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EXPLANATORY NOTES ON THE BEDOURIE GEOLOGICAL SHEET

by

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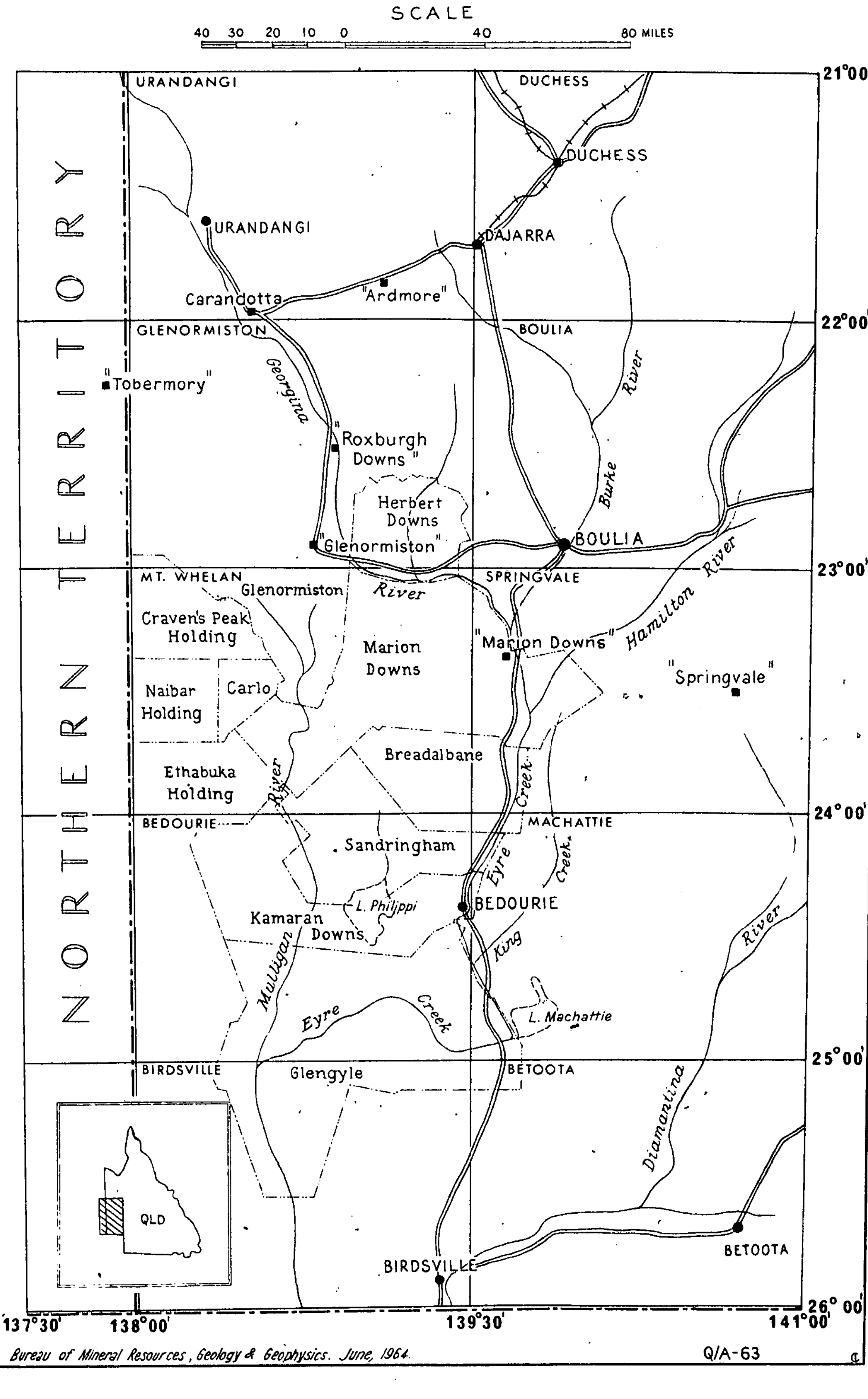
Fig. 1

LOCALITY SKETCH MAP

Showing 1:250,000 Sheets and Station Boundaries



Bureau of Mineral Resources, Geology & Geophysics. June, 1964. Q/A-63

EXPLANATORY NOTES ON THE BEDOURIE GEOLOGICAL SHEET.

by

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The Bedourie 1:250,000 Sheet area was mapped in 1960 as part of a regional survey which also covered the Machattie, Birdsville and Betoota Sheet areas, (Reynolds, Olgers and Jauncey, 1961). The western margin at 138° East Longitude is part of the Queensland - Northern Territory border; the area extends east to 139°30' East, and lies between the Latitudes of 24° and 25°South. The township of Bedourie is on the eastern side of the area on the main road between Boulia and Birdsville; it is the administrative centre of the Diamantina Shire.

Three cattle stations cover most of the area (see Figure 1): Sandringham in the north-east and Glengyle in the south are the properties of Kidman Estates, and Kamaran Downs in the central eastern part is owned by Mr. J. Clanchy. Breadalbane (Marion Downs Pastoral Company) extends into the north-eastern corner. Most of the western half is covered by the Simpson Desert.

The climate is characteristic of central Australia, with hot summer and milder winter conditions, marked daily temperature variations, and sparse rainfall. The climate is mild in winter with average daily temperatures of 60°F and cool to cold nights. Cold winds from the south are common although the dominant influence is from the trade winds from the south-east. Conditions are driest in winter, and towards the end of the season (September) dust and sand storms blow across the region; the name 'bedourie' locally refers to dust storms. The annual average rainfall is 6 to 8 inches; most of this falls in the summer months when temperatures are high (average 110°F), and conditions more humid than usual.

The eastern half of the Bedourie Sheet area is accessible by station tracks; cross-country traverses may be made with 4-wheel drive vehicles but sand dunes may locally involve long detours. Dune crossings are easiest from west to east. Vehicle tracks may be blocked at times by drift sand from dust storms, or may be affected by rain. In addition, access in summer may be impeded by flooding of the main streams and the adjoining flats (sometimes in belts up to 30 miles wide). The Simpson Desert is practically impenetrable from the east, but entry has been made elsewhere from the west and south - Geosurveys Ltd. made a central crossing of the Desert from the west (Sprigg, 1963), and the French Petroleum Company (C.G.G., 1964) ran geophysical surveys in the southern part.

Potable water is generally available in the eastern half of Bedourie either from artesian bores or from permanent and semi-permanent waterholes. Bedourie and the station homesteads at Sandringham and Kamaran Downs are supplied by artesian bores, and Glengyle homestead (in the south-western corner of the adjoining Machattie Sheet area) uses water from the permanent Glengyle Waterhole on Eyre Creek. Another permanent hole in the Bedourie area along Eyre Creek west of Glengyle homestead, is the Tomydonka Waterhole.

The mapping of the Bedourie Sheet area was done using air-photos at about 1:50,000 scale and an uncontrolled base map prepared from reductions of the 1-mile photomaps which were available in 1960; the photography was flown by Adastra in 1957 and 1958. Since then planimetric maps at 1:250,000 have been prepared by the Division of National Mapping.

The Bedourie area lies within the Queensland Authorities to Prospect for Oil No.s 66P and 67P held by Delhi Australian Petroleum Ltd., and Santos Limited.

This area may be of archaeological, as well as geological interest, because of the common evidence of aboriginal occupation: initiation and play-grounds, camping areas with artefact deposits, birthplaces and burial places, (see Reynolds, et al. op.cit.).

PREVIOUS INVESTIGATIONS

Early geological maps of western Queensland showed the Bedourie-Birdsville region as 'Cretaceous' covered in the south-western part by 'Desert Sandstone' (Daintree, 1872), or as Lower Cretaceous 'Rolling Downs Formation' (Jack & Etheridge, 1892). Dunstan (1920) showed the Bedourie area as 'Cretaceous' and in his accompanying report referred to reported salt deposits at Lake Kalidawarry at the junction of the Mulligan River and Eyre Creek and to brown coal occurrences in bores on Sandringham Station.

Whitehouse (1930) divided the Cretaceous of the Great Artesian Basin into the 'Roma, Tambo and Winton Series', and stated that the 'Tambo Series' completely overlapped the lower beds along the western and north-western margins of the Basin. The 'Winton Series' was thought to be restricted to the centre of the Basin east of the Bedourie area. Whitehouse correlated the uppermost (Tertiary) sandstones and shales in the Basin with the 'Eyrian Series' (Woolnough and David, 1926) of South Australia.

He later stated that the mesas and buttes of western Queensland are mostly made up of rocks of the mottled zone of lateritization, and postulated two periods of lateritization which were placed provisionally in the early and late Pliocene (Whitehouse, 1940). The existence of Tertiary highly silicified limestones in several areas of Queensland, including those at Roseberth and Cacoory in the Birdsville Sheet area to the south of Bedourie, was also recorded. The physiographical units of western Queensland were described by Whitehouse (1941), and he also refers to the abrupt swing of the Georgina River (Eyre Creek) from the south-easterly course in the south-western corner of the Machattie Sheet area to the west into the Bedourie area.

Whitehouse's (1945) paper on the geology of the Queensland part of the Great Artesian Basin is a prelude to his main work (1954); he discusses the geology in some detail in both papers, and also formalises his nomenclature in the latter. An intervening paper (1948) is relevant to the Bedourie area in that it discusses the geology, mainly Quaternary or later Cainozoic, of the channel country in south-western Queensland.

Two important accounts of the Simpson Desert and its borders are given by Madigan (1938, 1945). He regards the Mulligan River (and Eyre Creek) as the eastern boundary of the Desert.

Geophysical surveys commenced in the Bedourie area in 1958 and may be summarised as follows:

1958 A single north-south aeromagnetic traverse across the central part (Jewell, 1960).

1960 Seismic traverses by the South Australian Mines Department -

(a) a general reflection programme along the Breadalbane - Bedourie - Birdsville road;

(b) a short single line reversed refraction survey with continuous reflection profiling near Kamaran Downs No.3 Bore; (Milton and Seedsman 1961).

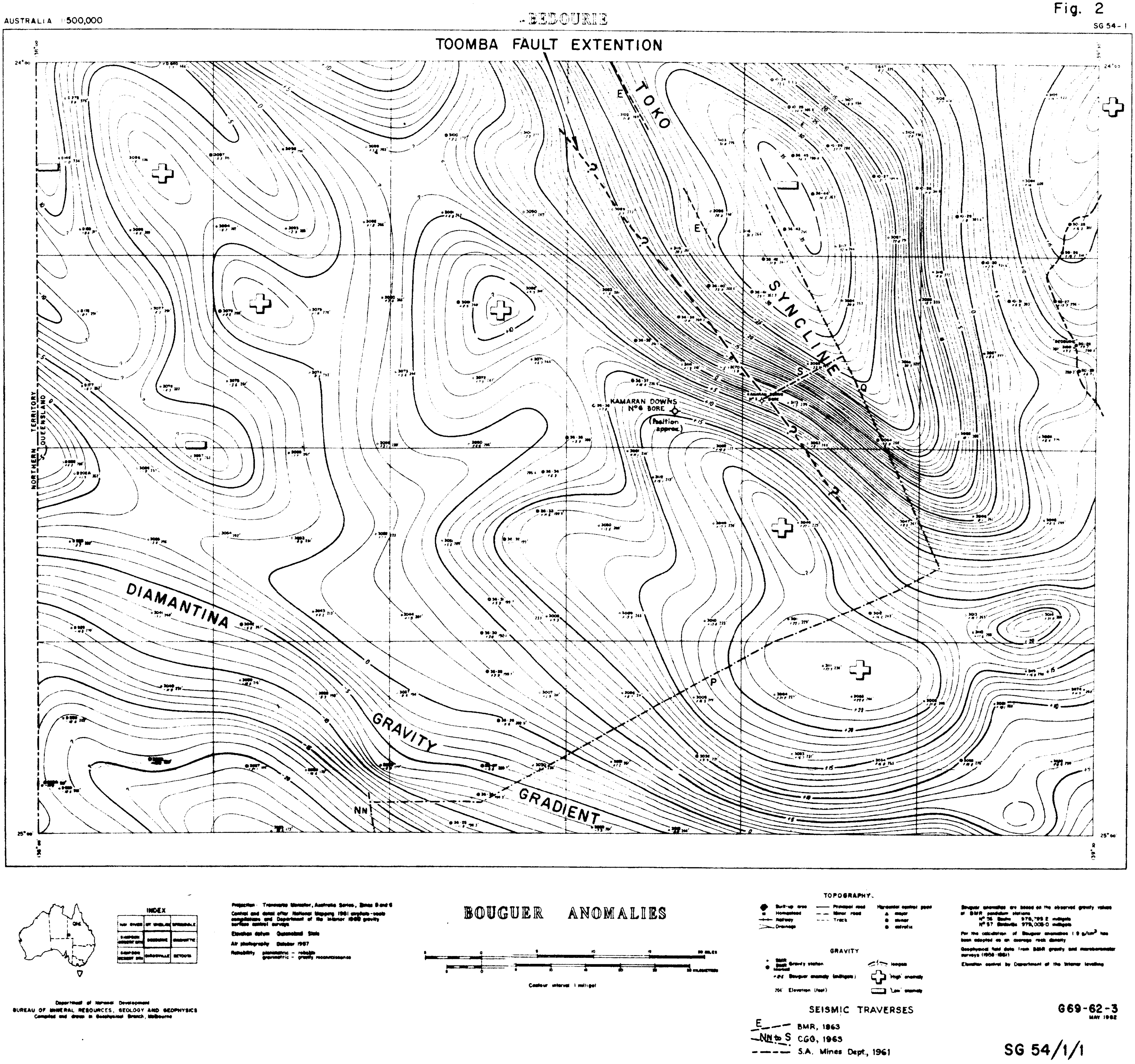
1961 B.M.R. helicopter gravity survey (Lonsdale, 1962).

1963 Traverse E of the B.M.R. South-eastern Georgina Basin Seismic Survey entered the northern part of the Bedourie area from the Mount Whelan Sheet area where most of the work was done (Robertson, 1964).

Another seismic survey, for the French Petroleum Company (C.G.G., 1964), traversed from Annandale in the Birdsville Sheet area in the south into the Bedourie Sheet area to link with the B.M.R. work. The French Petroleum Company also completed an aeromagnetic survey which included the Bedourie and adjoining areas to south and east. (A.H.G.,1964). All seismic traverses are shown on Fig.2.

Palaeontological work on some macrofossils from the Bedourie Sheet area has been done by Dickins (1960), but no identifications have yet been made from the large collection made in 1960. Crespin (1961, 1963) has identified microfossils from the area and described some of the foraminifera.

Fig. 2



AUSTRALIA 1:500,000
BEDOURIE
SG 54-1
TOOMBA FAULT EXTENTION
TOKO
SYNCLINE
KAMARAN DOWNS
Nº6 BORE
(Position approx.)
NORTHERN TERRITORY
QUEENSLAND
DIAMANTINA
GRAVITY
GRADIENT
BEDOURIE
24°00'
25°00'
INDEX
Projection: Transverse Mercator, Australia Series
Elevation datum Queensland State
Air photography October 1957
BOUGUER ANOMALIES
Contour interval 1 milligal
TOPOGRAPHY
Built-up area
Homestead
Railway
Drainage
Principal road
Minor road
Track
Horizontal control point
major
minor
astrofix
GRAVITY
Gravity station
Bouguer anomaly (milligals)
704' Elevation (feet)
'High' anomaly
'Low' anomaly
Elevation control by Department of the Interior levelling
Department of National Development
BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS
Compiled and drawn in Geophysical Branch, Melbourne
SEISMIC TRAVERSES
BMR, 1963
CGG, 1963
S.A. Mines Dept, 1961
G69-62-3
MAY 1962
SG 54/1/1

PHYSIOGRAPHY

More than half of the Bedourie Sheet area is covered by aeolian sand, either as extensive sand ridges which may be up to 100 miles long in the Simpson Desert, or as drift sand. Although Madigan (op. cit.) places the eastern limit of the Simpson Desert at the Mulligan River, dunes and drift sand are also widespread to the east in the Bedourie area. Most of the dunes are fixed, particularly in the Desert, by spinifex cover; sand migration along dune crests and northwards from their noses and deflation at the southern ends was seen in the area east of the Desert (Plates 4 and 5, Reynolds, et al., op.cit.). The sand ridges are 50 feet high on the average, and trend north-north-westerly. Merging of dunes at their northern ends is common (see geological map). The distance between dunes in the Desert averages ¼ mile but is more to the east; areas between are occupied by sand drifts and claypans. Most dunes are asymmetric with east side steepest.

Cainozoic sediments also form another physiographic division in the alluvial flats and channel country of the Bedourie area. They accompany two main drainage systems: Eyre Creek* and the Mulligan River. Eyre Creek skirts most of the eastern edge of Bedourie and in the south-western corner of the adjacent Machattie area turns sharply west into and across the south-eastern part of the Bedourie area. Whitehouse (1941) quotes a suggestion that this sharp turn may be due to a recent sag in Lake Eyre in South Australia which is the end point of most south-western Queensland drainage systems; but he also suggests that there may be some other contributing cause, such as that which swings the Georgina River eastward at latitude 23°S. The latter is attributed to diversion by structure (the Sun Hill Fault) and flow along a strike valley (Reynolds, 1964); the sharp swing of Eyre Creek appears also to be due to the same causes but occurs in a slightly different manner. The southerly course of Eyre Creek is maintained more or less along the eastern side of the Toko Syncline. At the south-eastern end of the Syncline, the Creek may flood-out into the Bilpa Morea Claypan to the east but generally flows west along a strike valley of apparently soft beds in the lower part of the lateritized Winton Formation. In the southern central part of the Bedourie area, the Creek meets the Mulligan at the eastern edge of the Simpson Desert and turns south-south-east to follow the predominant sand dune trend. The deposits of Tertiary limestone in the strike

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* The name 'Eyre Creek' is used for the river and channel systems which run south and west from the junction with King Creek (east of the Bedourie area), and south-south-east from from the junction with the Mulligan River. It has priority and follows the usage of the

valleys and extensions to them suggest that the valleys are old topographic features dating back to the post-lateritization landscape. The course of Eyre Creek is marked by channel country with waterholes (some permanent), flood-out lakes, and alluvial flats with grey soils, and in most parts forming deeply cracked 'gilgai' country when dry or swamp when wet. The more swampy parts are covered by lignum bush.

The Mulligan River diverts from a south-easterly course where it enters the northern edge of the Bedourie Sheet area, and follows a south-south-easterly to south-south-westerly course along the eastern edge of the Desert. The presence of lateral flood-out lakes such as Lake Philippi suggests that the Mulligan River system was probably similar to the Eyre Creek system in less arid times in the past. The River course is now separated by sand ridges from the lateral lakes and runs south as disconnected dry waterholes and channels between the ridges.

The highest topographic relief in the Bedourie area is provided by laterite plateau residuals protected by silcrete duricrust caps or by ironstone. Highest parts (400 to 500 feet above sea-level) are in the north-eastern corner; hills of lateritized Cretaceous rocks with duricrust Tertiary sandstone caps form the high parts. Elsewhere in the north-eastern part, lateritized or weathered rocks are capped by duricrust and ironstone in hilly country from 250 to 350 feet high. To the west ironstone covered rocks occur at lower levels as inliers protruding through sand near the Mulligan River. Farther south, and south-east of Lake Philippi, low south-dipping Cretaceous rocks are capped by Tertiary sandstone which appears to be generally silicified and forming a low plateau; this area, however, is mostly obscured by sand. Another low plateau rises south of Eyre Creek but never much more than about 50 feet above the alluvial flat level. This area is formed of lateritized Cretaceous and Tertiary rocks, with duricrust capping in parts.

A small area of little weathered Cretaceous limestone and mudstone with calcareous concretions occurs as a narrow belt from the northern edge of the Bedourie Sheet area near Sandringham homestead to Lake Philippi. It is rolling downs country and shows a distinctive air-photo pattern.

The area is generally arid, and apart from trees along the rivers and creeks, vegetation is scarce. Some Mitchell grass grows in the rolling downs country but elsewhere stock depend mainly on the thick herbage which grows after rain.

Table 1: Stratigraphy of the Mount Whelan and Bedourie Sheet areas, western Queensland

ERA	AGE	FORMATION	THICKNESS (feet)	LITHOLOGY	FOSSILS	STRATIGRAPHIC RELATIONSHIPS	DISTRIBUTION and TYPE of OUTCROP
CAINOZOIC	Undifferentiated	Alluvium and soil (Cza)	60 in bore	White sands and generally grey soils;			Major streams and alluvial flats
		Sand (Czs)	Dunes up to 50	Red-brown, orange aeolian sands.			Simpson Desert and other areas; mainly sand ridges - interdune sand flats, claypans.
		Duricrust gravel (Czg)	< 1	Gravel of mainly brown-coated rounded siliceous sandy pebbles ('gibbers')			Residual gravel from eroded duricrust - widespread in east of region.
		Gypsiferous deposits (Czy)	12+	White, bedded gypsiferous deposits.	Vertebrate remains		Low plateaux around alluvial flats at junction of Sylvester Creek and Mulligan River; edges of some Simpson Desert claypans.
	Tertiary	Silicification and formation of Duricrust (Czd)					
		Undifferentiated (T)	<10 in outcrop; up to 80 in bores	Limestone and chalcedony	Gastropods, ?ostracods	Probably equivalent to Austral Downs Limestone.	In Bedourie area, as elongated belts east-west along Eyre Creek and south-south-westerly from south edge into Birdsville Sheet area; in Mount Whelan area, small patches west of Toomba Range.
		Austral Downs Limestone (Ta)	<10 in outcrop	Limestone and chalcedony		Unconformable on Ninmaroo Formation	Along course of Georgina River in northeastern part of Mount Whelan area.
		Mount Coley Sinter (Tc)	170 (Casey, 1959)	Chalcedony and siliceous sinter over fine-grained sandstone.	Silicified fossil wood.	Overlies Cretaceous rocks; equivalent to Austral Downs Limestone.	Capping Mount Coley, Mount Whelan, Sugarloaf Hill and small deposits elsewhere (Mount Whelan area).
		Lateritization and Deep Weathering					
		Marion Formation (Tm)	55 (Bedourie area)	Quartz sandstone; quartz chert grit; sandy siltstone.		Disconformable on Cretaceous rocks; covered by sand in parts of Bedourie area.	Most common in eastern parts of both areas, in the duricrust cap over Cretaceous rocks.
MESOZOIC	Cretaceous	Winton Formation (Kw) -Bedourie Sheet only.	20 in outcrop	Leached argillaceous sandstone and mudstone with ironstone concretions.	Silicified wood, carbonized woody fragments.	Base not seen in outcrop; apparently conformable in bores; disconformably overlain by Marion Formation.	Low plateau and hilly country south of Eyre Creek (south-eastern part of Bedourie Sheet area).
		?Mackunda Beds (?Klm) -Bedourie Sheet only	Not known	Ferruginized sandy rocks, calcareous sandstone.	none found	Generally conformable above and below, but covered by Marion Formation in Bedourie Sheet area.	Possibly in buttes south of Kamaran Homestead, and scattered outcrop between dunes south of Lake Philippi (eastern central Bedourie area).
		Wilgunya Formation: upper beds (Klw_2)	500 increasing to over 1000 to south.	Grey mudstone (lateritized in outcrop), fossiliferous calcareous siltstone,	Ammonites, pelecypods (*Inoceramus*, etc.), arenaceous Foraminifera.	Conformable above and below	Mainly plateaux and hilly country, or rolling downs where calcareous beds crop out, (south-eastern Mount Whelan to north-eastern Bedourie area).
		Toolebuc Member (Klo)	up to 10	Fossiliferous pink platy limestone with green shale interbeds, ferruginized in part.	Pelecypods (*Aucellina*, *Inoceramus*), Foraminifera (*Globigerina*), fish scales.	Possible disconformity at base.	Ironstone-covered outcrops in mesa slopes in central eastern edge of Mount Whelan area, and at Bellevue Tank; around alluvial flats west and north of Sandringham at join of Sheet areas.
		Lower beds (Klw_1)	450-550	Sandy glauconitic gypsiferous grey mudstone (lateritized in part) with calcareous concretions.	Abundant arenaceous Foraminifera with well-formed tests.	Apparently conformable on Longsight Sandstone.	Hilly country in east of Mount Whelan area; small area at north edge of Bedourie.

ERA	AGE	SERIES / GROUP	FORMATION	THICKNESS (feet)	LITHOLOGY	FOSSILS	STRATIGRAPHIC RELATIONSHIPS	DISTRIBUTION and TYPE of OUTCROP
	The underlying formations crop out in Mount Whelan Sheet area only - but may extend subsurface into the Bedourie area							
MESOZOIC	Cretaceous		Longsight Sandstone (Kl1)	Up to 550 in bores	Poorly sorted silty sandstone, conglomerate, and silicified brown sandstone, glauconitic in part; minor fontainbleau sandstone; shale and lignite in bores.	Lower beds with fossil wood, plant remains, *Rhizocorallium*; upper-pelecypods, gastropods, belemnites, cidaroid remains, starfish, arenaceous Foraminifera.	Unconformable on Precambrian and Palaeozoic rocks; disconformable on ?Lower Jurassic.	In valleys along Georgina River and east of Toko Range; in Toomba Range area and north-west parts of Mount Whelan, mainly lateritized and capping mesas.
MESOZOIC	?Lower Jurassic (Jl)			380+	Red claystone, partly calcareous; minor sandstone.	None found.		Subsurface only - Montara Bore on Sandringham Station; below Lower Cretaceous in trough of Toko Syncline
PALAEOZOIC	?Permian (P)			Unknown	Unconsolidated fluvioglacial (?) boulders, cobbles and pebbles of silicified sandstone mainly.		Apparently unconformable over older Palaeozoic and below Mesozoic rocks.	Loose gravel on flanks of Toomba Range, low hilly mounds in trough of Toko Syncline, scattered gravel patches elsewhere.
PALAEOZOIC	Upper Silurian to Lower Devonian		Craven's Peak Beds (S-Dc)	456+	Brown ferruginized fine to medium-grained quartz sandstone with clay pellets and basal conglomerate in part.	Fish scales	Basal erosional disconformity over lower Palaeozoic and Precambrian rocks.	As strike ridges or steep cuestas along Toomba Range; low dip slopes in claypans of Simpson Desert.
PALAEOZOIC	Ordovician	Middle; Toko Group	Mithaka Formation (Omm)	200-400	Brown gypsiferous siltstone and sandstone; minor pellet beds.	Nautiloids, trilobites, sponges (*Receptaculites*), conodonts; some pelecypods, brachiopods; tracks.	Conformable on Carlo Sandstone.	Hard beds may form dip slopes or strike ridges in scattered outcrops through sand north-east of Toomba Range and west of Toko Range.
PALAEOZOIC	Ordovician	Middle; Toko Group	Carlo Sandstone (Omc)	200+	Red, brown thick-bedded sandstone, clay pellet beds and some siltstone; cross-bedded.	Nautiloids, brachiopods, pelecypods, trilobite casts and tracks; U-tube structures thought to be organic.	Conformable with overlying and underlying formations.	Prominent steeply dipping beds of east side of Toomba Range, top of scarp and plateau of Toko Range.
PALAEOZOIC	Ordovician	Middle; Toko Group	Nora Formation (Omn)	165-?2500	Green, brown, purple gypsiferous siltstone, and brown sandstone; calcarenite and coquinite beds; clay pellets common.	Nautiloids, brachiopods, pelecypods, trilobites, gastropods, bryozoa, tracks and trails, tubular structures.	Conformable above and below.	Exposed in Toomba Range, and in basal part of and valley to east of Toko Range scarp.
PALAEOZOIC	Ordovician	Lower	Coolibah Formation (Olc)	50-520	Grey calcilutite, some oolitic, and green-white marl; chert lenses, minor calcarenite, dolarenite.	Nautiloids, gastropods, ribeirioids, corals(?), sponges.	Fossil evidence suggests a time break between the Coolibah and Kelly Creek Formations.	As low hills and strike ridges parallel to and north-east of Toko Range; part of deformed sequence in Toomba Range.
PALAEOZOIC	Ordovician	Lower	Kelly Creek Formation (Olk)	250	Lower part mainly sandstone and some siltstone overlain by dolomite with marl and chert; laminated to thin-bedded.	Brachiopods, nautiloids, trilobites, ribeirioids, tubular structures (U-tubes), tracks.	Basal relationship with Ninmaroo Formation uncertain, but probably disconformable.	Generally poor exposures along north-east side of Toko Range and central valley of Toomba Range.
PALAEOZOIC	Cambrian to Ordovician		Undifferentiated (Є-O)	Estimated 3000 to 4,000	Calcilutite, calcarenite, dolomite, sandstone - units ranging in age from Cambrian (?Middle) to Lower Ordovician - which could not be differentiated in the mapping of the northern part of the Toomba Range in the Mount Whelan Sheet area.			
PALAEOZOIC	Cambrian to Ordovician		Ninmaroo Formation (Є-On)	Up to 2400 ±	Calcilutite, calcarenite, and dolarenite; sandy in part; sandstone and siltstone inter-beds; algae, intraformational breccia, oolitic limestone.	Algae (stromatoliths), nautiloids, brachiopods, ribeirioids, 'mandibles'.	Disconformable on Georgina Limestone; overlain by Kelly Creek Formation.	Along northern edge in plains, low rises with terraces, strike ridges and in Georgina River alluvial flats; hard beds prominent along west side of Toomba Range.
PALAEOZOIC	Cambrian	Upper	Georgina Limestone (Єug)	100 (outcrop) probably more than 1100 in Tyson's Bore.	Thinly interbedded hard grey and soft white calcilutite, some sandy, with chert; calcareous sandstone, oolitic limestone, breccia, two-coloured blue grey and brown limestone.	Trilobites, brachiopods, hyolithids.	Basal contact not seen but beds have same general attitude as small Middle Cambrian inliers to east.	Low terraced rises in plains with poor outcrop - usually occur as scattered lines of limestone plates along strike.

AGE			FORMATION	THICKNESS (feet)	LITHOLOGY	FOSSILS	STRATIGRAPHIC RELATIONSHIPS	DISTRIBUTION and TYPE of OUTCROP
PALAEOZOIC	Cambrian	Middle	Undifferentiated (Ꞓm)	Not known but apparently thin in outcrop.	Laminated calcilutite, some sandy, and minor calcareous sandstone.	Trilobites	Low westerly dip, contacts not seen.	Small inliers in sand west of Polly's Lookout and in Cretaceous sediments west and north-east of the low plateau between Mount Coley and Rocky Yard.
		Lower	Sylvester Sandstone (Ꞓls)	1200 (Casey, 1959)	Silicified dense brown sandstone and green siltstone.	tracks	Probably conformable on Sun Hill Arkose; Middle Cambrian and younger rocks apparently unconformably above.	Low elongate plateau, mainly west of Sylvester Creek, from west of Mount Coley to south-east of Rocky Yard; also as small inlier south-west of Sun Hill Fault.
			Sun Hill Arkose (Ꞓlh)	150+ (Casey, 1959)	Arkose, arkosic sandstone conglomerate, siltstone dolomite, greywacke.	Worm trails and trilobite tracks.	Base not seen; unconformably overlain by ?Permian and by Lower Cretaceous.	Low rounded hills (Sun Hill) and rises (south-west of Rocky Yard); small inliers north of Mount Coley Tank.
UPPER PROTEROZOIC			Field River Beds (Buf)	1,000+ (inliers in Simpson Desert)	Interbedded green siltstone and boulder beds - some tillitic texture; arkose, dolomite, siltstone and sandstone.	None	Unconformably overlain by Carlo Sandstone, Craven's Peak Beds, and Lower Cretaceous Longsight Sandstone.	West of Toomba Fault in north-western part of Sheet area, in low rises and strike ridges protruding through sand.
ARCHAEAN (A)				unknown	Granite, schist, pegmatite.	None	Field River Beds thought to be unconformable above although contact not seen.	A small inlier in the Simpson Desert 16 miles north-west of Mirrica Bore.

Parachelia ('parakeelya' - Calandrinia balonnensis - Madigan, 1938,p.520), a particularly good herb for feed, is common in parts of the sand dune country. Spinifex, is the only permanent common vegetation in the Bedourie part of the Simpson Desert. It occurs in large circular clumps, hollow in the centre, and is brown and dry for most of the time, but showing new and vigorous growth after rain.

STRATIGRAPHY

The stratigraphy of units mapped in the Bedourie Sheet area is shown in Table 1 together with that of formations in the Mount Whelan area; many of the older units known from the Mount Whelan area extend subsurface into the Bedourie area, but only the Cretaceous and younger sediments crop out.

Granitic basement rocks in the Bedourie area were found in Kamaran Downs Bores Nos.3 and 6 at depths of 1500 and 1627 feet respectively. The age of the granite from No.3 Bore is 798 million years by the potassium-argon dating method (Evernden and Richards, 1962). They point out, however, that tectonic heating causes argon loss, and age determinations for rocks which may be affected by such processes (e.g. in close proximity to faults) are possibly too young. The granite in the Kamaran Downs Bore No.3, which is close to the south-eastern extension of the Toomba Fault, could therefore be older. The nearest known outcrop of granite to this locality is in a small inlier in the Simpson Desert to the north-west in the Mount Whelan Sheet area. This granite is associated with pegmatite and schist which has been correlated with the Arunta Complex (of the adjoining Hay River Sheet area to the west), and mapped as Archaean; both granite and pegmatite, however, could be intrusive and younger than the schist.

The depth to basement elsewhere in the Bedourie area can be inferred only from the geophysical surveys conducted in the area. Gravity (Lonsdale, 1962), aeromagnetic (A.H.G.,1963) and seismic (C.G.G., 1964) methods suggest shallow basement along the south-western side of the Toomba Fault and around the south-eastern end of the Toko Syncline, and this is borne out to some extent by the occurrence of granite in Kamaran Downs Bore No.6 at 1627 feet. The granite occurrence at 1500 feet in Bore No.3 appears anomalous when its position relative to gravity contours is compared - Figure 2 shows the bore is over an interval of very steep gravity gradient. However the granite here is considered to be on the up-side of a reverse fault (the Toomba Fault) and underlain below the fault plane by sedimentary rock. The aeromagnetic survey (A.H.G., 1963) shows an increase in depth from 1500 feet to over 10,000 feet to magnetic basement across the fault opposite Bore No.3.

An area of shallow pre-Mesozoic basement rocks occurs in the north-east of the Bedourie area and in the area to the north around Breadalbane Homestead. The rocks are called 'limestone, blue rock, or grey slate' in drillers' logs, and may belong to the Lower Cambrian Sylvester Sandstone/Sun Hill Arkose sequence, or younger Cambrian or Ordovician carbonate rocks; they are at least 276 feet thick in Breadalbane No.1 Bore. Seismic evidence suggests that they may be part of the Sylvester Sandstone/Sun Hill Arkose sequence (Reynolds, 1964), and the suggestion may be further supported by the Bouguer gravity anomaly diagram (Figure 2) which shows a positive anomaly in this area (possibly due to dense dolomitic and arkosic rocks of the Sun Hill Arkose). The aeromagnetic results (A.H.G., op.cit.) in the area show depths of either 7,000 to 8,000 feet, or 6,000 feet to magnetic basement - (two alternative depth interpretations are given).

The only other occurrences of possible Upper Proterozoic or Lower Palaeozoic rocks known from water bores in the area are the 6 feet of 'quartz', 33 feet of 'hard grey rock' below the Cretaceous and above 'granite' in Kamaran Downs No.6 Bore, and 12 feet of 'quartz bedrock' above granite in No.3 Bore.

Apart from the identification by P.J. Jones (pers. comm.) of Middle Ordovician Mithaka Formation in a scout hole drilled in connection with the French Petroleum Company's seismic survey in the Bedourie area, no other sediments of Palaeozoic or pre-Cretaceous Mesozoic age have been recognised from bore logs. They are possibly present, however, within the Toko Syncline, and the thickness of sedimentary section just north of Lake Philippi is thought to be more than 16,000 feet, based on the 1963 B.M.R. seismic survey results. According to gravity and aeromagnetic surveys (Lonsdale, 1962; A.H.G., 1964) the section thins a short distance south-east of here to less than 3,000 feet.

Lower Cretaceous

The sediments logged by drillers between the Precambrian or lower Palaeozoic rocks and the base of the Wilgunya Formation are mainly 'sand and sandstone' some coarse-grained, 'clay' and 'shale', up to 550 feet thick in Bindiacca Bore. These form the main aquifer for artesian water and have been correlated with the Lower Cretaceous Longsight Sandstone. In Wickamunna Bore, 56 feet of 'soft black shale' and 24 feet of 'sand mixed with brown coal' below 37 feet of 'sandstone' form the Longsight Sandstone; thin beds of 'limestone' are also recorded in this formation in Ludlow No.2 (or Crown Wheel), Bedourie No.2 and Pippagitta Bores. The Longsight Sandstone is only ?46 feet thick in Kamaran Downs No.3 Bore and 58 feet in No.6 Bore.

The Longsight Sandstone and Wilgunya Formation (with Toolebuc Member) were named by Casey (1959). The lower beds of the Wilgunya Formation, below the Toolebuc Member, are similar lithologically to the upper beds but have a distinctive fauna which can be correlated with that in the Roma Formation of Whitehouse (1954). They extend into the central northern edge of the Bedourie area between the Mulligan River and Sandringham omestead. The thickness in water bores is between 450 and 550 feet. Kamaran No.2, Bedourie and Ludlow bores show a fairly sharp break at the base of the overlying Toolebuc Member on gamma-ray logs (Jesson and Radeski, 1964) and the thickness for the lower beds varied from 482 to 491 feet. Shallow water conditions generally persisted during the deposition of the lower beds - marginal beds are sandy, and the Foraminifera are mainly arenaceous with well-formed tests and are abundant. The environment of deposition is thought to have been within a large marine intracontinental basin with access to the ocean restricted by a shallow submarine bar.

The Toolebuc Member is formed mainly of platy pink limestone with large Inoceramus, Aucellina, and fish remains, and with minor shaly interbeds. Mudstone with nodular calcareous siltstone immediately above the Toolebuc Member, and which was included in that Member by Reynolds et al (op.cit.), is now regarded separately. The sharp break at the base of the Toolebuc Member on gamma-ray logs, and the marked change in fauna from the lower beds of the Wilgunya Formation to the upper beds (with basal Toolebuc Member) indicate a sudden change in conditions in Toolebuc time, and possibly a brief hiatus in sedimentation. The change may have been due to the oceans gaining open access to the basin and introducing the new fauna - this is suggested by the influx of planktonic Foraminifera, fish and ammonites; conditions also became more arid at that time - predominance of limestone with little terrigenous material. The invasion of the oceans, however, was short-lived and conditions reverted to those existing in the basin before Toolebuc time, probably by uplift at the edge and sag in the centre of the basin.

The strong displacements in the gamma-ray logs associated with the Toolebuc Member are due to the radioactive minerals accompanying fish remains. The thickness of the interval showing this displacement is very consistent in bores in the Bedourie area and nearby: 4 show 65 feet, and 1 is 71 feet. This is much greater than the outcrop thickness of the Toolebuc, and the effect is thought to be due to the persistence of fish in the basin for a short interval after Toolebuc time.

Immediately above the Toolebuc Member the upper Wilgunya beds contain large fossiliferous calcareous siltstone nodules in the northern part of the Bedourie area; thin clay pebble - remanie fossil conglomerate occurs in this section. The fossils include a rich assemblage of ammonites, probably unable to survive for long in the changed conditions after Toolebuc time. The upper beds are mainly mudstones and vary in thickness from about 500 feet at Kamaran Downs No.2 Bore to over 1000 feet in Cacoory Bore (approximately 15 miles south of the south-eastern corner of Bedourie, and in the Betoota Sheet area). The beds are lateritized in outcrop and some limestone beds have been altered to ironstone; the ironstone commonly forms a residual capping over hills. Some minor mineralization appears to occur towards the top of the upper beds, south of Lake Philippi, as pockets of crystalline celestite and gypsum, and barytes nodules and may be associated with a change from marine to brackish environment. The fauna of the Toolebuc Member and upper beds is like that in the Tambo Formation (with basal coquinite) of Whitehouse (op.cit.).

Lateritized sandy rocks and calcareous fine-grained sandstone above the Wilgunya Formation south of Lake Philippi have been mapped as ?Mackunda Beds in the Bedourie area, although it is not certain whether these rocks are equivalent to the Mackunda Beds, as mapped to the east. The Mackunda Beds were named by Vine (1962) from the Mackunda Sheet area for transitional beds between the marine Wilgunya Formation and non-marine Winton Formation; they were traced across the

Springvale and Machattie areas to the east of Bedourie, mainly as surface exposures of brown calcareous lithic sandstone. They appeared to be thinner and much less fossiliferous towards Bedourie than in the Mackunda area.

The lateritized Winton Formation forms a plateau south of Eyre Creek with a general low southerly dip; it is locally deformed just north of Humpamurra Tank and along its western edge, south-east of Wilpaterrie Waterhole. Precious opal is reported from the outcrops north of Humpamurra Tank, but only common opal veining in ironstone was found in 1960.

CAINOZOIC

Tertiary

The 55 feet of Tertiary Marion Formation referred to in Table 1 occurs in the section north of Humpamurra Tank and is also deformed by minor folding; the top 15 feet is coarse gritty sandstone to fine-grained quartz, chert conglomerate, the lower 40 feet was thin-bedded fine-grained sandstone to siltstone with coarse grit lenses. Deposition of the Marion Formation was followed by a period of lateritization and deep weathering. Two main belts of Tertiary limestone occur, one along the north side of Eyre Creek, the other south of Tomydonka Waterhole extending in a southerly belt to the middle of the Birdsville area - possibly an older course of Eyre Creek. Small patches occur along Eyre Creek north of Bedourie. The main Eyre Creek outcrops west of Glengyle are fossiliferous - high and low-spired gastropods, and ?ostracods, and contain small amounts of a yellow mineral associated with pockets of crystalline calcite. The mineral was examined by W.M.B. Roberts in the B.M.R. Laboratory and found to contain uranium, arsenic and vanadium in that order of abundance (Appendix I in Reynolds et al., op.cit.). The X-ray powder diagram suggested the mineral carnotite, but the presence of arsenic is anomalous in this case. The greatest known thickness of Tertiary limestone in the Bedourie area is 33 feet ('solid white rock') in Gulgong No.2 Bore.

The Tertiary limestone was deposited in depressions in the old lateritized land surface. Widespread silicification occurred later throughout the area and formed billy within lateritized sandstone profiles, porcellanite over lateritized mudstones, and chalcedony above Tertiary limestone.

Younger Sediments

More than half of the Bedourie area is covered by aeolian sand, and a large part of the remainder is covered by alluvium, and duricrust or ironstone gravel.

The sandy areas have been discussed to some extent under Physiography. The source of the sand was probably the upper parts of lateritized sandstone which were not fixed by silicification; this would account for limonite coating of most dune sands and their predominant reddish colours. White or light coloured dunes appear to be mostly adjacent to the main streams and composed of sand of alluvial origin.

White sandy limestone nodules are found at the base of dunes in some places and similar milky white limestone occurs in small algal-like mounds in claypans in the interdune areas. Whitehouse (1948) refers to formation of the interdune claypans by seepage of water with clay from the dunes into interdune hollows. Prominent benches protruding from beneath the sand around some of the dry lakes in the eastern part of the Simpson Desert are thought to be gypsiferous deposits similar to those around Pulchera Waterhole to the north.

The main alluvial deposits are composed of grey to blue-grey gypsiferous clays, silts, white sands and gravels up to 103 feet thick in the Bedourie Bore. Lime accumulates in bands and in irregular pointed tube-like structures up to 1 foot long within the sands.

Erosion of the duricrust has formed widespread billy gravel deposits ('gibbers') in the eastern part of the Bedourie area. Where the gravel accumulates in shallow depressions on plateau surfaces (such as south of Eyre Creek), the pebbles have been stained dark brown in stagnant water; such beds give unusual airphoto patterns and may be mistaken for ironstone outcrops. The process of erosion which controls gibber distribution is due to the arid climate. The gibbers are not moved significantly by water action, but they do move downwards as underlying soil is deflated. This results in accumulations of gibbers in narrow belts - a type of soil-creep effect - and the resultant airphoto pattern is suggestive of beds which have been domed, particularly over low rounded hills, (see Plate 8, Reynolds, et al., op.cit.).

Beds of ironstone are eroded in the same way as the duricrust and the gravel formed gives similar but blacker airphoto patterns.

STRUCTURE

Structures in the south-western Queensland region are generally difficult to define at the surface. It is a region of low relief and mostly covered by sand, gravel, and alluvium which can in some places give false impressions of structure. Lateritization and duricrust formation have also confused the picture by obscuring true dips and showing apparent dips in the duricrust due to irregular silica deposition. The duricrust does, however, show true tectonic folding as well.

Based on subsurface and geophysical information, the Bedourie Sheet area has the following major structural features:

(a) It is mostly a shelf area (an extension of the Boulia Shelf of Whitehouse, Fig. 34, 1954) with a fairly steep gravity gradient at its margin in the south-western corner; the margin is shown in Figure 2 as the 'Diamantina Gravity Gradient' because of its continuity with the feature of that name which swings to the north-east, more or less following the course of the Diamantina River, in the area east of Bedourie (see Gibb, in prep.).

(b) The Toomba Fault extends subsurface across the shelf into the south-eastern quadrant of Bedourie from the Mount Whelan Sheet area to the north (Figure 3); aeromagnetic traverses show a slight offsetting to the east by transverse faulting south of Lake Philippi (A.H.G., op.cit.).

(c) The Toko Syncline also has its southernmost extension into the south-east of the Bedourie area; its western extent is marked by the Toomba Fault and the eastern side by a positive Bouguer gravity anomaly (Figure 2); the gravity contours show the south end of the Syncline as a sharp gradient along a fairly straight axis, but the aeromagnetic results show a bending to the east.

The formation of the Toko Syncline was associated with a major thrust movement from the south-west causing reverse movement on the Toomba Fault. The suggested overthrusting explains anomalous gravity patterns along the fault zone near Kamaran Downs No.3 Bore, and also the problems experienced by the French Petroleum Company (C.G.G. op.cit.) in interpreting their seismic results across the fault opposite No.3 Bore - they obtained reflections from deep events near No.3 Bore where shallow granitic basement is known to occur, and suggested that these might possibly be oblique reflections from the other side of the Toko Syncline. Based on outcrop evidence in the Toomba Range in the north-west of the Mount Whelan area to the north of Bedourie, the age of the thrust movement is given as possibly Carboniferous (Reynolds & Pritchard, 1964).

Subsequent movement which water bore logs showed to be up to the east (Reynolds et al. 1961), occurred against the Toomba Fault in post-Cretaceous time. Buckling of the duricrust farther to the north along the Fault suggests a late Tertiary age for the movement. The deformation of the Winton Formation and the overlying Marion Formation (and its duricrust capping) south of Eyre Creek is also apparently associated with the late Tertiary movements; these structures are not obvious in geophysical interpretations of basement because they are either too small to show up, or represent superficial effects in the younger rocks only of regional compression against the edge of the Boulia Shelf.

The minor joint pattern which shows up through inter-dune areas in the central-western part of the Bedourie Sheet area apparently occurs over the Shelf area, but its origin is not known.

ECONOMIC GEOLOGY

Hydrology

Most bores drilled to the Longsight Sandstone in the Bedourie Sheet area have been successful, and obtained good artesian supplies from depths varying between 568 feet in the north to 2336 feet in the south. The details of these have been included in Appendix 1. Bores in the Longsight Sandstone where it thins over basement highs, however, may be unsuccessful. The water may be too salty for use, as in the Breadalbane area north-east of the Bedourie area, or inadequate as in the shallow basement area south-west of the Toomba Fault. Kamaran No.3 Bore, just west of the Fault, yielded no water from the Longsight Sandstone, and Kamaran No.6 to the west gave only a small supply of potable water.

Artesian and subartesian supplies from other rocks and sediments are mostly unreliable both in supply and quality. The only bore supply from other underground sources known to be used in the area is subartesian and from ?Tertiary sediments; even this is slightly brackish and only suitable for stock.

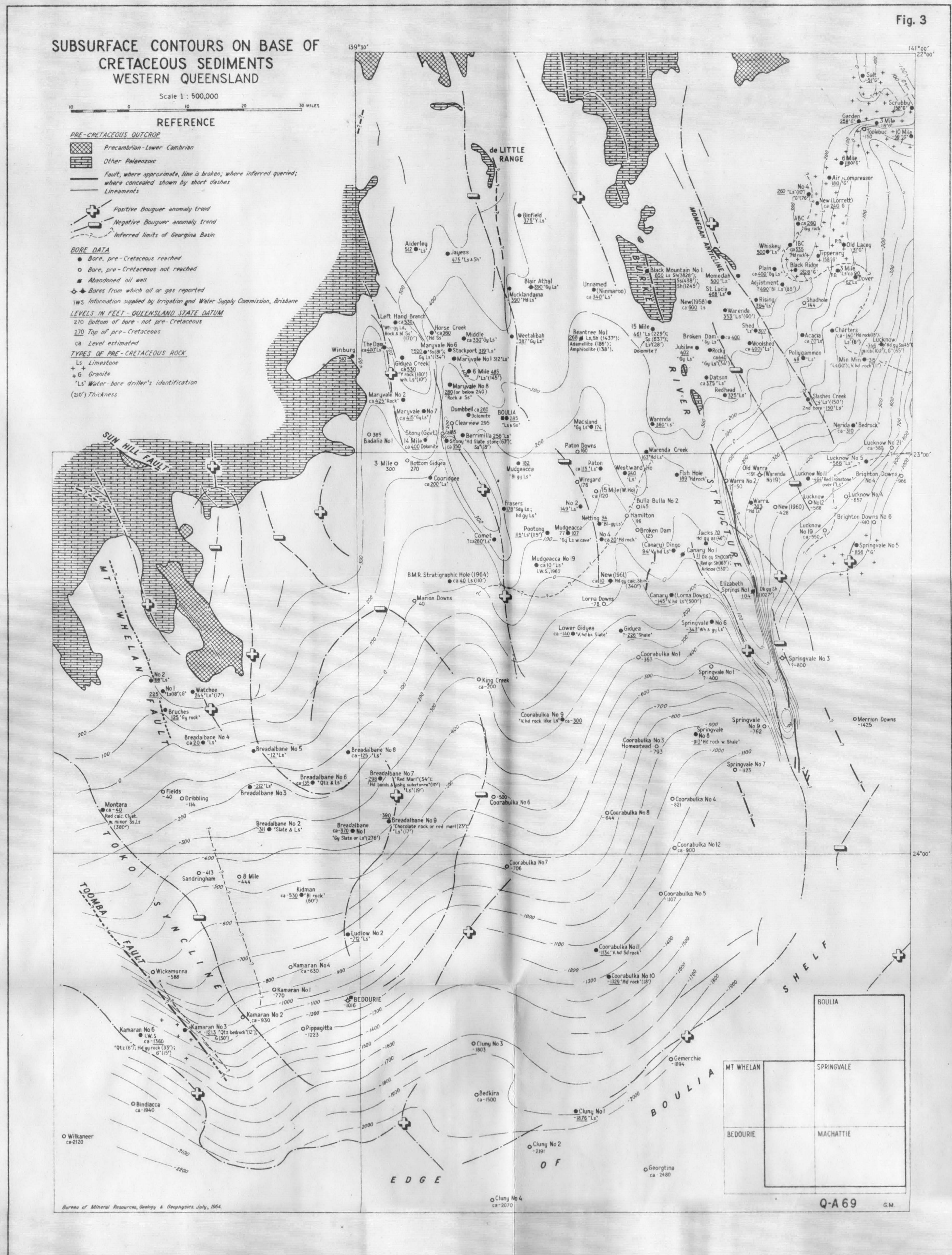

Fig. 3
SUBSURFACE CONTOURS ON BASE OF CRETACEOUS SEDIMENTS
WESTERN QUEENSLAND
Scale 1 : 500,000
10 0 10 20 30 MILES
REFERENCE
PRE-CRETACEOUS OUTCROP
Precambrian - Lower Cambrian
Other Palaeozoic
Fault, where approximate, line is broken; where inferred queried; where concealed shown by short dashes
Lineaments
Positive Bouguer anomaly trend
Negative Bouguer anomaly trend
Inferred limits of Georgina Basin
BORE DATA
Bore, pre-Cretaceous reached
Bore, pre-Cretaceous not reached
Abandoned oil well
Bores from which oil or gas reported
IWS Information supplied by Irrigation and Water Supply Commission, Brisbane
LEVELS IN FEET - QUEENSLAND STATE DATUM
270 Bottom of bore - not pre-Cretaceous
270 Top of pre-Cretaceous
ca Level estimated
TYPES OF PRE-CRETACEOUS ROCK
Ls Limestone
G Granite
'Ls' Water-bore driller's identification
(210') Thickness
139°30'
141°00'
22°00'
23°00'
24°00'
de LITTLE RANGE
MOMEDAH ANTICLINE
BURKE RIVER STRUCTURE
SUN HILL FAULT
MT WHELAN FAULT
TOKO SYNCLINE
TOOMBA FAULT
EDGE OF BOULIA SHELF
BOULIA
BEDOURIE
BOULIA
MT WHELAN
SPRINGVALE
BEDOURIE
MACHATTIE
Bureau of Mineral Resources, Geology & Geophysics. July, 1964.
Q-A 69
G.M.

Several springs occur in the north-western part of the Bedourie Sheet area, possibly associated with east-north-easterly faulting west of the Toomba Fault as interpreted from the aeromagnetic survey. Beppery Springs yield a good supply of water suitable for stock but little is known of the other springs.

Some wells have been sunk to tap groundwater supplies in the alluvium, mainly on Glengyle Station, but the water supply is poor. On the other hand, good water is commonly derived from soaks below the beds of dry waterholes and channels of the main streams. Tim's soak on Eyre Creek, 5½ miles north-north-east of Bedourie, is about 10 feet deep and yields a good supply of potable water. Fresh water also occurs down to 10 feet in Titchery and Kalidawarry waterholes.

The only permanent surface water supply occurs in Tomydonka waterhole on Eyre Creek. Many holes may hold water for a few months after the rivers have flowed, but this is not common. Kalidawarry Waterhole holds fresh water for two years after being filled, but if not supplemented during that time, may turn salty.

Petroleum

The best prospects for petroleum accumulation appear to lie within the Toko Syncline - the sedimentary sequence is thick, possibly more than 16,000 feet in the Lake Philippi area according to the 1963 B.M.R. Seismic Survey, and includes possible source, reservoir and cap rocks. The best of the possible source rocks are the dark grey foetid limestones of Middle to Upper Cambrian age and the richly fossiliferous beds in the overlying Upper Cambrian to Ordovician sequence which crop out in the limbs of the Syncline to the north of Bedourie, and probably extend subsurface into the Bedourie area. The B.M.R. seismic survey traced the Upper Cambrian to Lower Ordovician Ninmaroo Formation from shallow depth to about 11,000 feet in the core of the Syncline just north of the Bedourie area. Reflection results along the axis of the syncline into the Bedourie area indicated an increase in the thickness of sediments by about 5,000 feet. Subsequently a scout hole drilled by the French Petroleum Company as part of their seismic work in the Bedourie area (3 miles south-east of Sandringham Homestead) penetrated the Middle Ordovician Mithaka Formation from about 950 to 1003 feet (total depth); the identification is based on conodonts (P.J. Jones, pers. comm.). This indicates that the total section of sediments determined by seismic methods is mostly

Middle Ordovician to Upper Cambrian in age with probably some older sediments, Middle Cambrian and/or Upper Proterozoic to Lower Cambrian, below. The sequence is not conformable; Table 1 shows that disconformities occur in outcrop between the Toko Group and Kelly Creek Formation, and between most of the underlying units. Reservoir possibilities are common in the sandstone and dolomite beds in the Ninmaroo Formation to Toko Group succession, and several siltstone interbeds which would form cap rocks occur.

The south-western corner of the Bedourie Sheet area may have prospective section with stratigraphic traps along the edge of the Boulia Shelf. Seismic results (C.G.G., op.cit.) indicate a sedimentary section of at least 3000 feet although this is probably mostly Lower Cretaceous; (Wilkaneer Bore, which is the southernmost deep bore in the Bedourie area and is over the Shelf area was in Lower Cretaceous sediments to 2336 feet - total depth). Best prospects for this section lie further south in the Birdsville Sheet area.

The only report of hydrocarbons from the Bedourie Sheet area is by Mott (1952) who includes the Bedourie Bore among those in the Great Artesian Basin with 'reported showings of oil or gas not confirmed by analysis, but considered important and authentic'. According to the driller's log, this bore finished in 34 feet of water bearing 'coarse sandstone' and is thought to contain only Lower Cretaceous sediments.

Large-scale structures are not apparent in outcrop within the Sheet area, but geophysical methods and subsurface studies show the presence of the Toomba Fault and Toko Syncline at depth. They formed by thrust movement from the south-west, possibly in the Carboniferous, but small late Tertiary movements from the east have been recognised. Their significance in relation to possible hydrocarbon accumulation can only be assessed by further subsurface studies, and ultimately by drilling.

Other Minerals

Occurrences of other minerals are known from the Bedourie area but are either too small, or too remote to be of any economic importance. These include: thin brown coal in some of the Sandringham bores; uranium minerals in very small amounts in the Lower Cretaceous Toolebuc Member and Tertiary limestone; celestite and barytes from the upper beds of the Wilgunya Formation; and thick gypsum deposits and also some salt along the eastern side of the Simpson Desert.

Unconfirmed reports were received of precious opal from north of Humpamurra Tank and another locality 14 miles to the east.

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APPENDIX 1 - WATER BORES IN THE BEDOURIE SHEET AREA

Name of Bore (Station) in Alphabetical Order	Registered Number	Position	Artesian (A) or Sub-Artesian (S.A.)	Total Depth (feet)	Depth (Ft.) Water Struck	Depth (Ft.) Water Rose To	Supply (Gallons per day) and Year Tested	Quality	Driller and Year Drilled
Bedourie (Government)	316	Bedourie Town	A	1314	25 41 255 355 1162,1190- 1314	? Surface 40 Surface Surface	? ? ? ? 1905-2,649,401	Brackish Brackish Salt Salt Good	1905
Bindiacca (Glengyle)	2419	40 miles S.W. of Bedourie	A	2318	20 1891,1966, 2062,2161.	? Surface	? 1926- 500,000 1948- 244,000	Salt Good	1926
Eight Mile Creek (Sandringham No.4)	4322	9 miles E. of Sandringham H.S.	A	775	710 741 760	Surface	1916- 716,000	Good	1916
Gulgong No. 2 (Glengyle)	2417	7 miles S.S.W. of Bindiacca	S.A.	820	33	33		Salty	1925
Kamaran Downs Homestead or Philippi No. 1 (Kamaran Downs)	12914	Kamaran Downs Homestead	A	1090	1015 1090	Surface Surface	Small flow 600,000	Good Good	Station Plant 1955
Kamaran No. 2 or Philippi No. 2 (Kamaran Downs)	13149	6 miles S.S.W. of Kamaran H.S.	A	1226	1045,1060, 1080,1140, 1218.	Surface	534,000	Good ("Sweet")	F. A. Peterson 1956
Kamaran No. 3 or Philippi No.3. (Kamaran Downs)	13283	16 miles S.W. of Kamaran Homestead.	A	1513	1295	Surface	960	Salty	F. A. Peterson 1958
Kamaran Downs No. 4 or Philippi No. 4 (Kamaran Downs)	13649	6 miles N.N.E. of Kamaran Downs H.S.	A	971	758 915 947 961	525 Surface	? 80,000 150,000 344,000	Good Good	R. Ruwaldt 1958
Kamaran Downs or Philippi No. 6	15484	7½ miles west of No. 3	A	1642	32 600 1543 1580	31 Soak Surface	12,000 - 2,800	Salt Salt Potable	R. Ruwaldt 1963
Kartarchara (2 bores 35 yards apart) (Sandringham E)	4316	15 miles north of Wickamunna Bore	A	430 deepened to 492	?	Surface	Flow increased by deepening in 1959 to 16,800.	?	1891
Kidman or Duck Creek Bore (Sandringham)	12625	19 miles E.S.E. of Sandringham H.S.	A	920	290 740,780 875	Surface Surface	165,000	Good Good	Godfrey Brothers 1954.
Ludlow No. 2 or Crown Wheel Bore (Government Bore on Sandringham property)	12040	13 miles N. of Bedourie, ¼ mile W. of Bedourie-Boulia Road	A	1025	176 720 905 950 1025	Soak Surface	? 50,000 70,000 460,000 793,000	Salt Good	Godfrey Brothers 1952
Pippagitta (Glengyle No. 1)	2806 2807	9 miles S.W. of Bedourie	A	1507	1340,1370, 1390,1430, 1470,1490, 1507	Surface	1948-1,238,000	Good	2806-McInnes 2807-V.Beauchamp, 1924
Sandringham Homestead (Sandringham No. 1)	4319	Sandringham Homestead	A	725	35 568 609,702, 721.	19 Surface Surface	? ? 147,000	Good	1915

Name of Bore (Station) in Alphabetical Order	Registered Number	Position	Artesian (A) or Sub-Artesian (S.A.)	Total Depth (feet)	Deepth (Ft.) Water Struck	Depth (Ft.) Water Rose To	Supply (Gallons per day) and Year Tested	Quality	Driller and Year Drilled
Shote-hole No. 100, S. Australian Mines Department.	-	2 miles South of Kamaran Downs No. 3	S.A.	75	32 small supply) 50)	20	24,000	Brackish slightly bitter	South Australian Mines Department. 1960
Wickamunna (Sandringham No. 5)	4323	15 miles south-west of Sandringham Homestead.	A	863	745 829	Surface Surface	1917-1,000,000) 1917-3,000,000) 1955-1,355,000 (total)	Good	D. McInnes 1917.
Wilkaneer or Kalidawarry No. 1 (Glengyle)	3113	13 miles west-south-west of Bindiacca	A	2336	2167 2336	Surface Surface	1929-750,000) 1948-380,000)	Good	1929

APPENDIX 2 - ABBREVIATED DRILLERS' LOGS OF WATER BORES

Abbreviations used: bd.:bed, bl.:blue(ish), blk.:black, bnd.:band(ed), brn.:brown, c.:coarse(ly), cgl.:conglomerate, cly.:clay(ey), col.:color(ed), dk.:dark(er), f.:fine(ly), gn.:green, gvl.:gravel, gy.:gray, gyp.:gypsum(iferous), hd.:hard, lig.:lignite(ic), ls.:limestone, lt.:light(er), mdst.:mudstone, olv.:olive, pbl.:pebble, pk.:pink, pyr.:pyrite(ic)(ized), qtz.:quartz, rk.:rock, sd.:sand, sdy.:sandy, sft.:soft, sh.:shale, ss.:sandstone, v.:very, /.:with, wh.:white, yel.:yellow.

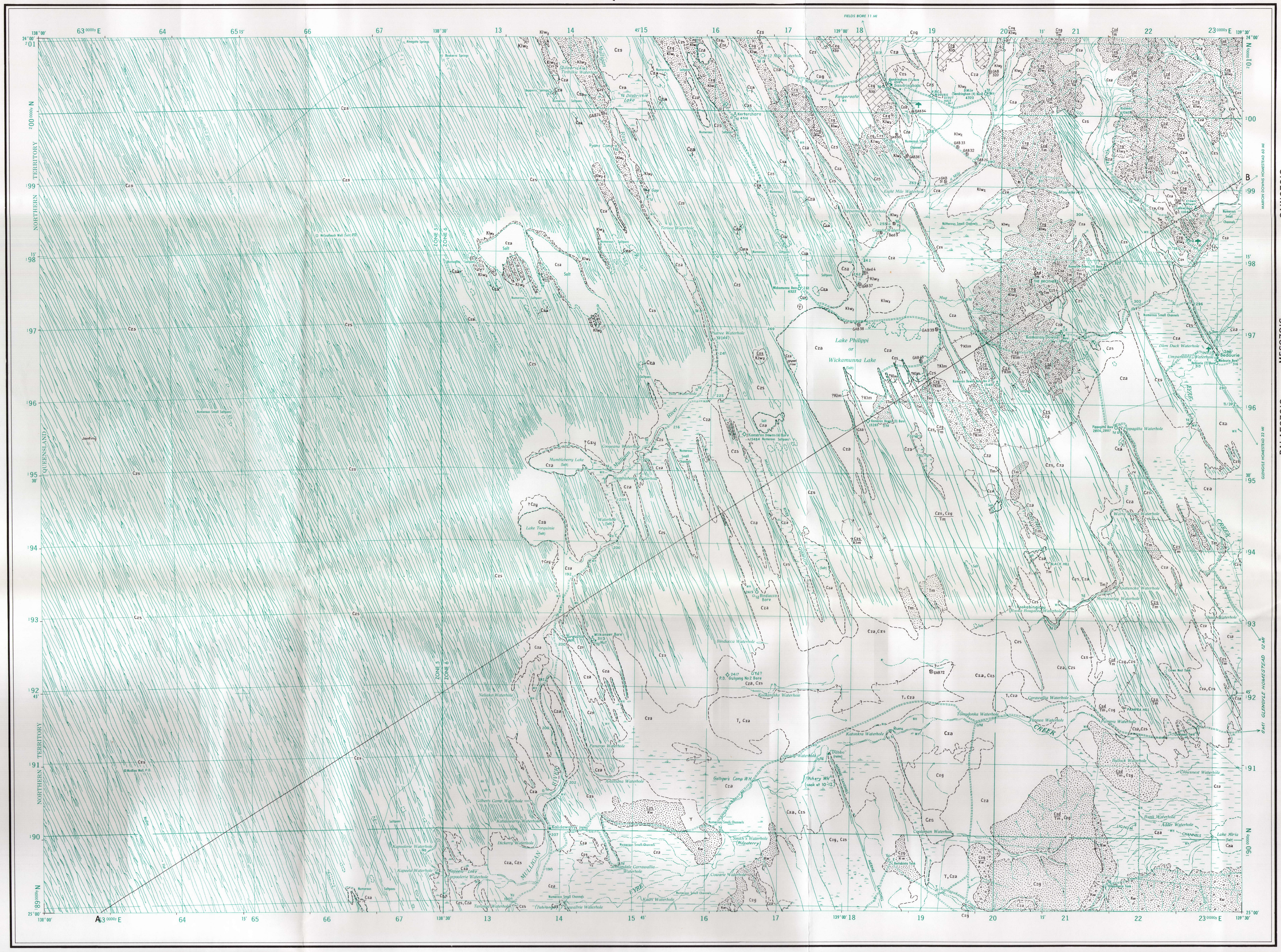
	Bedourie	Bindiacca	8-Mile	Gulgong No.2	Kamaran No. 1	Kamaran No. 2	Kamaran No. 3	Kamaran No. 4	Kamaran No. 6	Kartarchara	Kidman	Ludlow	Pippagitta	Sandringham	Shote Hole 100	Wickamunna	Wilkaneer
CAINOZOIC	Feet 0- 3 sd - 32 yel cly/sd & kopai * - 41 sd & kopai - 62 sd & gvl - 63 soapstone - 103 drift sd & gvl	Feet 0- 26 wh sd rk - 42 drift sd - 66 pipe cly	Feet 0 ?	Feet 0- 33 solid wh rk (Tertiary limestone)	Feet 0- 6 red soil		Feet 0- 10 cly - 45 ss	Feet 0- 2 sdy top soil	Feet 0- 4 soil - 12 sdy cly - 32 ss & kopai - 47 brn sdy cly - 70 f drift sd	No log	0- 50 residual soil & stones	0- 3 soil - 10 gy sdy cly	0- 27 soil - 50 gvl & sd	0- 6 sd & cly	No log		0- 65 sd
LOWER CRETACEOUS — WILGUNYA FORMATION	- 111 yel cly - 118 mud spring - 148 yel & pk cly/kopai - 173 red cly/kopai - 205 yel cly - 234 blk, bl cly - 255 yel cly - 285 f sd/cly bds - 330 drift sd/basalt & qtz pbls, pyr, lig. - 342 sd & gvl - 375 sd & cly -1187 bl & blk sh/kopai bds: sd & kopai at 945 6" ls at 975 6" hd ls at 1022 4" " " " 1049 gn sd & sh 1150	- 200 yel sh - 250 dk pipe cly - 308 yel cly - 691 dk sh/sd seams - 774 olv hd sh -1024 blk sh/gyp (810-850) & rk bnds -1048 drift sd -1482 blk sh/sd & rk bnds - 1612 bl rk	?	-103 rotten soapstone -628 bl sh & cly -820 blk sh Abandoned	- 18 cly & kopai - 108 yel sh - 200 gy sh -1000 gy sh/seams gy rk	0- 2 sdy cly) - 130 yel cly) ** & kopai) - 500 gy sh/seams of hd rk - 800 gy sh - 880 gy sdy sh - 940 gy sh -1045 hd gy sh	- 75 cly) - 420 gy sh) ** - 450 ss) - 690 gy sh - 800 gy sh/rk seams -1295 gy sh -1303 bl sd -1331 gy sh -1348 sdy sh -1350 gn cgl -1391 gy sh/ls bnd -1399 sdy sh/ls bnd -1415 sdy cly -1442 gy sh	- 30 l brn cly - 31 red rk -192 brn & gy cly -193 ls -400 gy sh -411 ls & gy sh (Toolebuc M.) -691 gy sh -735 sdy gy sh -757 l gy sh -758 ls -881 gy sh -883 ls -907 gy sh -1433 gn sd & gy - mdst	- 130 yel cly - 145 dk yel cly - 228 blk mdst - 230 ls - 376 blk mdst - 519 gy mdst - 520 ls -1079 gy mdst -1184 sdy gy mdst -1216 sdy l gy mdst -1241 hd sdy mdst -1388 sdy gy mdst/ls seams -1390 dk ss -1448 blk muddy ss -1456 gn mdst ss & ls -1520 gy mdst -1530 ss & mdst		- 95 yel sh -285 gy sh -290 honeycombe ss -640 gy sh -725 gy sh/ss seams	- 23 yel cly - 43 gy cly - 44 red rk - 83 gy cly -100 col cly -130 gy sh -131 gy rk -325 gy sh -415 dk gy sh -563 bl sh -651 dk gy sh/kopai -720 dk gy sh -743 l sdy sh/layers of rk -751 l gy sh/layers of rk -885 gy sh -893 sd rk & slate -906 sh & ls	- 60 yel cly) ** & sd) - 75 yel cly) - 220 bl sh) - 225 hd gy streak - 375 bl sh - 378 hd gy streak - 645 bl sh - 845 blk sh -1300 bl sh -1338 blk sh	-563 sh		0- 28 yel cly -243 bl-blk blazing sh -322 hd bl-gy rk -496 bl sh -506 hd gy rk -742 sft sh/veins gn & wh sd -746 gn-gy rk, v. hd	- 253 yel & wh cly - 255 rotten ironstone - 288 yel sh - 389 wh cly - 497 gy cly -1493 bl & gy cly & sh/hd bnds -1513 bl sh/sdy streaks -1842 blk & bl sh & cly -2204 bl cly/sd & hd bnds
LONG SIGHT SANDSTONE	-1198 sd & sh -1266 f gy ss -1271 sd, gvl, pyr -1278 gy ss -1280 ls -1314 c ss	-1640 wh sd -1662 c rubble -1780 gy sd & cly -2161 ss	722-775 ss		-1090 honeycombe ss	-1049 ss -1080 sdy sh/ss seams -1100 ss -1140 sdy sh -1200 ss -1218 gy sh -1226 ss	-1470 lt col mixture of cly & qtz -1486 ss -1488 drift sd	-921 sdy sh, ss, & rk -950 sdy sh & ss -961 sdy sh -971 ss	-1543 c & f ss -1548 c ss -1588 sft ss/qtz seams		-858 gy sh & honeycombe ss	- 923 f sd rk - 950 sd rk - 950'6" ls -1022 f sd rk ?	-1340 wh qtz -1507 ss & ls	-567 hd rk & ss -609 sh -611 ss -703 sh -706 ss -721 sh -725 ss		- 783 ss - 839 sft blk sh - 863 sd/brn coal	-2336 ss
PRE-CRETACEOUS		-2318 ?					-1500 qtz bedrock -1530 granite		-1594 qtz -1627 hd gy rk -1642 granite		-920 bl rk	-1025 ls					
	Gamma-ray log shows base Toolebuc Member at 705.		Gamma-ray log shows base Toolebuc Member at 255.			Gamma-ray log shows base of Toolebuc M. at 555.		(* local name for gypsum) (** may be partly Mackunda Beds)				Gamma-ray log shows base of Toolebuc Member at 415.					

AUSTRALIA 1:250,000

BEDOURIE

QUEENSLAND

1:250,000 GEOLOGICAL SERIES SHEET SG 54-1



PRELIMINARY EDITION, 1965

SUBJECT TO AMENDMENT

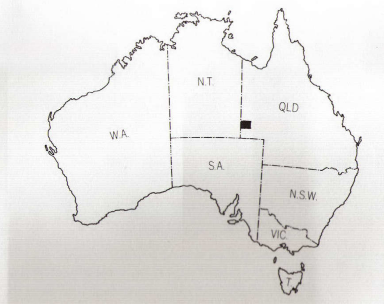
Reference

CAINOZOIC	UNDIFFERENTIATED		Cza	*Soil, alluvium*
			Czs	*Sand*
			Czy	*Gypsiferous deposits*
			Czg	*Gibbers - duricrust gravel*
			Czd	*Duricrust - mainly silcrete*
				Ironstone gravel
				Leached and ferruginized (lateritized) rock
	TERTIARY		T	*Limestone, chalcedony*
		Marion Formation	Tm	*Sandstone, grit, sandy siltstone*
MESOZOIC	CRETACEOUS	Winton Formation	Kw	*Argillaceous sandstone, mudstone*
	LOWER CRETACEOUS	?Mackunda Beds	?Klm	*Ferruginized sandy rock, calcareous sandstone*
		Wilgunya Fm	Klw_2	*Upper beds: mudstone with calcareous lenses*
		Wilgunya Fm — Toolebuc Member	Klo	*Fossiliferous limestone*
		Wilgunya Fm	Klw_1	*Lower beds: mudstone with sandy bands*
		Longsight Sandstone	Kll	*Poorly sorted sandstone, shale*
PALAEOZOIC			Pz	*Lower beds mainly carbonates including Georgina Limestone, Ninmaroo Formation; upper beds mainly clastics - (Kelly Creek Formation, Toko Group, Craven's Peak Beds, and ? Permian)* (Subsurface only)
	LOWER CAMBRIAN		€l	*Sun Hill Arkose and Sylvester Sandstone ?* (Subsurface only)
PRECAMBRIAN			Pg	*Granite* (Subsurface only)

Geological boundary, where approximate, line is broken; where inferred, queried; where concealed, dotted
Syncline
Strike and dip of strata
Trend lines
Joint pattern

Macrofossil locality. Text reference prefixed by Bed, GAB
Microfossil locality
Na *Salt deposit*
Bore
Abandoned scout hole
Artesian bore, flowing } *showing Register Number*
Abandoned bore } *showing Register Number*
Well
E *Earth tank*
T *Tank*
Windpump
OWH *Waterhole*
Spring
Intermittent swamp
Sand dunes
Claypan
Road
Vehicle track
Fence
"Dubbo" *Homestead*
Yd *Yard*
Landing ground
Trigonometrical station
Astronomical station
·200 *Height, instrument levelled*
P.D. *Position doubtful*

Compiled and issued by the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development. Base map compiled by the Division of National Mapping, Department of National Development. Aerial photography by Adastra Airways Pty. Ltd; complete vertical coverage at 1:50,000 scale. Transverse Mercator Projection.



INDEX TO ADJOINING SHEETS

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ILLOGWA CREEK SF 53-15	HAY RIVER SF 53-16	MOUNT WHELAN SF 54-13	SPRINGVALE SF 54-14	BRIGHTON DOWNS SF 54-15
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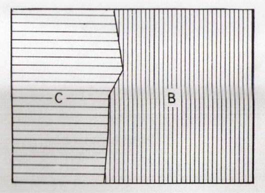
ANNUAL CHANGE 2'E

Scale 1 : 250,000

5 0 5 10 15 MILES

5 0 5 10 15 20 25 KILOMETRES

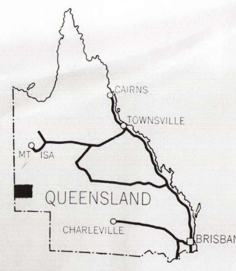
GEOLOGICAL RELIABILITY DIAGRAM



B General reconnaissance, some traverses, air-photo interpretation

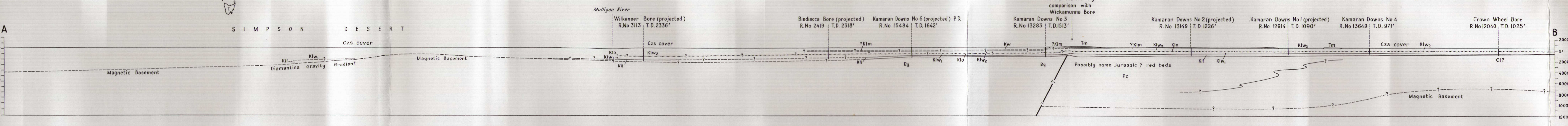
C Air-photo interpretation

Geology, 1960, by: M.A. Reynolds F. Olgers and W. Jauncey
Compiled, 1964, by: M.A. Reynolds
Drawn by: G. Matveev



Section

Scale $\frac{V}{H} = 2$



BEDOURIE

SHEET SG 54-1