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DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
REGIONAL MAPPING SECTION

A PHOTOGEOLOGICAL STUDY OF THE COOBER PEDY - LAKE EYRE REGION

by

B.G. Forbes
Geologist

Rept,Bk.No. 53/142
G.S. 2179
D.M. 2034/61

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1. ABSTRACT

A study of air photographs, bore-hole records and previous reports covering the Coober Pedy and Lake Eyre 8-mile sheets indicates the general thinness and flat-lying nature of the Mesozoic sedimentary rocks to the west and southwest. Some small anticlinal structures around Lake Conway and the Coorie Appa bore appear to be related to faults, which parallel the very prominent N.W. to N.N.W. regional lineation.

Mesozoic rocks become thicker and dip at higher angles in the central northern part of the area and in the Lake Eyre region. Permian rocks are not known in the latter region but occur in glacially-deepened troughs to the west and southwest of the Peake and Denison ranges. Upwarping and erosion of the Permian appears to have occurred before the Cretaceous.

2. INTRODUCTION

This study was initiated in response to a growing interest in the oil prospects of the region west of the Peake and Denison ranges following Dr. N.H. Ludbrook's confirmation of marine Permian sediments in seven boreholes. Work was begun by Mr. R.P. Coats, who completed an examination of the Ceeber Pedy 4-mile sheet and covered most of the Billa Kalina 4-mile sheet.

As well as details from air photographs, much valuable information has been gleaned from previous reports, both published and unpublished, and from bore records kept in the Records Section of the Department. Below are listed the six 4-mile (1:253,440) sheets involved, with details of the photography and base maps available. The area extends between latitudes 28 and 30 degrees and longitudes 133.5 and 138 degrees.

Murloocoppie: 4-mile military sheet and vertical air photographs.

Warrina: published geological maps of the Peake and Denison region, pastoral plans 17 and 13, vertical and trimetrogen air photographs.

Lake Eyre: 4-mile air photograph mosaic, vertical and trimetrogen air photographs.

Ceeber Pedy: 4-mile military sheet, 1-mile air photograph mosaics and vertical air photographs.

Billa Kalina: 4-mile military sheet, 1-mile air photograph mosaics and vertical air photographs.

Curdimurka: Callanna and Willouran unpublished 1-mile geological maps, pastoral plans 12 and 13 and trimetrogen air photographs.

The plotting of information is more accurate in position on the Ceeber Pedy and Billa Kalina 4-mile sheets, because of the superior base maps available and vertical air photography. Information is least accurately placed on the Warrina and Curdimurka 4-mile sheets in which it was necessary to transfe detail directly from trimetrogen air photographs to pastoral plans.

The main items plotted on the 4-mile maps are stratigraphic units, geological structures, lineaments and borehole details. The stratigraphic units represented are Quaternary (where sufficiently thick or extensive), Tertiary duricrust, ?Tertiary dolomite, Cretaceous (excluding the Blythesdale Group), Blythesdale Group, Permian and pre-Permian basement.

3. PREVIOUS REPORTS

Little work of a detailed nature has been done in the area. Much shallow drilling for water has been carried out on pastoral properties and the area criss-crossed by geological reconnaissance without close palaeontological control. However, the work of earlier geologists such as R.L. Jack and H.Y.L. Brown is of great value because of the accuracy of their observations and the soundness of their judgment. Of more recent work, some of the most valuable has been that by Reyner, Knapman and Chagg in the Peake and Denison region, by Ludbrook on Permian sediments in certain bores and by King and Stirton on the Tertiary and Quaternary of the Lake Eyre region.

Previous reports are listed in a Bibliography.

4. GEOGRAPHY

The area here described is arid pastoral country with an irregular rainfall averaging less than six inches a year. Vegetation is scanty and characterized by saltbush, bluebush and mulga, and in some creeks, coolibah and red gum. The main industries are cattle and sheep raising and the opal diggings at Coober Pedy. The chief means of access are the Alice Springs railway line and road via Marree and the Alice Springs road via Kingoonya, Coober Pedy and Mt. Willoughby. These two main routes are connected by tracks from Anna Creek H.S. to Coober Pedy and from Coward Springs railway siding via Billa Kalina to the Twins H.S.

The major topographic features trend in a N.N.W. to north-westerly direction. From west to east, these major features are:
(1) a sandy area at a height of about 500 feet, with sand ridges and low scarps of chiefly Mesozoic rocks; (2) the Stuart Range - Turret Range dissected plateau, which appears to reach its maximum height of about 750 feet in the Coober Pedy region; (3) the Lake Cadibarrawirracanna basin; (4) the Peake and Denison ranges, rising to a height of about 1350 feet; (5) the Lake Eyre depression, in part at least 25 feet below sea level; (6) the north-west end of the Willouran Range, which reaches a height of approximately 1060 feet.

The main drainage is aligned in a N.N.E. to north-easterly direction. In the western sandy area (1) there are only faint local drainage patterns and small scattered lakes. Drainage into this area from the Stuart Range ends in lakes such as Lake Phillipson and Lake Wirrida. East of the range, Peake Creek carries the northern drainage into Lake Eyre North. Drainage from the central section of the Stuart Range is dammed back by a ridge of Cretaceous rocks to form Lake Cadibarrawirracanna. Wind erosion may also have contributed to the formation of this lake basin. Further south, streams, such as The Margaret, flow into Lake Eyre South. The trend of sand ridges is mainly between east and north-east, except around the southern and eastern margin of Lake Eyre, where it is approximately north.

5. STRATIGRAPHY

(1) Basement. Archaean rocks are represented on the Coober Pedy 4-mile sheet and in the Peake and Denison region. In the former area (Jack, 1931) they occur as low, scattered inliers of schist and gneiss. There are also granite and porphyry exposures. According to Reyner (1955), Archaean rocks of the Peake region include schist, gneiss, quartzite and basic rocks. Basic and granitic intrusives also occur in the region.

The Peake and Denison and Willouran Ranges are composed largely of sedimentary rocks of the Adelaide System. Scattered outcrops of slate and quartzite recorded by Scoular (1887) and Brown (1892, 1905) in the Curdimurka 4-mile area are also probably of this age.

There are disused copper workings in basement rocks in the Peake region and the Willouran Ranges.

(2) Permian. Probable Permian tillite has been recorded by Reyner outcropping in the Peake region near the western margin of the ranges. Chugg (1957) suggested the probable Permian age of sediments below the ?Jurassic sandstone in the Peake Region. N. H. Ludbrook has (1961b) identified Permian rocks in the Lake Phillipson, Stuart Range 1 and 2, Beerthanna, Anna Creek, Coorie Appa and Margaret Creek bores. This identification was aided by the work of B.E. Balme (1957) on plant spores. The occurrence of this subsurface Permian is indicated in the accompanying

geological cross-sections.

The Permian section in the Lake Phillipson bore is the thickest known, and may be summarized (after Ludbrook) as below:

166'10" - 430' depth, L. Artinskian - U. Sakmarian grey carbonaceous mudstone, shale, siltstone with coal and minor sandstone; freshwater fossils; thickness 263 feet.

430' - 744' depth, Sakmarian grey carbonaceous siltstone, mudstone and shale; freshwater fossils; thickness 314 feet.

744' - 2269' depth, L. Sakmarian grey carbonaceous siltstone, sandstone, mudstone; freshwater fossils; thickness 1525 feet.

2269' - 2357' depth, L. Sakmarian grey carbonaceous mudstone, calcareous mudstone, siltstone; marine fossils; thickness 88 feet.

2357' - 3140' depth, Lowermost Sakmarian glacial boulder clay, shale, sandstone; thickness 783 feet.

The marine Permian beds reach a known maximum thickness of 288 feet in the Beerthanna bore and are definitely absent only in the Margaret Creek bore.

(3) ?Blythesdale Group. The only well-established occurrences of possible Blythesdale Group sandstones are those in boreholes ("Jurassic") and outcrops around the Willouran and Peake and Denison Ranges. It is assumed in this report that sandstones immediately below the lower Cretaceous shales may be correlated with the Blythesdale Group; the actual age of many of these sandstones is not known because of the absence of fossils. Extensive areas of quartzite, grit and conglomerate, possibly of Blythesdale age also, occupy the south-western part of the Coober Pedy 4-mile sheet (Jack, 1931). Other areas on the accompanying maps have sometimes been shown as Blythesdale or ? Blythesdale because of the resemblance of their surface pattern to an area around the Coorie Appa bore ("Jurassic" 0-30').

In the Peake region the Blythesdale sandstone is white, quartzose, coarse-grained and shows cross-bedding. Over large areas the sandstone has been ferruginised, which accounts for its dark colour in air photographs. In bore core the possible Blythesdale equivalent ("Jurassic" of Ludbrook 1961b) is grey and buff kaolinitic quartz sand and gravel. This is unfossiliferous and considered to be non-marine and possibly Permian, in part

The formation varies in thickness from a few hundred feet in the Peake region to 67 feet in the Lake Phillipson bore. Near Coward Spring the sandstone contains marine fossils (Ludbrook, 1961a) and its upper part is basal Aptian in age.

Gold has been obtained from basal ?Jurassic beds in the Peake region (Reyner, 1955). However, the most important economic aspect of the sandstones is their function as the main aquifer of the Great Artesian Basin.

(4) Cretaceous. Probably the most widespread rock-types in the region under study are the shales of the Cretaceous. In outcrop these shales are often gypseous and grey in colour, but may be white, brown, pink, mauve or yellowish. Bore core from the Cretaceous is usually a grey mudstone, siltstone or shale and is often described by drillers as "blue shale."

Much of the outcropping Cretaceous appears to be Aptian in age. However, Albian is known E.N.E. of Mt. Alford (Curdimurka 4-mile sheet). In this area the base of the Albian is approximately represented by a thin ferruginous gritty sandstone, as confirmed during regional mapping in 1960 (samples examined by N.H. Ludbrook). Rocks of the Winton formation were encountered at a depth of a few hundred feet in a recent boring in the south-eastern part of Lake Eyre north. Thus, Cretaceous sediments younger than Aptian may be expected in the north-east part of the Curdimurka 4-mile, in the Lake Eyre 4-mile and in some northern parts of the Warrina and Marloo-coppie 4-mile sheets.

The Aptian shales contain scattered boulders of basement rocks (including porphyry) and ironstone, barite and calcite concretions, fossil wood, and thin, lenticular beds of brown fossiliferous limestone.

According to Ward (1916) opal at Coober Pedy occurs as veins in Cretaceous claystone and sandstone.

(5) Tertiary. The most widespread Tertiary formation is the duricrust, which has resulted from the silicification of lower Tertiary sandstones and shales and older rocks. Tertiary plant fossils from this formation have been recorded by Ludbrook (1956). The duricrust is commonly a few feet in thickness, but is sometimes thicker, and often forms the capping on higher flat-topped hills.

Another fairly widespread unit of possible Tertiary age (? Pliocene) is a freshwater limestone and dolomite, described by Ludbrook (1958) and Brown (1965) on the Billa Kalina 4-mile sheet and King (1956) and Stirton et al. (1961) in the Lake Eyre region. Stirton tentatively equates part of his Etadunna Formation with the dolomitic mudstone described by King on the southern edge of Lake Eyre North. This limestone is probably more widely distributed than is indicated in the accompanying maps.

(6) Quaternary. Older Quaternary deposits include clays such as those described by King unconformably above ?Tertiary dolomitic mudstone, and a high level cross-bedded pebbly sandstone and conglomerate. An ancient dune system south-west of Curdimurka (described by Webb and Wopfner, 1961) may be related to conditions in the late Tertiary or may be of Pleistocene age. Other curved lineaments transverse to the recent sand ridges are possibly marginal features of old lakes. King (1956, Fig. 2) records stranded beach ridges of limestone shingle near the south margin of Lake Eyre North. These are up to 30 feet above the present lake bed.

Drilling of two mound springs (Forbes, 1961) indicates that at least some mounds are made up largely of clay and sand derived from the underlying Cretaceous and Blythesdale beds and are covered with only a superficial layer of travertine. The relief of the larger mounds may have been accentuated by wind erosion of surrounding softer deposits. The development of large mounds appears to occur where the Blythesdale aquifer is brought close to the surface as a result of folding and/or faulting. Numerous small mound springs, such as Finniss Springs near Hermit Hill, are related to inliers of basement rock. (? Blythesdale sandstone occurs as a fringe around Hermit Hill - B.P. Webb, personal communication).

Recent sand ridges are sub-parallel to the present-day system of strong winds. They have thus extended in an easterly direction in the western part of the area and in a northerly direction in the Lake Eyre region. King (1960) considers these dunes to have developed through a scooping action of the wind and points out the consistency of Y-shaped dune convergences, the base of the Y always pointing in the direction of transport.

6. GEOLOGICAL STRUCTURE

The most obvious feature of the geological structure of the Coober Pedy - Lake Eyre region is the frequency of northwest to N.N.W. lineaments. This lineation appears to have developed from at least as early as the lower Palaeozoic orogeny and to have been repeated during the Tertiary and possible later movements (Reyner, 1955). Strong folding is largely confined to the basement rocks, while Permian and younger sedimentary rocks are flat-lying or gently dipping, save in certain small areas. The accompanying map has been subdivided into zones which are concerned largely with the attitude of post-Carboniferous sedimentary rocks.

Dickinson and Sprigg (1953) have termed much of the area west of the Peake region the "Stuart stable shelf" which is bounded to the east by the "Torrens lineament". There seems to be no evidence for the continuation of this lineament of Dickinson and Sprigg between Lake Torrens and the eastern margin of the Peake and Denison ranges. The "Gairdner lineament" approximates to the western edge of zone II. The continuation of the North-West fault lineament is possibly represented by lineaments east of Lake William.

In the extreme western part of the Murloocoppie 4-mile sheet there are scattered outcrops of flat-lying rocks, probably Cretaceous in age. Further south, (zone I in the accompanying plan), in the western and south-western part of the Coober Pedy 4-mile, flat-lying ?Blythesdale sandstones appear with scattered inliers of granite and Archaean metamorphic rocks. Many lineaments in the sandstone area are directed approximately to the N.N.E., at variance with the main N.N.W. lineation. The N.N.E. lineament approximates to the Pidinga lineament of Dickinson and Sprigg (1953) which forms the north-western boundary of their Gawler nucleus.

The next structural zone to the east is characterized by rocks with a slight southwesterly dip. This inference is based on the southwesterly extent of duricrust down the topographic slope in the Coober Pedy region.

Further east again is the inferred zone III which contains such diverse features as the higher parts of the Stuart Range, the Lake Cadibarrawirracanna basin and the Willouran Range. This is considered to be an area of mainly flat-lying rocks which have been up-warped slightly

in places and from which a central area has been eroded to form a basin of Quaternary alluvium. Near the centre of the Marloocoppie 4-mile sheet, surface patterns suggestive of sandstone (? Blythesdale Group) were noted on air photographs; this inference is not made with any great confidence, however. If the inference is correct, minor uplift in this area is suggested. On the same basis, Blythesdale sandstones are inferred to occur near the Coorie Appa bore. At this bore ?Blythesdale ("Jurassic" of N.H. Ludbrook) sandstone is at the surface between two lineaments noted originally by R.P. Coats. These lineaments, which may represent faults, extend in a northerly direction for at least 10 miles. North of the Coorie Appa bore is a small dome of ?Blythesdale sandstone, first noted by Coats, which also appears to be related to faulting, as are possibly two other small occurrences in the vicinity. Thus this area of possible Blythesdale rocks may represent a minor dome transected by a system of N.N.W.-trending minor faults which are directly in line with a southward prolongation of the Mt. Margaret Range and which give rise to minor uplifted wedges of Blythesdale sandstones.

North-east of zone III begins the deeper part of the Great Artesian Basin. The area marked IV, west of the Peake and Denison Ranges, is suggested as being synclinal with a downward pitch to the N.N.W. The western limb of this structure is indicated by a probably north-easterly dipping duricrust in the north-eastern part of the Marloocoppie 4-mile sheet. The eastern limb of the structure is formed by the Peake and Denison range, off which the Mesozoic rocks are known to dip at a low angle. The nature of the syncline is also indicated by an analysis of bore-hole data, which shows a dip of both ?Blythesdale and marine Permian beds toward the N.N.W. Between the Anna Creek and Beerthanna bores this dip is about 1 degree. The southern limit of the syncline is uncertain.

A prominent feature of zone IV is the Weedina Creek lineament, close to which are mound springs. Jack (1915) considered this to be a fault. Coats has recognized a possible dome of Blythesdale sandstone immediately west of the lineament. Just beyond the northern limit of the Warrina 4-mile sheet and approximately on the extension of the Weedina lineament is another possible dome at Mt. Toondina.

The Peake and Denison ranges, according to Reyner (1955), are faulted and uplifted along their eastern margin and have an overall slope down to the west; the Mesozoic rocks dip away from the ranges on all sides.

The Cretaceous shales in the area studied reach their greatest thickness and have a generally greater angle of dip in zone VI. Dips as high as 10 degrees have been noted locally during mapping in the Callanna area. A dip of 50 degrees was inferred from air photographs just south of Lake Eyre South. The northeastern part of the Curdimurka 4-mile sheet contains minor folds in the Cretaceous, pitching toward the north. The ? Pliocene dolomite would appear to be dipping gently toward Lake Eyre from the neighbourhood of Hermit Hill, assuming that the dolomites at these two localities are stratigraphically equivalent.

7. CONCLUSIONS

In the western part of the area studied the Mesozoic sequence is thin, hence possibilities of petroleum occurrence depend largely on the thickness of the underlying sedimentary rocks.

The main factors affecting the depth and extent of Permian rocks are the Permian topography and the nature of any post-Permian diastrophism. In the southernmost of the accompanying geological sections the original late Carboniferous topography would seem to be the dominant control. However, up-warping of the basement appears to have elevated by about 1900 feet the Permian marine beds in the Coorie Appa bore relative to the altitude of the same beds in the Lake Phillipson bore. This represents an average inclination of less than one-fifth of a degree. In the same section the Mesozoic beds appear to be almost horizontal. Hence most of the post-Permian folding in the area took place before deposition of the ?Blythesdale sandstone. Slight doming followed by erosion of the Permian rocks may be the reason for the absence of post-glacial Permian beds in the Margaret Creek bore.

Chugg (1957, p. 6) suggested glacial deepening as the reason for the steep plunge of the basement in the vicinity of the Anna Creek diamond drill hole. Ludbrook (1961) also suggests the probability of glacial over-deepening, and concludes: "..... to the west of Lake Phillipson and into Western Australia lies the Officer Basin, as yet completely unexplored below

the surface. One is tempted to consider the possibility of Permian sediments occurring in the Officer Basin ..."

In the Lake Eyre region the sedimentary column is undoubtedly much thicker, but much of the surface expression is obscured by Quaternary deposits. There is also a dearth of information on the sedimentary rocks below the main aquifer.

Regional geological mapping of the area would certainly provide some necessary information, but probably the most valuable contribution would be an extensive geophysical survey to indicate depth to basement and the structure of the overlying sedimentary rocks. There is also a need for deep boreholes in the Lake Eyre region and in the Officer Basin, west of Coober Pedy.

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APPENDIX A

EXTRACT FROM INTERIM REPORT BY R.P. COATS

OUTSTANDING FEATURES OF COMPILATION

1. The recognition of a major lineament south of the Peake and Denisons.

The occurrence of mound springs coincides with this lineament suggesting rupture of the aquifer (probably Blythesdale Sandstone). The structure trends NNW and is parallel to the boundary faults of the Peake and Denisons.

If extrapolated to the south it would coincide with the lineament on the western side of Lake Torrens, which separates the shield area and flat lying Adelaide System from the folded belt.

The appraisal of bore logs on either side of the structure indicates thicker Cretaceous to the east.

2. The occurrence of probable Blythesdale group sandstones and shales extending W and NW of Coober Pedy to Emu Field, south of the Everard Ranges.

These rocks produce dark outcrop patterns similar to the recognised ferruginous Jurassic bordering the Peake and Denison.

3. The recognition of a system of major ENE trending structures on the Tallaringa 4 mile which affects the Blythesdale.

4. Trend lines with appreciable dips in Cretaceous in the vicinity of Margaret Creek bore. These trends can be followed to the north for 12 miles.

A small dome of dimensions 1 mile x ½ mile occurs on the extension of these structures to the north.

APPENDIX B

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APPENDIX C.

NOTES ON 4-MILE SHEETS

MURLOCOPPIE.

Q — probably occurs more widely than is indicated in the NE. corner of the map. In the western region there is much more scattered k and ? Bl than is shown on the map.

T — some of the broader areas shown as T may actually be silicified k forming the lower part of the duricrust profile.

References (see Bibliography) 6, 15, 16, 21, 30.

COOBER PEDY.

T — has been generalized west of the Stuart Range escarpment.

?Bl — in the western region is very scattered and on air photographs resembles granite, which also occurs in the region. Outcrops have been very much generalized on the map.

References 1, 6, 15, 16, 30, 31, 37.

MARRINA

References 8, 9, 14, 26, 32, 33, 35.

BILLA KALINA

Q — The area of this to the NW. on the map is probably greater than actually on the ground e.g. Jack reports boulders (? from the Cretaceous or Permian) around Mt. Woods.

Tls — near Crown Well has been noted by Ludbrook and others.

k — Aptian fossils, collected by Twist, have been described by Ludbrook.

?Bl — The actual extent of this is uncertain. The large area on the map west of Coorie Appa bore shows a similar surface pattern to the known "Jurassic" at the bore, but this pattern may not be directly related to the "Jurassic". The area east of Mt. Penrhyn is based on bore records and one of Jack's maps.

P — There is possible Permian in many water borings. The record of Pritchard's bore appears to be anomalous and may be Permian.

Basement outcrops SW of L. William are conjectural.

References 6, 12, 15, 16, 22, 24, 26, 29, 36.

LAKE EYRE

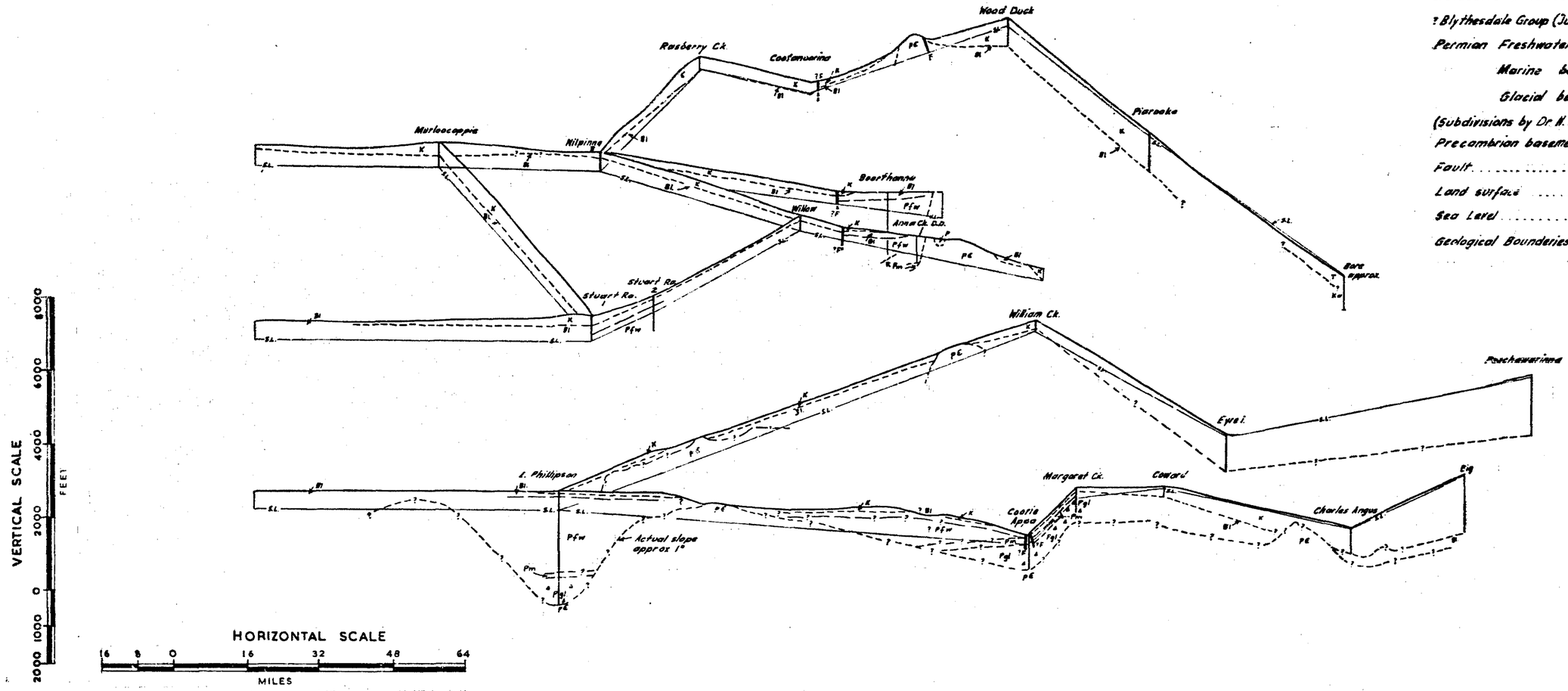
References 7, 9, 17, 16, 19, 27.

CURDIMURKA

k Aptian macrofossils from Fred Springs have been examined by Ludbrook. Howchin reports marine fossils from Mirrabuckinna bore SE. of Porter Hill (just off the Curdimurka sheet).

?Bl shown on the map near Coward is conjectural.

References (see Bibliography) 3, 9, 11, 13, 18, 19, 25, 26, 33, 34, 39, 40.



To accompany report by B.G. Forbes, Geologist

S.A. DEPT. OF MINES

GEOLOGICAL CROSS SECTIONS COOBER PEDY — LAKE EYRE REGION

Req. No.
D.M.
Compiled from

Associated Drawing No. | No. | Amendment | Exd. | Date

Approved | Passed

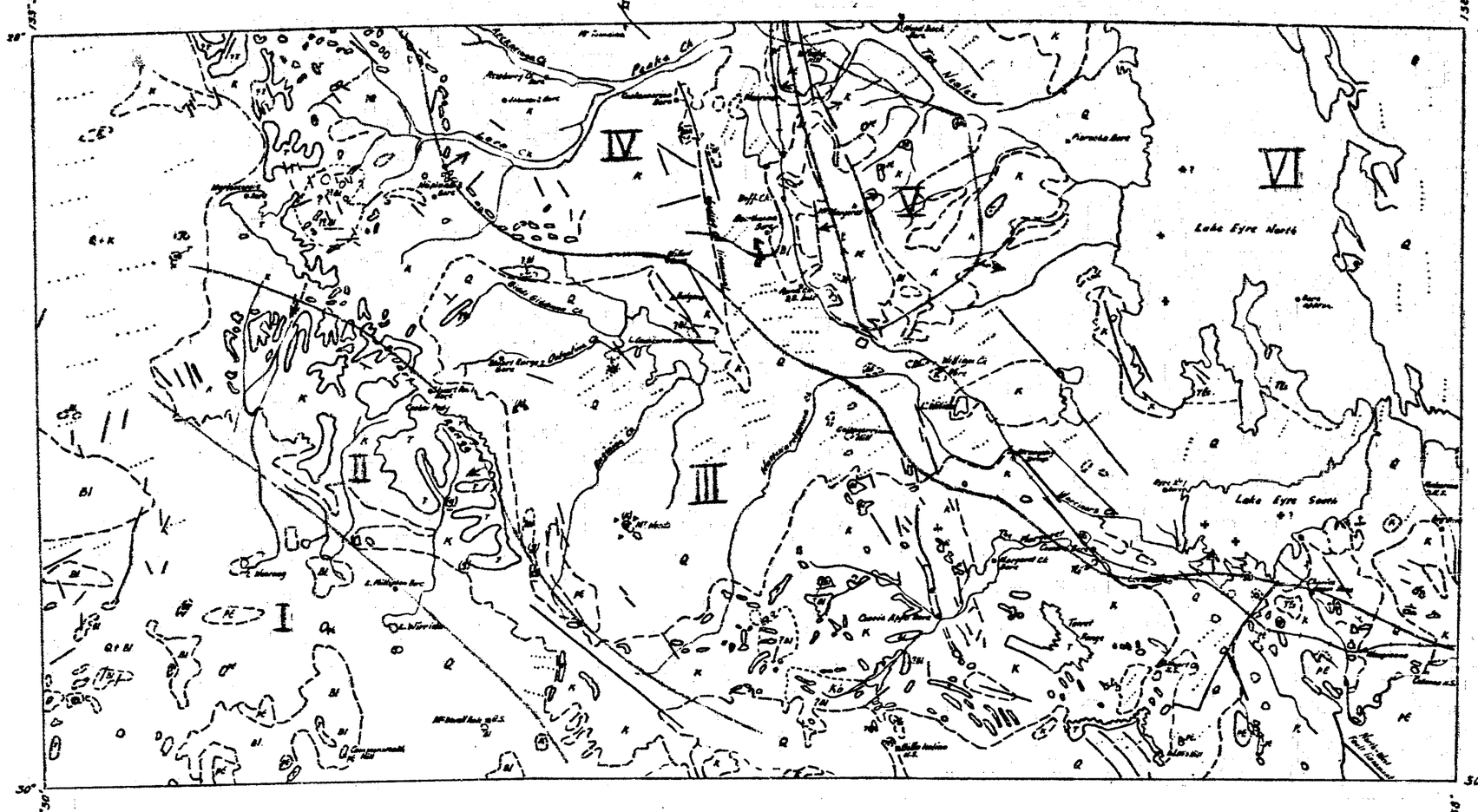
Director of Mines

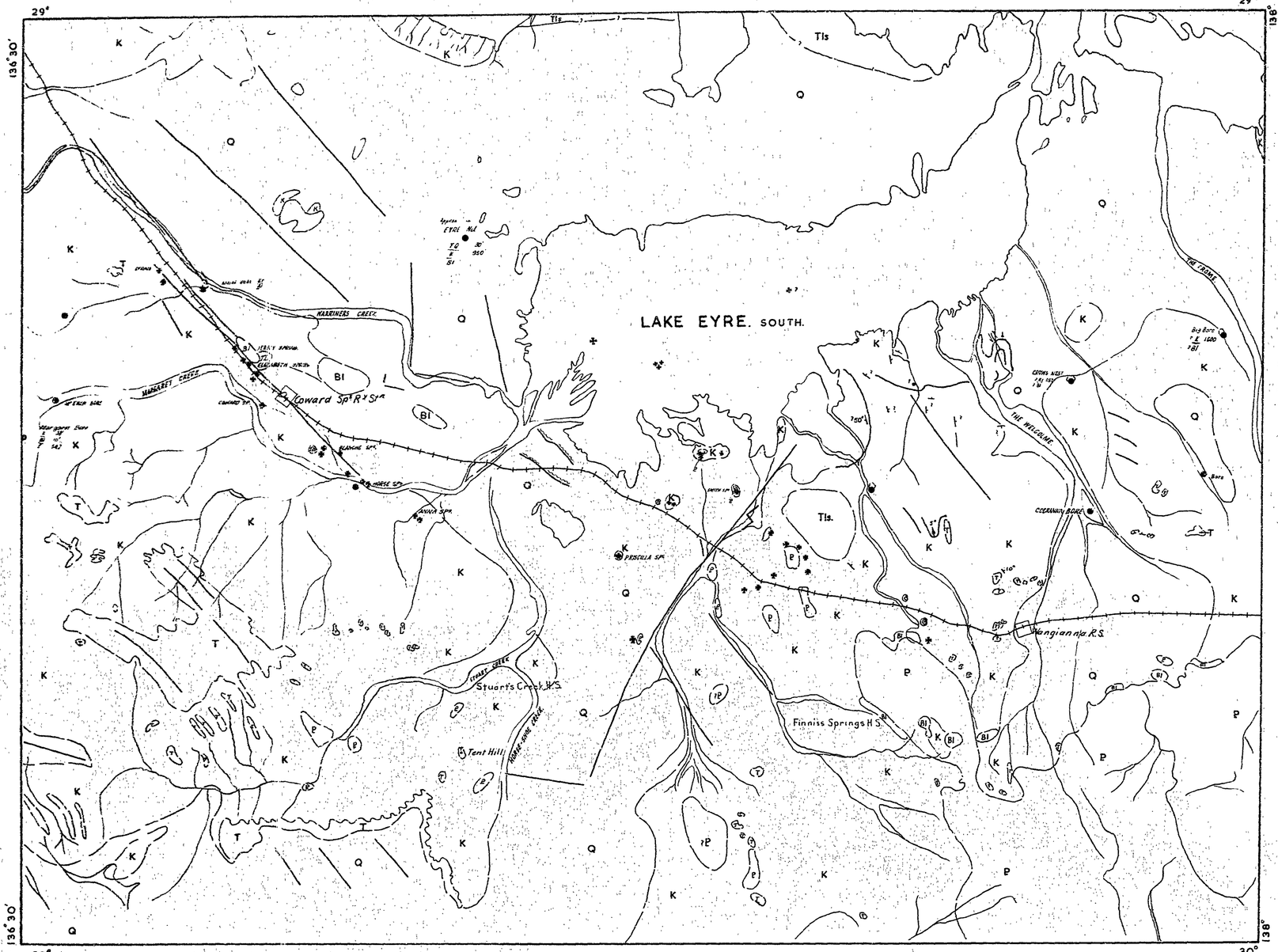
Drn. B.G.F.
Tcd. A.O.W.
Ckd.
Exd.

Scale As shown

61 - 795
BC

Date 17 - 11 - 61


I
II
III
IV
V
VI
Lake Eyre North
Lake Eyre South
Peake Ck
Lake Ck
The Warlu
Mt Hamilton
Mt Howitt
Mt Gerard
Mt Sarah
Mt Dare
Mt Finke
Mt Kitchener
Mt Margaret
Mt Squires
Mt Freeling
Mt Lyndhurst
Mt Lindsay
Mt Sturt
Mt Hopeless
Mt Gason
Mt Arrowsmith
Mt Clarke
Mt Serle
Mt Victoria
Mt Deception
Mt Dutton
Mt Barrow
Mt Babbage
Mt Willson
Mt Willoughby
Mt Wilkinson
Mt Wilson
Mt Wood
Mt Wright
Mt Wyatt
Mt Wyndham
Mt Wynne
Mt Wynyard
Mt Wyrie
Mt Wyrie
Mt Wyrie



LEGEND

Q	Quaternary alluvium, sandridges.
Tls	?Pliocene dolomite, limestone.
T	Tertiary duricrust.
K	Cretaceous shales, with minor limestone, sandstone.
BI	?Blythesdale Group sandstone.
P	Adelaide System slates, quartzites.
	?Dip of bedding.
	Lineament.
	?Old strand line.
	Spring.
	Macrofossil locality.
	Plant fossil locality.

Topographic base: pastoral plans Nos. 12 & 13. Trimetrogon air photographs, also Callanna and Willouran unpublished 1 mile geological maps. Margaret Creek bore examined by Dr. N.H. Ludbrook palaeontologist. Air photograph interpretation by B.G. Forbes, Regional Mapping Section.

SCALE

Miles 4 2 0 4 8 12 16 Miles.

INDEX TO ADJOINING SHEETS

MURLOOCOPPIE.	WARRINA.	LAKE EYRE.
COBER PEDY.	BILLA KALLINA.	CURDIMURKA.

TO ACCOMPANY REPORT BY B.G.FORBES, GEOLOGIST.

S.A. DEPT. OF MINES

CURDIMURKA
4 MILES TO 1 INCH
PHOTOGEOLOGICAL INTERPRETATION

Req. No.
D.M.
Compiled from

Associated Drawing | No. | No. | Amendment | Exd. | Date

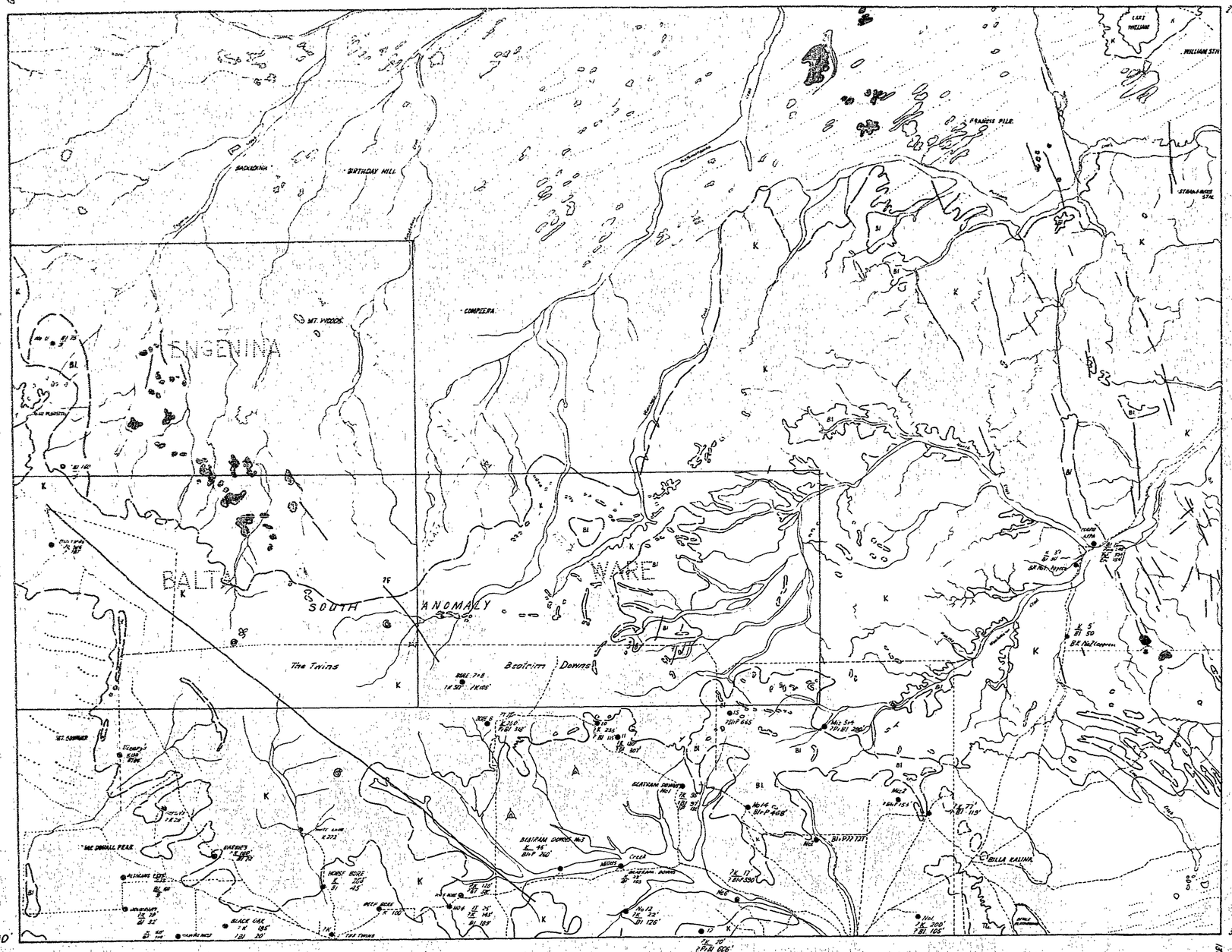
Approved | Passed | Director of Mines

Drn.
Tcd. G.K.W.
Ckd.
Exd.

Scale: 4 Miles to 1 inch.

61-742 BC

Date 1-11-61.



Index to adjoining sheets.

MURLOCKOPPIE	WARRINA	L. EYRE
COOBER PEDY	BILLA KALINA	CURDIMURKA

SCALE.

MILES 4 2 0 4 8 12 16 MILES

LEGEND

- Q — Quaternary alluvium, sandridges
- Tℓ — ?Pliocene freshwater limestone
- T — Tertiary duricrust
- K — Cretaceous shales
- Bl — ?Blythesdale Group (Jurassic) sandstone
- P — Permian beds
- Pm — Permian marine beds
- Pgl — Permian glacial beds
- g — Granite
- Precambrian
- Macrofossil
- Microfossil
- Plant remains
- Dip of bedding
- Lineament
- F — Fault

Topographic base: Royal Aust. Survey Corps. Billa Kalina 1:253440 sheet 1949, and 1:63,360 air photo mosaics. Vertical air photography. Coarse Appa bore and some surface material examined by Dr N.H. Ludbrook, Palaeontologist. Geological interpretation by R.P. Coats and B.G. Forbes, Regional mapping section.

To accompany report by B.G. FORBES. Geologist.

S.A. DEPT. OF MINES

BILLA KALINA
4 MILE TO 1 INCH
PHOTOGEOLOGICAL INTERPRETATION

Req. No.
D.M.
Compiled from

Associated Drawing	No.	No.	Amendment	Exd.	Date

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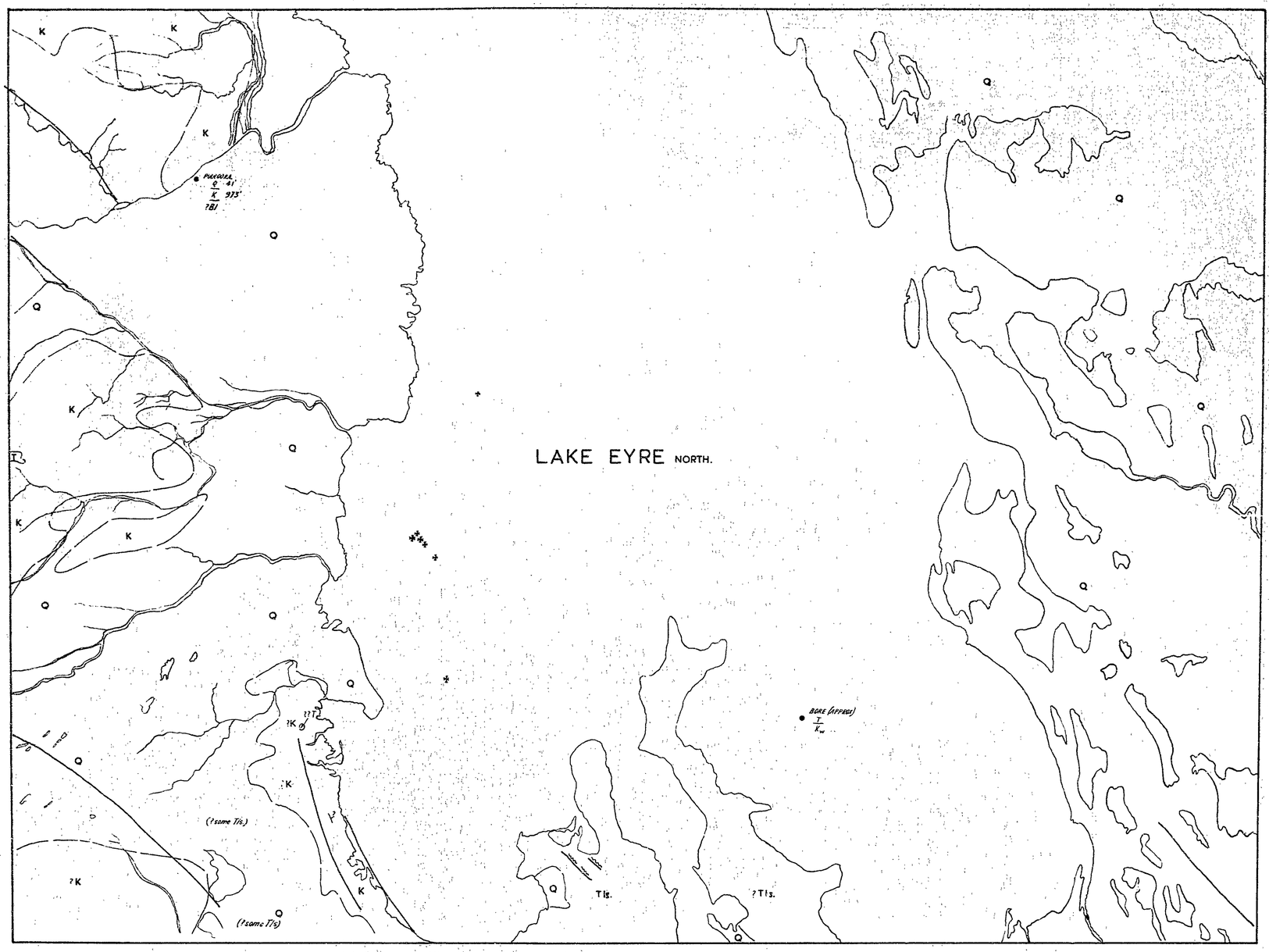
		Drn.	61-741. Be.
		Tcd. G.K.W.	
Director of Mines		Ckd.	
		Exd.	Date 30-10-61

LAKE EYRE NORTH.



LEGEND

- Q — Quaternary alluvium, sand ridges
- Tls — ?Pliocene dolomite
- T — Tertiary duricrust
- K — Cretaceous shales
- Kw — Winton beds
- Lineament
- Dip of bedding
- Jst strand line
- Mound spring

Topographic base: Lake Eyre 4-mile mosaic, vertical and trimetrogon air photographs. Description (incomplete) of Lake Eyre bore by N.H. Ludbrook, Palaeontologist. Geological interpretation by B.G. Forbes, Regional Mapping Section.

MURLOOC OPPIE.	WARRINA.	LAKE EYRE.
COOBBER PEDY.	BILLA KALINA.	CURDAIMURKA.

SCALE.

MILES. 4 2 0 4 8 12 16 20 MILES.

TO ACCOMPANY REPORT BY B.G.FORBES GEOLOGIST.

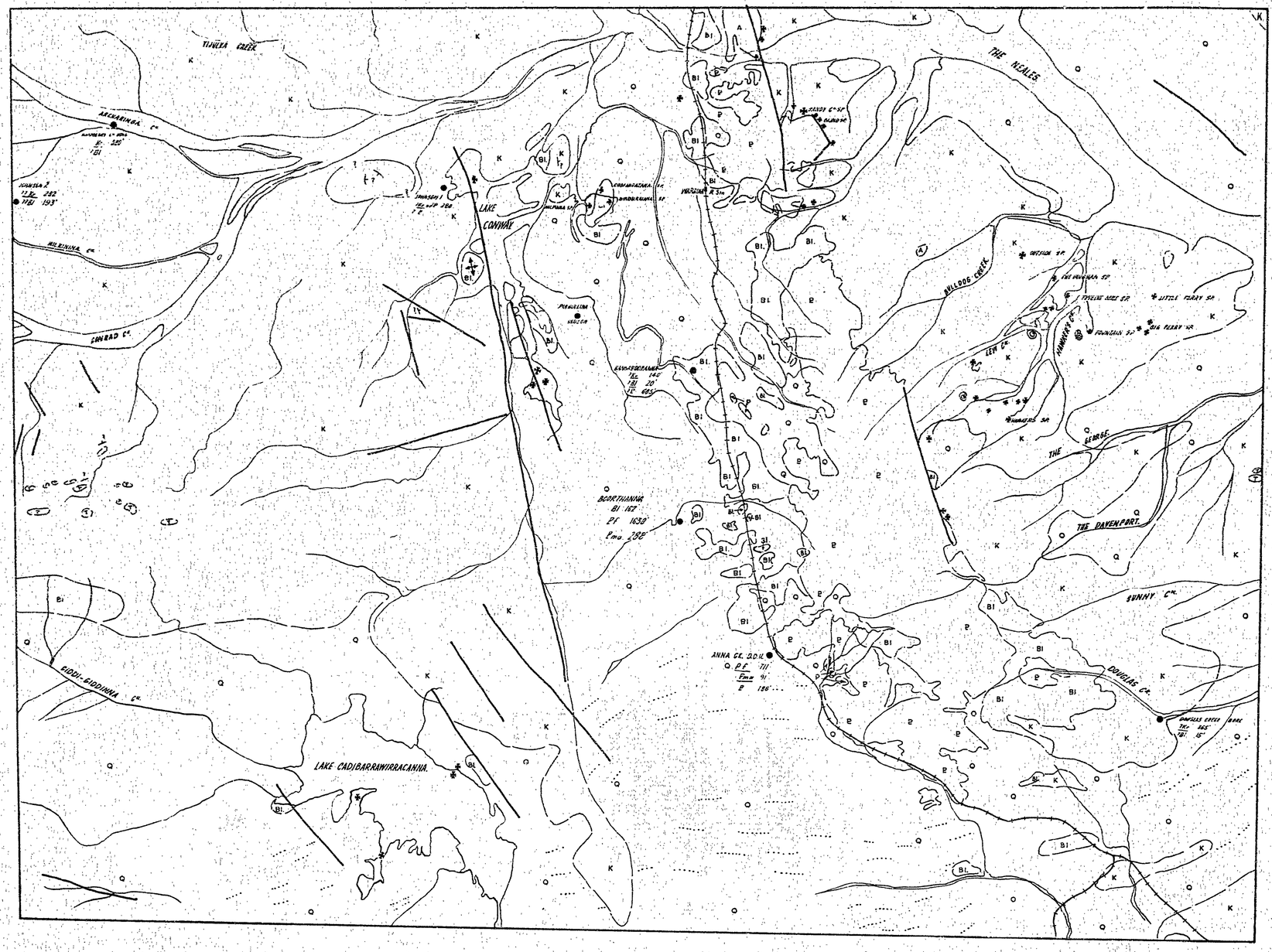
S.A. DEPT. OF MINES

Associated Drawing	No.	No.	Amendment	Exd.	Date

Req. No.
D.M.
Compiled from

LAKE EYRE
4 MILES TO 1 INCH
PHOTOGEOLOGICAL INTERPRETATION.

Approved	Passed		Scale : 4 MILES TO 1 INCH.
		Drn.	61-740. BC.
Director of Mines		Tcd. G.K.W.	
		Ckd.	
		Exd.	Date 9-11-61.



LEGEND

- Q — Quaternary alluvium, sand ridges.
- T — Tertiary duricrust.
- K — Cretaceous shales.
- Bl. — Blythesdale group ("Jurassic") sandstone.
- P — Permian beds.
- P / A — Basement Rocks. Proterozoic. Archean.
- Lineament.
- Fault.
- Dip of bedding.
- Macrofossil locality.
- Springs.

Topographic base: pastoral plans 175, 13N, 14N. Vertical and trimetrogon air photographs. Description of some bores by N.H. Ludbrook, Palaeontologist. Use of Peake and Denison published 4 mile geological map. Geological interpretation by B.G. Forbes, R.P. Coats, Regional Mapping Section.

Index to adjoining sheets.

MURLOOCOPPIE	WARRINA	LAKE EYRE
COOBER PEDY	BILLA KALINA	CURDIMURKA

SCALE

MILES 4 2 0 4 8 12 16 20 MILES.

TO ACCOMPANY REPORT BY B.G. FORBES, GEOLOGIST.

S.A. DEPT. OF MINES

Associated Drawing	No.	No.	Amendment	Exd.	Date

Req. No.
D.M.
Compiled from

WARRINA.
4 MILES TO 1 INCH
PHOTOGEOLOGICAL INTERPRETATION.

Approved	Passed	
	18	Drn.
Director of Mines		Tcd. G.K.W.
		Ckd.
		Exd.

Scale: 4 MILES TO 1 INCH.

61 739 Bd.

Date 14-11-61

Legend

Quaternary alluvium, Sandridges	Q
?Pliocene dolomite	?Ts
Tertiary duricrust	T
Cretaceous shales (Post Blythesdale)	K
Dark coloured Cretaceous	

Aptian	Apt
?Blythesdale Group Sandstones	Bl
Permian freshwater beds	Pfw
Lineament	
?Dip of bedding (often duricrust)	

Topographic base Royal Aust. Survey Corps Murloocappie 1:250,000 sheet 1960.
Vertical air photography. Stuart Range bores described by Dr. N.H. Ludbrook, Palaeontologist.
Geological interpretation by B.G. Forbes, Regional Mapping Section.

Index to adjoining sheets

Murloocoppie	Warrina	Lake Eyre
Coober Pedy	Billakalina	Curdimurka

Scale

Miles 4 2 0 4 8 12

Scattered K outcrops in sand

To accompany report by B.G. Forbes, Geologist.

						Req. No.	S.A. DEPT. OF MINES
						D.M.	MURLOOCOPPIE
						Compiled from	4 MILES TO 1 INCH
Associated Drawing	No.	No.	Amendment	Exd.	Date		PHOTOGEOLOGICAL INTERPRETATION

Approved	Passed		Scale: 4 Miles to 1 inch.
		Drn.	61-738 Ba
Director of Mines		Tcd. J.E.	
		Ckd.	
		Exd.	Date 20-10-1961

29°00'
135°00'
30°00'

Corkscrew
Bos Swamp
Salt
Coober Pedy
Lake Phillipson Bore
Corringallana
Penrhyn
Ball Bird 39
Commonwealth Hill No.
Ingomar Hill
McDouall Peak No.

LEGEND

Quaternary alluvium, sandridges	Q
Tertiary duricrust	T
Lower Cretaceous shales (Post-Blythesdale Group)	K
?Blythesdale Group sandstones	Bl
Permian "fresh water" beds	Pfw
Permian "marine" beds	Pmar
Permian "glacial" beds	Pgl
Granite, Gneiss, Schist Archaean	g, Gn, Sch, A
Lineament	

Topographic base: Royal Aust. Survey Corps Coober Pedy 1:253,440 sheet, 1949 and 1:63,360 air photo mosaics. Vertical air photography. Lake Phillipson bore described by Dr. N.H. Ludbrook, Palaeontologist. Geological interpretation by R.P. Coats chiefly, also B.G. Forbes, Regional Mapping Section.

SCALE
MILES 4 2 0 4 8 12 16 MILES

INDEX TO ADJOINING SHEETS

MURLOOCOPPIE	WARRINA	LAKE EYRE
COOBER PEDY	BILLAKALINA	CURDIMURKA

To accompany report by B.G. Forbes, Geologist

S.A. DEPT. OF MINES

COOBER PEDY
4 MILES TO 1 INCH
PHOTOGEOLOGICAL INTERPRETATION

Req. No.
D.M.
Compiled from

Associated Drawing	No.	No.	Amendment	Exd.	Date

Approved | Passed | Director of Mines

Drn.
Tcd. A.O.W.
Ckd.
Exd.

Scale: As shown
61-737
Bb
Date 26-10-61