unconformity between the Roper and Tawallah Groups is slight, it represents the period during which 15,000 feet of chiefly carbonate rocks of the McArthur Group were deposited to the east in the central belt of the McArthur Basin. Roper Group sediments can be seen directly overlying those of the Tawallah Group in the central, northern, and north-eastern sectors of the Tanumbirini Anticline, but the boundary is obscured on the western flank. During McArthur Group times the area received little or no sediment and erosion was meagre and local; the area was comparatively stable.

Eventually subsidence was resumed, and at least 15,700 feet of clastic sediments were deposited to form the Roper Group.

In post-Roper Group times the major diastrophism of the area took place. Deformation was probably the result of compression from two directions, north-west and south-west, the north-west compression being relieved by fracture- the Lagoon Creek wrench fault - and the south-west one by folding along north-west axes. At least 18,000 feet of uplift

and erosion occurred to expose the Rosie Creek Sandstone in the core of the Tanumbirini Anticline. The north-west and north-east joints in the arenite units are also probably connected with these tectonic movements.

Subsequent tectonic activity was epeirogenic; the Cambrian and Cretaceous sediments are almost undeformed veneers overlying the folded Upper Proterozoic rocks. They were weakly faulted and warped along former lines of weakness.

ECONOMIC GEOLOGY

Water

Scattered waterholes are the only source of water for stock throughout all but a small part of the Sheet area. Four successful and one unsuccessful water-bore were drilled in the area; details are presented in the Appendix.

Four of these bores were drilled on Nutwood Downs Station, whose homestead lies 15 miles to the north of the Sheet area. At N.A. Bore the aquifer is probably an Upper Proterozoic sandstone. At N.B. Bore and No. 9 Bore water is drawn from the Middle Cambrian Tindal Limestone, which crops out at one locality on the Hodgson Downs Sheet area to the north. The remaining bore was abandoned because of hard drilling. These bores are all situated in the Gulf Fall Area.

The fifth bore, situated on the Tableland near the western margin of the Sheet area, is known as 'Dunmara No. 2.'. No lithological log is available.

Minerals

No mineralization of actual or potential economic importance has been found in the Sheet area. A 2 - inch wide discontinuous vein of barytes was found near the contact between the Masterton Formation and the Tanumbirini Volcanic Member, 8 miles north-north-east of Tanumbirini Homestead. Scattered crystal aggregates of gypsum up to 3 inches long occur near the base of the Lower Cretaceous claystone, where levels which were not lateritized are now exposed.

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APPENDIX I

Details of Water Bores in the Tanumbirini Sheet area

Bore Symbol	Location	Depth in feet	Yield (Gal/Hr.)	Lithological Log
N.A.	16°04' S. 133°52' E.	171	950	0' - 70' Shale, 70' -171' Sst.
N.B.	16°04' S. 134°08' E.	257	2,100	0' - 82' Clay, 82' -257' Lst.
No.9	16°04' S. 134°00' E.	181	2,000	0' - 55' Clay, 55' -121' Sst. 121' -181' Lst.
* No.10	16°01' S. 134°14' E.	113	-	0' -111' Clay, & Lst., 111' -113' Volcanics. *
Dunmara No. 2	16°38' S. 133°32' E.	305	1,200	Not recorded.

* No. 10 Bore was abandoned in volcanics, owing to hard drilling.

FIG. 2

STRUCTURAL SKETCH MAP

OF PART OF TANUMBIRINI 1:250,000 SHEET AND ADJOINING 1:250,000 SHEETS

Scale

MILES 5 0 5 10 15 MILES

Reference

- Post Lower Cambrian
- Lower Cambrian
- Roper Group
- McArthur Group } Precambrian
- Tawallah Group

- Anticlinal axis, showing plunge
- Synclinal axis, showing plunge
- Fault
- Relative movement on wrench fault
- 15 Regional dip of strata
- \+ Strata regionally horizontal
- Geological boundary
- ■ H.S. Homestead

LOCATION DIAGRAM
SHOWING ADJOINING 1:250,000 SHEETS

HODGSON DOWNS | MOUNT YOUNG
TANUMBIRINI | BAUHINIA DOWNS

E53/2/2
R.G.W.

Bureau of Mineral Resources, Geology and Geophysics. June 1962.

TABLE I.

STRATIGRAPHIC TABLE – TANUMBIRINI 1:250,000 SHEET AREA.

ERA	PERIOD	GROUP	STRATIGRAPHIC UNIT	DISTRIBUTION	LITHOLOGY	APPROX. * MAX. THICKNESS (in feet)	TOPOGRAPHY	REMARKS
CAINOZOIC	QUATERNARY		(Qa)	Bordering major creeks. Existence doubtful on the Tableland.	Alluvial deposits, viz. soil, sand, silt and gravel.	50	Linear plains and minor levees	Generally gives white air-photo pattern.
	TERTIARY		GOLLIGER BEDS Tg	Small outcrops 10 miles west of Tanumbirini Homestead	Impure grey limestone	10	In lip of shallow depression at plain level	Abundant gastropod and plant remains.
	UNDIFFERENTIATED		(Czs)	Universal	Residual soil (with local calcareous nodules of Lower Cretaceous age in Younger Gulf-Fall Area), slope-wash and talus, ferruginous gravel.	30	General sloping and undulating plains; talus and outwash slopes bordering strike-ridges of U. Proterozoic rocks	Old erosion surface in "Younger" Gulf-Fall Area. Thin residual sand on Bukalara Sandstone and Lower Cretaceous plateaux in extreme north-east.
			(Czb)	Extreme west of Sheet area	Black soil	Unknown	Featureless plain	Probably an acient lake bed. White, featureless air-photo pattern.
								UNCONFORMITY
			(Czl)	Tableland, with minor outliers	Ferruginous zone of laterite profile, locally pisolitic. Ferruginous rubble and soil.	5	Gently undulating plateau with pronounced scarp.	Extensive rubble and soil. Mottled pale grey and black air-photo pattern, owing to local dense Lancewood patches.
								UNCONFORMITY
MESOZOIC	LOWER CRETACEOUS		(Kl)	Universal	Lateritised, leached and silicified claystone; soft grey claystone (locally gypsiferous); red and mottled sandstone and conglomerate; white pure quartz sandstone with sandstone breccia-conglomerate. Laterite host-rock.	250	In scarp of Tableland. Local, conical residual hills in Younger Gulf Fall Area. Thin cappings and abutments in Mature Gulf Fall Area.	Rests with marked abutment unconformity on older rocks. Plant fossils in white sandstone. (White, 1961)
								UNCONFORMITY
?PALAEOZOIC	?LOWER CAMBRIAN		BUKALARA SANDSTONE (Clb)	Extreme north-east of Sheet Area	Massive, buff and red-brown strongly cross-bedded medium felspathic sandstone	100	Plateau. Minor outlying mesa-cappings.	Unconformable on U. Proterozoic rocks, probably with local abutment. Blanket deposit.
								UNCONFORMITY
PRECAMBRIAN	UPPER PROTEROZOIC	ROPER GROUP	COBANBIRINI FORMATION (Brb)	Lagoon Creek, Kangaroo Springs Creek	Lower half is black and grey shale passing up into upper portion of interbedded micaceous hematitic siltstone and fine sandstone. Highest lithology seen is thinly interbedded buff quartz sandstone and thin mudstone showing injection structures.	4,500	Low-lying strike ridges of sandstone. Shale and siltstone form low undulating country 2 miles east of Condon Rock-hole.	Top not seen. Equivalent to Maiwok Sub-Group of Hodgson Downs Sheet area (Dunn, 1962).
			BESSIE CREEK SANDSTONE (Brb)	Lagoon Creek – Emu Creek area.	Blocky and massive, generally white, fine to medium pure quartz sandstone, well sorted, with cross-bedding and ripple-marks. Typically friable.	1,200	Strike ridges, prominent in north, fading out to south.	Close joint-system locally developed. Air-photo pattern white, with dark bands near top of unit (cf. Hodgson Sandstone Member).
			CORCORAN FORMATION (Brc)	Hot Springs Valley, and small outcrops 2 miles north-west of Condon Rock-hole.	Shale, locally hematitic, grading up through micaceous siltstone to blocky fine quartz sandstone with clay-gall marks.	1,400	Fine sandstone forms rubble-covered scarp-slope. Siltstone and shale form strike-valley.	Shale and siltstone do not crop out in the Sheet area but are known one mile to the north on Hodgson Downs Sheet area.
			ABNER SANDSTONE Hodgson Sandstone Member (Brh)		Massive and blocky, generally white, medium and coarse pure quartz sandstone, with cross-bedding and ripple-marks. Locally friable.	1,000	Prominent top to strike-ridges of Abner Sandstone. Minor jointed plateau north-east of Hot Springs Valley.	Well-developed close joint-system. White, homogeneous photo-pattern.

ERA	PERIOD	GROUP	STRATIGRAPHIC UNIT	DISTRIBUTION	LITHOLOGY	APPROX. MAX. THICKNESS (in feet)	TOPOGRAPHY	REMARKS
PRECAMBRIAN*	UPPER PROTEROZOIC	ROPER GROUP	Jalboi Member (Erj)	Hot Springs Valley, Bull Creek, Tom Lagoon Creek, Condon Rockhole area.	Blocky quartz sandstone with regular interbeds of flaggy fine micaceous sandstone and possible siltstone. Quartz sandstone is cross-bedded.	600	Subdued central member of Abner Sandstone strike ridges.	Characteristic striped air-photo pattern. Micaceous beds rarely crop out. Unit thins to the south-east.
			Arnold Sandstone Member (Erx)		Massive and blocky white and pink quartz sandstone with ripple-marks and cross-beds.	600	Basal resistant unit of Abner Sandstone strike ridges.	Similar in all respects to Hodgson Sandstone Member. Thickens to the south-east.
			CRAWFORD FORMATION (Err)		Flaggy, micaceous and feldspathic sandstone with glauconite. Minor quartz sandstone interbeds near top.	600	Gentle slope with ridges below scarp of Arnold Sandstone Member.	Grey, slightly banded air-photo pattern.
			MAINORU FORMATION (Eru)	Outcrop restricted to small area 10 miles N.N.W. of Tanumbirini	Thinly flaggy grey and pink fine micaceous siltstone. Flaggy micaceous fine sandstone. Green and grey shale.	2,400	Valley-forming	Outcrop very local. Gradational boundary with Crawford Formation.
			LIMMEN SANDSTONE (Eri)	From Lansen Creek in the south to the northern margin of the sheet. The most extensive Upper Proterozoic Formation.	Recrystallised, micaceous, hematitic siltstone and fine sandstone with glauconite, passing up into medium feldspathic and micaceous sandstone, locally gritty. Overlain by flaggy fine micaceous sandstone and finally by blocky, fine quartz sandstone.	3,400	Basal siltstone valley-forming, but preserved beneath scarp of Bukalara Sandstone in the north. Sandstone forms broad strike-ridges.	Sandstone units are typically mauve-purple. Overlies Masterton Formation with slight regional unconformity.
			UNDIFFERENTIATED (Er)	Just east of Arnold River, on northern margin of Sheet.		unknown	Low resistant rises with rectilinear edges.	Air-photo interpretation only. Jointed quartz sandstone with white air-photo pattern.
								UNCONFORMITY
		TAWALLAH GROUP	MASTERTON FORMATION	East of Tanumbirini Homestead and south to Lat. 16°20'.	Massive and blocky pink quartz sandstone with cross-beds and ripple-marks. Minor chert-pebble conglomerate. Polymictic and volcanic cobble and pebble conglomerate. Local minor volcanic lenses.	2,000	Major relief of Mature Gulf-Fall Area. Rugged dissected country in Eight-Mile Creek area.	Volcanic and polymictic conglomerate locally 100 ft. thick. Unit strongly jointed. Only 200 ft. preserved beneath Limmen Sandstone in the extreme north-east.
			Tanumbirini Volcanic Member (Ett)	East of Tanumbirini Homestead towards north-east corner of Sheet area.	Coarse, tuffaceous quartz porphyry, volcanic breccia, agglomerate, polymictic and volcanic cobble and pebble conglomerate; quartz sandstone lenses. Minor tuffaceous siltstone.	300		Probably lenticular. Quartz porphyry in lava with pyroclastic fragments.
			WOLLOGORANG FORMATION (Eto)	Head-waters of Eight-Mile Creek	Dolomitic siltstone, silty dolomite, sandy dolomite, magnesian dolomite, siltstone local halite and pyrite pseudomorphs	500	Chiefly valley-forming; one small area of terrace-formation owing to sub-horizontal resistant interbeds.	
			SETTLEMENT CREEK VOLCANICS (Ete)	One small outcrop on head-waters of Eight-Mile Creek	Altered fine to medium grained dolerite/basalt, locally porphyrite	Unknown	Small rise on dip-slope of Rosie Creek Sandstone.	10 feet exposed in small outcrop at one locality
			ROSIE CREEK SANDSTONE (Etr)	Core of Tanumbirini Anticline.	Blocky brown-to-white feldspathic medium and fine quartz sandstone, with glauconite near top.	? 300 Base not seen	Broad convex rises, usually rubble-covered.	

* No stratigraphic sections have been measured in the Sheet area. Thicknesses of Upper Proterozoic units were estimated from air photographs on the basis of dips measured in the field.

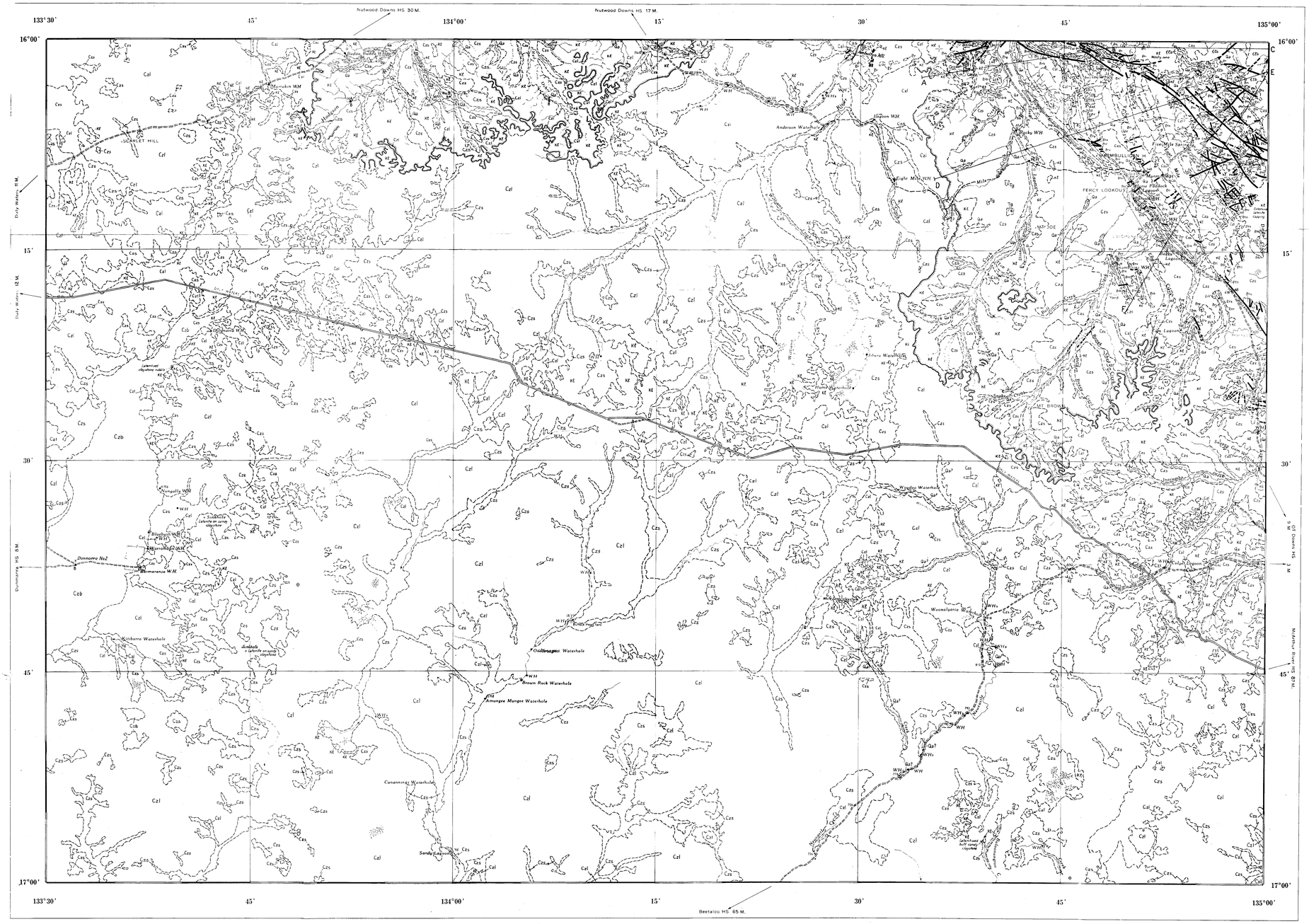
AUSTRALIA 1:250,000

TANUMBIRINI
NORTHERN TERRITORY

1:250,000 GEOLOGICAL SERIES SHEET SE 53-2

PRELIMINARY EDITION, 1962

SUBJECT TO AMENDMENT



Compiled and published by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development. Topographic base compiled by the Division of National Mapping, Department of National Development. Aerial photography by the Royal Australian Air Force; complete vertical coverage at 1:50,000 scale. Transverse Mercator Projection.

INDEX TO ADJOINING SHEETS

Showing Magnetic Declination

LARRIMAH	HODGSON DOWNS	MT YOUNG
DALY WATERS	TANUMBIRINI	BAUHINIA DOWNS
NEWCASTLE WATERS	BEETALOO	WALLHALLOW

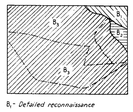
ANNUAL CHANGE 4.5°E

Scale 1 : 250,000

5 0 5 10 15 MILES

5 0 5 10 15 20 25 KILOMETERS

GEOLOGICAL RELIABILITY DIAGRAM



B_1 - Detailed reconnaissance

B_2 - Ground reconnaissance with air-photo interpretation

B_3 - Air-photo interpretation with helicopter traverses

— — Helicopter traverses

Geology, 1960-61 by: A.G.L. Paine

Compilation, 1962 by: A.G.L. Paine and A.S. Mikolajczak

Drawn by: A.S. Mikolajczak

Sections

SCALE $\frac{V}{H} = 1$

Cainozoic sediments omitted from sections

Reference

CAINOZOIC	QUATERNARY		Qa — Alluvium
	TERTIARY	Gollinger Beds	Tg — Impure grey limestone
	UNDIFFERENTIATED		Czs — Residual soil, ferruginous gravel, sand, talus (Generally overlies Lower Cretaceous sediments)
			Czb — Black soil
			Czl — Laterite, lateritic rubble and soil
MESOZOIC	LOWER CRETACEOUS		Kt — Laterized claystone, soft grey claystone, impure sandstone, white quartz sandstone, conglomerate
? PALAEOZOIC	? LOWER CAMBRIAN	Bukalara Sandstone	€b — Massive, feldspathic, medium to coarse quartz sandstone
PRECAMBRIAN	UPPER PROTEROZOIC	Roper Group — Cobanbirini Formation	Prb — Micaceous siltstone, shale, fine and medium-grained, buff quartz sandstone
		Roper Group — Bessie Creek Sandstone	Pre — Blocky and massive, white, fine to medium quartz sandstone
		Roper Group — Corcoran Formation	Prc — Shale, micaceous siltstone, blocky fine quartz sandstone
		Roper Group — Abner Sandstone, Hodgson Sandstone Member	Prh — Massive and blocky medium-grained quartz sandstone
		Roper Group — Jalboi Member	Prj — Blocky quartz sandstone, flaggy micaceous sandstone
		Roper Group — Arnold Sandstone Member	Prx — Massive and blocky, medium and coarse quartz sandstone
		Roper Group — Crawford Formation	Prr — Flaggy micaceous and feldspathic sandstone, with glauconite
		Roper Group — Mainoru Formation	Prv — Flaggy micaceous siltstone, shale, fine sandstone
		Roper Group — Limmen Sandstone	Pri — Blocky, mauve-white quartz sandstone, medium to coarse feldspathic and micaceous sandstone, micaceous hematitic siltstone and fine sandstone
		Roper Group — Undifferentiated	Pr — Jointed quartz sandstone (air-photo interpretation)
		Tanumbirini Group — Masterton Formation	Ptn — Massive and blocky pink quartz sandstone, polymictic and volcanic conglomerate
		Tanumbirini Group — Tanumbirini Volcanic Member	Ptt — Tuffaceous quartz-porphyry, volcanic breccia, agglomerate, polymictic and volcanic conglomerate quartz sandstone lenses
		Tanumbirini Group — Wollogorang Formation	Pto — Dolomitic siltstone, silty dolomite, dolomitic sandstone, crystalline dolomite
		Tanumbirini Group — Settlement Creek Volcanics	Pte — Altered dolerite or basalt
		Tanumbirini Group — Rosie Creek Sandstone	Ptr — Blocky and flaggy, medium and fine, feldspathic quartz sandstone, with glauconite
		Tanumbirini Group — Undifferentiated	Pt — Cross-section only

- Geological boundary
- Fault
- Anticlinal axis
- Where location of boundaries, faults, axes is approximate, line is broken, where inferred, queried, where concealed, faults are shown by short dashes.
- Strike and dip of strata
- Horizontal strata
- Dip < 15°
- Dip 15–45°
- Horizontal strata (Air-photo interpretation)
- Trend of bedding (Air-photo interpretation)
- Joint pattern (Air-photo interpretation)
- Macrofossil locality
- Microfossil locality
- Plant fossil locality
- Water bore
- Windpump
- Bore for water, abandoned due to hard drilling
- Spring
- Rockhole
- Waterhole
- Road
- Minor road
- Horse track
- Fence
- Homestead
- Yard
- Astro station
- Height in feet, instrument levelled (datum: mean sea-level)
- Escarpment

TANUMBIRINI
SHEET SE 53-2

DIAGRAMMATIC RELATIONSHIP OF ROCK UNITS