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DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
REGIONAL SURVEYS DIVISION

RECONNAISSANCE SURVEY AND PHOTO-GEOLOGICAL INTERPRETATION GASON DOME AREA OF THE GREAT AUSTRALIAN ARTESIAN BASIN, SOUTH AUSTRALIA

by

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DEPARTMENT OF MINES
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RECONNAISSANCE GEOLOGICAL SURVEY OF THE GASON DOME AREA OF THE GREAT AUSTRALIAN ARTESIAN BASIN

ABSTRACT

The GASON 1:250,000 map area is located in the northeast of South Australia, on the Birdsville Track. The map area includes the Gason Dome, a topographically low structure with a northeasterly trending axis, and shallow dips on its flanks.

The Upper Cretaceous Winton Formation is the oldest outcropping stratigraphic unit, which, although extensive, is very poorly exposed. Silcrete is the major Tertiary unit, generally consisting of collapsed boulders rather than solid plateaus. Quaternary units are extensive throughout the map area. The oldest of these is a gypsite profile, and there is a younger soil profile which has been reworked from the gypsite. Northwesterly trending sand dunes surround and lap onto the Gason Dome, the centre of which is covered mainly by silcrete gibbers. A vast flood plain of The Warburton and The Diamantina covers the area to the northwest of the structure.

INTRODUCTION

The following is a report on a preliminary investigation of the geology of the GASON 1:250,000 map area, which was carried out as a part of an overall plan to complete reconnaissance mapping of the Great Australian Artesian Basin in South Australia. This map area includes the major part of

the Gason Dome and the surrounding sand ridges.

The investigation entailed air photo-interpretation of the GASON 1:250,000 map area followed by several field reconnaissance trips - four days in September, 1969 and six days in June, 1970. A preliminary map of the area has been compiled from the information obtained. The stratigraphic units are the same as those used by Dr. H. Wopfner in his reports on various parts of the Great Australian Artesian Basin. (See list of references).

PREVIOUS INVESTIGATIONS

The information obtained by previous geological work on GASON is very limited. There is no record of any specific work prior to 1960 although elsewhere in South Australia, the Great Australian Artesian Basin has long been a subject for study.

Forbes (1960) conducted a survey for underground water prospects on Mungeranie Station. Mungeranie Homestead is 2 miles south of the edge of the GASON 1:250,000 map area, on the Birdsville Track.

In 1960, Doeringsfeld, Amuedo, and Ivey did a detailed photo-interpretation of the Gason Dome for Delhi Australian Petroleum Ltd., but they did not actually visit the area. They compiled a brief report and a photo-interpreted map of the Gason Dome. A field reconnaissance was later carried out by Delhi Australian Petroleum Ltd., but no new information was added to the report. (Doeringsfeld et al, 1960).

Between 1960 and 1965 the South Australian Department of Mines conducted seismic surveys along the Birdsville Track. Geological cross sections have been interpreted from the shot hole records. (Milton, pers. comm.)

Dr. H. Wopfner, Supervising Geologist, of the Department of Mines, has visited the area several times and has given a great amount of information for the compilation of this report. His assistance in preparing the preliminary map of GASON is gratefully acknowledged. Dr. R.H. Tedford has also kindly supplied information on the region.

GEOGRAPHY

The GASON 1:250,000 map area consists of the Gason Dome, a northeasterly trending anticline, which occupies the centre north-south area of the map, and this dome is surrounded by northwesterly trending sand ridges. The Warburton flood plain occurs on the northwest edge of the structure.

The area of the Gason Dome consists of gibber plains with little relief except for occasional silcrete capped mesas about 100 feet above the general plain level. The approximate height above sea level of the higher parts of the dome is probably 300 feet. (Doeringsfeld et al, 1960). The sand ridges around the dome are generally uniform in height, possibly 30 feet on the average, but there are occasional dunes up to perhaps 60 feet high.

Accessibility within the area is generally good. The Birdsville Track extends lengthwise from north to south along the centre of the structure. There are a few station tracks, but it is possible to drive on the gibber plains.

STRUCTURE

The Gason Dome stretches across the PANDIE PANDIE 1:250,000 map area, the GASON 1:250,000 map area and the KOPPERAMANNA 1:250,000 map area.

The Gason Dome on GASON covers approximately 3,000 square miles on the southwestern edge of the broadly synclinal structure of the Great Australian Artesian Basin. The dome trends on a curved axis from the south to a northeasterly direction, and its outcropping area is approximately oval in shape. The dome is steeper on the western flank, but its overall dips are very shallow. This anticline was one of many formed during widespread epeirogenic movement in the Lake Eyre Basin, at about the middle of the Miocene. (Wopfner and Twidale, 1967). This movement is often referred to in literature as "the post-duricrust folding" (Wopfner, 1960).

The exact position of the axis of the dome is not known due to a lack of outcrop in the centre, but its length has been estimated at 75 miles. (Doeringsfeld et al, 1960). The structurally highest part of the anticline appears to be a group of mesas approximately 10 miles north~~west~~ east of Mt. Gason Bore.

To the south, sand ridges cover the area between the Gason Dome and the Cooryanna Dome on the MARREE 1:250,000 map

area. To the north the flood plain of The Diamantina extends to the western edge of the Cordillo uplift (Wopfner, 1960), in the northeast of South Australia.

STRATIGRAPHY

General

All of the information of the subsurface geology on the Gason structure comes from the water bores drilled in the area. Most of these are artesian bores, and lithologic details of the logs are in Appendix I of this report.

The surface lithology is limited to the Upper Cretaceous Winton Formation, a possible Tertiary sandstone, the Tertiary siliceous duricrust (silcrete), the Pleistocene gypsite (this term is defined under Pleistocene) profile, and Recent units comprising a soil profile, gibber plains, sand dunes and flood plain alluvium.

Cretaceous

The only Cretaceous unit which outcrops on the surface of the Gason Dome is the Winton Formation. It is a fresh water deposit of Cenomanian age (Parkin, Ed., 1969, p.159), and is the youngest widespread sedimentary formation in the Great Australian Artesian Basin. In general, the Winton Formation consists of interbedded siltstones and fine-grained sandstones, and these are the only units which were seen on the GASON 1:250,000 map area.

The only relatively fresh outcrop was seen in some quarried hills on the Mirra Mitta - Cowarie track, approximately 6 miles west of Mirra Mitta Bore. (Photo 1). Two varieties of rock were noted. One was a light grey siltstone and the other was a fine-medium grained sandstone of the same colour. The sandstone unit contained galls of the siltstone. It appeared as though the sandstone was stratigraphically higher than the siltstone. A thin section examination of the sandstone showed 60-70% of detrital siliceous claystone fragments, 30-40% detrital quartz and a few heavy minerals. The sample has been called a lithic sandstone. The quartz and claystone fragments consist of sub-angular grains and are packed with very little interstitial material. There are a few deformed flakes of clay and opaline silica clouds all the quartz grains. X-ray diffraction showed a mineral composition of quartz and opaline silica. (Sample P.282/70, Mrs. S. Whitehead, AMDEL, pers. comm.)

Although this outcrop is the best exposure of the Winton Formation seen on GASON, a fair amount of kaolinization has taken place. In all other areas, the visible Winton rocks consist of powdery kaolinized clays. This clay is often difficult to distinguish as Winton if the Pleistocene gypsite unit is present.

A small mesa near the quarried area shows faint bedding layers in the kaolinized Winton. These indicate a slight southerly dip.

Very kaolinized Winton Formation containing plant remains outcrops on the floor and around the edges of Lake Howitt. (Tedford, pers. comm.).

In a cliff section two miles southeast of Cowarie Homestead there is a small outcrop of a silicified sandstone and a kaolinized version of the same rock, with small quartz veins in it. The cliff face is almost completely masked by veins of satin spar gypsum. (Photo 2). There is no solid silcrete above this outcrop, but collapsed silcrete does occur on the dip slope of the hill. This unit does not appear to be part of the silcrete profile, and thin section examination indicates that it may be Winton. The upper part of the unit (Sample P.286/70) is a silicified siltstone with 60% detrital quartz, variable clays, some overgrowths of opaline silica and chalcedony on the quartz grains, various types of heavy minerals in small amounts, and a little calcite. The sample of the lower unit (P.287/70) gave the same results, but contained no calcite. A sedimentary lamination is indicated by different sizes of quartz grains in adjacent laminae. (Mrs. S. Whitehead, AMDEL, pers. comm.). These results compare favourably with thin sections of samples of known Winton Formation. The silicification and kaolinization of these samples indicates that the outcrop is part of the duricrust profile.

No other variations or units of the Winton Formation were observed on GASON.

Tertiary

The only definite Tertiary unit recognized on GASON is the silcrete. The folding of this area was post-silcrete, and any noticeable dips of the eroded remnants of the silcrete surface

indicate the domal nature of the Gason structure. Several other units have been observed in the area which could be of Tertiary age.

On the western side of Lake Howitt is a silicified sandstone below the silcrete profile. (Tedford, pers.comm.). This sandstone may be Tertiary (Tedford, pers. comm.) but it could also be older.

Approximately 2 miles southeast of Cowarie Homestead there is a low gypsum scarp to the west of the road in which loose rounded cobbles up to 6 inches in diameter are found. They show a definite layering or bedding and seem to be a very dense calcareous sandstone. This material was not found in situ, but it was suggested that it could be Etadunna Formation, i.e. Miocene or younger in age. (Wopfner, pers. comm.). Thin section examination showed these cobbles to be an impure limestone which consists of a mosaic of small calcite grains that have been recrystallized and cemented. There is a little clay in the interstices, but no matrix. There is also about 20-25% of extremely fine grained quartz present. X-ray diffraction examination indicates that the rock consists of calcite and quartz. (Mrs. S. Whitehead, AMDEL, pers. comm.).

The silcrete on the Gason Dome is hard, dense and white to grey on fresh surface. The weathered surface is brown to red in colour. The solid silcrete on top of mesas is no greater than 4 feet thick. A characteristic feature of the silcrete is concentric layering which is highlighted by the differential weathering of the layers.

The silcrete on a mesa 2 miles west of Uwinya Hill, on the Birdsville Track is composed of polygonal columns up to 8 inches in diameter. This is a common feature of the silcrete in the northeast province of South Australia, (Wopfner, pers. comm), although, here the columns are not particularly well-developed. In most cases, the silcrete on the flat-topped mesas is very fractured due to weathering. Capping lower hills, throughout the centre of the Gason Dome are open patches of silcrete boulders. These are due to collapsing of the silcrete layer and are generally mapped as solid silcrete to indicate the former extent of the solid layer of the duricrust.

Around the edge of the Gason Dome, specifically on the western side, extremely large boulders of silcrete have been found up to 8 feet long, 6 feet wide and 6 feet high. These are lag deposits and occur at the base of hills and in creeks, rather than at the top of the hills. About six miles northeast of Cowarie Homestead, on the edge of the flood plain, a silcrete boulder was seen to be about half the size of a Landrover.

Quaternary

Pleistocene

The Pleistocene on GASON consists of a gypsite profile, which due to a definite surface pattern, seems to be more extensive from photo interpretation, than it actually is. However this pattern can include other lithologies besides the gypsite. The gypsite profile was once the most extensive early Quaternary unit over the structure, but now only remnant scarps and patches

of this unit occur. "Gypsite is proposed as a morphostratigraphic term to identify a weathering profile associated with an extensive Pleistocene land surface. The gypsite profile is characterized by a massive gypsum crust at the top, an intermediate, sometimes mottled, gypsiferous zone, and a thin ferruginous zone at the base." (Wopfner and Twidale, 1967, p.128).

In several areas, there are long, low scarps up to six feet in height, consisting of a gypsiferous clay with some clear crystals or plates of gypsum. Horizontal bands of satin spar gypsum are present in gypsiferous clay in a cliff section two miles southeast of Cowarie Homestead. (Photo 2). Along the Warburton River the gypsum cliffs contain butterfly twin crystals of a selenite-sand mixture in the gypsiferous unit. None of these scarps were seen to have a massive gypsum crust.

On the flat gibber plains there are occasional patches of gypsum in low mounds. This gypsum forms a crust although weathering causes it to be very crumbly. This gypsum is generally found between silcrete on the mounds and on some higher hills. A possible explanation of this is that the gypsite profile was developed across all surfaces on the structure and was stripped from most, leaving remnants in between the silcrete boulders. Another reason could be percolation of the gypsum into cracks in the silcrete, and later erosion causing the silcrete to split into boulders; the gypsum would have been reworked, but remained in place. These mounds are quite distinctive in that sand has collected on them and vegetation is more abundant than on the surrounding gibber plains.

In many places there is remnant gypsiferous clay lapping on to the sides of mesas, although it has been stripped from the surrounding plains. Often it is mixed with the weathered clays of the Winton Formation, and it is difficult to distinguish two without close inspection.

Some gypsum cliffs have silcrete boulders completely incorporated in them. (Photo 3). This is most likely a form of erosion and reworking of the gypsum and the silcrete.

The basal ferruginized zone of the gypsite profile is quite extensive in the centre of the Gason Dome. It appears as black patches on the normally red gibber plains and consists of Winton sediments ferruginized to various degrees. The most common type seen is a medium grained ferruginized sandstone and this is extensive on the gibber plains between the Mirra Mitta and Kalladeina Bores. (Photo 4). Around the base of Cretaceous mesas a younger degree of this ferruginization can be seen. It is an ochre coloured, fractured siltstone. A more weathered part of the profile is a banded ironstone that displays a distinct boxwork pattern, a concentric layering or a highly folded form. (Photo 5). Examples of all three types of ironstone are seen in a creek, one mile east of Mirra Mitta Bore. The three degrees of ferruginization are seen outcropping in a mesa, about 8 miles west of Kalladeina Bore.

Recent Deposits

These consist mainly of the silts and clays of the present flood plains, sand dunes, as well as the older gibber plains and reworked gypsite soil profiles.

The absence of the gypsite on the Gason Dome is due mainly to erosion that has stripped it from the surface. Samples of a red, fine silty soil were taken at 4 inches - 6 inches and 18 inches below the surface of one of the low hills on the edge of the flood plain, north of Cowarie Homestead. The samples at 4-6 inches contained small (approximately up to 2 mm) white gypsum nodules, and the deeper sample contained hard crumbly lumps of the red soil. These were compared with samples taken on the CORDILLO 1:250,000 map area, from the same type of surface. This was called a reworked gypsite soil profile that could be late Pleistocene or Recent. (Wopfner, pers. comm.). This reworked soil profile is patchy but very extensive over the Gason Dome. It is very soft to drive on even though there is a solid gibber cover. Most of it appears around the edges of the structure, on the edge of alluvial plains, and it is extremely widespread in the northeast of the map area. This surface causes a swirling pattern on the air photographs, but that is not conclusive evidence of its existence. This pattern is indicative of the gypsite soil profile on the photos of the Tellapanie one mile area. However, in other areas, although the soil profile may be present, sand collecting in mounds on the gibber plains can also give a swirling pattern, e.g. photos on the Cowarie - Mungeranie track (the Uwinya one mile area) show the swirling pattern, but some of the area is reworked soil profile and some is gibber plain.

Silcrete gibbers are very widespread on GASON. They cover every surface with the exception of the flood plains and

sand dunes. They are derived by erosion from the Tertiary silcrete duricrust. The gibbers are sub-angular and their size grades from boulders near the mesas to pebbles on the plains surrounding the mesas. In some areas the gibbers have a black ferruginous coating. This is a result of ferruginization at the base of the gypsite profile. (Wopfner, pers. comm.).

On the air-photographs (e.g. Point (1), Photo #0150, Run 2, Yelpawaralinna 1 mile), the tops of some hills seem to show a solid silcrete surface, but on field examination, have a smooth surface of packed cobbles - a 'pavement'. (Photo 6). Larger silcrete boulders occur around the edge of the tops of these hills. This surface is best seen about 2 miles south east of the Birdsville Track, at a point 18 miles south of Clifton Hills Homestead.

The Warburton is the main river system on GASON and is a continuation of The Diamantina. This river runs along the northwest edge of the Gason Dome. There are wide flood plains on either side of the main channel, but flooding is rare in this area. The material on the flood plains is white clay and fine white silts. Sand may also cover parts of this area.

The sand dunes surrounding the Gason Dome trend in a northwesterly direction and are generally very long seif dunes. They lap onto the edges of the dome, and quite a few dunes cover areas in the centre of the structure. The sand in the dunes is generally cream to orange in colour and is medium to coarse grained. Sand spreads collect on the northwest (i.e. lee) side of most mesas and there are large isolated seif dunes on the gibber plains. To the north of the flood plains, the dunes are

generally whiter, indicating a local source (i.e. the flood plain). This fact, that of sand collecting on the northwest side of the mesas, and the regular direction of the seif dunes, indicates a fairly steady southeasterly wind direction.

CONCLUSIONS

Many other specific areas on GASON need to be visited to produce further information on the extent of the various lithologies. Some of the hills near Milkapurda Hill and 12 miles east of Lake Koodnanie might yield some good cliff sections. As the main problem in the area is generally poor outcrop, subsurface information will be extremely useful, and drilling is recommended. Also, more detailed investigation of the Quaternary on GASON may further refine the present stratigraphical nomenclature.

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APPENDIX I

SUMMARIZED STRATIGRAPHY REPORTS of BORES DRILLED ON THE GASON DOME.

MUDDY HOLE BORE Unlocated - Clifton Hill Station

Feet		Feet	
0	-	3	Flood silts
		3	Grey gluey clay (soapstone)
3	-	16	White sandstone, fairly hard
16	-	26	Hard band (boulders), small supply of water. 7 oz.
26	-	30	Flinty rocks
30	-	35	White clay
35	-	37	Red clay
37	-	41	White clay
41	-	70	White rotten sand rock (kaolinitic). Water level 25', salt.
70	-	75	White drift
75	-	102	Yellow clay, sand and nodules
102	-	131	Yellow sand with salt water
131	-	134	White clay and nodules
134	-	135	Red and yellow clay
135	-	141	Yellow sand. Water level 18', salt.
141	-	143	Tough white clay with yellow bands
143	-	160'	White clay
160	-	182	Yellow clay
182	-	198	Yellow clay with brown bands
198	-	201	Yellow clay
201	-	238	Yellow sandstone
238	-	242	Yellow clay
242	-	264	Black clay
264	-	270	Yellowish clay
270	-	276	Blue clay
276	-	280	Blue clay
		280	Total depth.

GOYDERS LAGOON BORE (7 miles bore, completed 1905)

Lat: 27°01'00"

Long: 138°54'00"

Feet		Feet	
0	-	8	Clay with gypsum
8	-	20	Hard white siliceous rock
20	-	90	Pipeclay and siliceous sand
90	-	135	Siliceous sandstone, fine grained
135	-	145	Siliceous sandstone, with lignite
145	-	180	Siliceous sand
180	-	185	Fawn sandy clay
185	-	240	Cream sandy clay
240	-	280	Grey clay
280	-	1080	Blue shale. 980'-1080' has the appearance of typical blue shale.
1080	-	1150	Shale with lignite
1150	-	1260	Grey clay becoming blue by 1260'
1260	-	1280	Particles of lignite (possibly introduced)
1280	-	1626	Blue shale (this blue shale is slightly greyer and more clayey and sticky than below at 1966')
1626	-	1712	Lignitic clay
1712	-	1966	Slightly sandy grey clay
		1966	Possible change
1966	-	1972	Hard siliceous sand and clay
1972	-	2080	Blue shale
2080	-	2087	Hard rock
2087	-	2144	Shale
2144	-	2151	Siliceous sand and clay, indurated.
2151	-	2582	Blue shale. Above 2247' trace of sand in clay, and below, very fine grains.
2582	-	2590	Hard calcareous rock. Definite Lower Cretaceous
2590	-	4530	Blue shale
4530	-	4537	Blue shale with pyrite nodules
4537	-	4680	Blue shale, greyer. Sandy from 4537'-4570'
4680	-	4700	Gravel
4700	-	4740	Sandstone, fine grained sand
4740	-	4850	Sand
		4850	Total depth.

PANDI BURRA (OIL) BORE Lat: 26°45'345"
Long: 139°25'03.1"

Feet		Feet	
0	-	330	Sandstone and claystone
330	-	2275	Carbonaceous shale, sandstone interbeds, lignite bands.
2275	-	3462	Shale, minor limestone and sandstone
3462	-	3484	Shale
3484	-	4174	Shale, minor sandstone
4174	-	4370	Sandstone and shale
4370	-	5050	Medium - coarse grained sandstone, minor shale
5050	-	5352	Interbedded sandstone and shale
5352	-	6770	Coarse grained sandstone, minor shale
6770	-	6970	Fine grained sandstone
6970	-	7253	Fine grained sandstone, Orthoquartzite, very minor shale.
		7253	Total depth.

MELON CREEK BORE Lat: 27°08'00"
Long: 138°17'00"

Feet		Feet	
0	-	3	
3	-	27	White hardened siliceous silt on very fine sandstone
27	-	50	Yellow silty sand on soft sandstone
50	-	57	White silty sand slightly coarse. Water
57	-	80	White silty sand slightly coarse, inclinated and silicified.
80	-	83	12" soft siliceous silt. 80½" water
83	-	100	Inclinated siliceous silt (Quartzite? to sandstone)
100	-	102	Yellow quartzite (?) to sandstone
102	-	103	Yellow quartzite (?) to sandstone with fine sand. Salt water.
103	-	105	Creamy sandstone
105	-	110	Yellow clay
110	-	125	White clay
125	-	134	Creamy sandstone
134	-	155	Buff siliceous shale
155	-	204	Yellow, cream and pale grey shales
204	-	331	Pale grey shale
331	-	345	Greenish sandy silt
345	-	450	Light grey shale
450	-	539	Greenish silty sand
539	-	600	Greenish-grey shale
		600	Total depth

MT. GASON BORE

Completed 1903
Lat: 29°19'45"
Long: 138°45'15"

Feet		Feet	
0	-	1½	Red sandy loam
1½	-	19	Gypsum
19	-	79	Yellow clay
79	-	149	Light grey clay
149	-	345	Light grey clay
345	-	383	Grey sandy shale
383	-	444	Grey shale and lignite
444	-	775	Light grey shale, sandy in parts
775	-	915	Grey shale, trace of lignite
915	-	927	Grey shale and lignite
927	-	946	Grey very sandy shale
946	-	994	Grey shale
994	-	1220	Greyish shale
1220	-	1345	Light grey sandy shale
1345	-	1400	Grey shale, trace of lignite
1400	-	1483	Grey shale
1483	-	1667	Sandy grey shale to 1667'; lignitic particles 1618'-1624'
1667	-	1767	Grey shale
1767	-	1772	Hard calcareous rock with lignite fragments
1773	-	1795	Grey shale with lignite
1795	-	2039	Grey shale, trace of lignite
2039	-	2224	Grey sandy shale
2224	-	2608	Probably blue shale, lighter than normal; very argillaceous; no lignite Lower Cretaceous
2608	-	3950	Blue shale with marine fossils
3950	-	4304	Blue shale
4304	-	4324	Indurated sand
4324	-	4420	Sandstone. 4324'-4403', fine sand 4403'-4420', sand and sandstone fragments.
		4420	Total depth

MIRRA MITTA BORE — Completed 1901, Tested October 1966

Lat: 27°43'15"

Long: 138°44'30"

Height above sea level Feet		Feet	
0	-	30	Gypsum and clay
30	-	126	Indurated calcareous sand
126	-	295	Blue shale, greyish to blue
295	-	332	Greenish-grey sandy clay
332	-	433	Grey shale
433	-	460	Greyish shale with a little lignite
460	-	865	Grey shale
865	-	900	Calcareous rock. Very fine grey sand, soft and non-siliceous.
900	-	1300	Grey shale
1300	-	1400	Traces of lignite in dark grey shale
1400	-	1480	Grey shale
1480	-	1619	Soft very fine grey non-siliceous sand
1619	-	1628	Trace lignite. Lower Cretaceous
1628	-	1728	Blue shale
1728	-	1729	Calcareous rock
1729	-	2820	Blue shale
2820	-	3364	Blythesdale
3364	-	3534	Soft siliceous sandstone
		3534	Total depth

KALLA DEINA BORE

Sunk September 1913
Lat: 27°39'30"
Long: 139°07'00"

Feet		Feet	
0	-	4	Surface soil
4	-	30	Travertine
30	-	80	Yellow clay
80	-	238	Sandy green clay
238	-	948	Calcareous shale
948	-	1022	Blue shale Lower Cretaceous?
1022	-	1070	Blue shale with lignite (more like carbonaceous shale than lignite; no structure)
1070	-	1725	Blue shale
1725	-	1774	Hard calcareous shale
1774	-	2100	Blue shale
2100	-	2110	Hard calcareous shale
2110	-	2280	Shale and fossil shells
2280	-	2900	Shale
2900	-	2905	Shale and fossil shells
2905	-	2906	Hard calcareous shale
2906	-	3286	Blue shale
3286	-	3390	Hard blue shale
3390	-	3470	Soft blue shale
3470	-	3667	Hard blue shale with thin layers of sand
3667	-	3743	Pale sandy shale
3743	-	3748	Hard calcareous rock
3748	-	3812	Light sandy shale
3812	-	3907	Shale
3907	-	3984	Sandstone
		3984	Total depth

MUNGERANIE BORE

Completed 1900, Tested October 1966
Lat: 28°01'30"
Long: 138°41'08"

Feet		Feet	
0	-	6"	Sand
6"	-	3	Red sandy clay
3	-	9	Gypsum
9	-	70	Sandstone
70	-	80	Yellow clay
80	-	97	Grey clay
97	-	411	Blue shale
411	-	438	Sandy shale
438	-	442	Hard limestone
442	-	470	Sandy shale
470	-	585	Blue shale
585	-	588	Hard limestone
588	-	707	Blue shale
707	-	712	Shale, trace lignite.
712	-	736	Hard limestone
736	-	738	Blue shale
738	-	750	Hard limestone
750	-	815	Blue shale
815	-	818	Hard limestone
818	-	997	Hard limestone; one small piece of lignite between 818' and 873'.
997	-	998	Hard limestone
998	-	1019	Blue shale
1019	-	1022	Hard limestone
1022	-	1046	Blue shale
1046	-	1051	Hard limestone
1051	-	1068	Blue shale
1068	-	1070	Hard limestone
1070	-	1085	Blue shale and lignite
1085	-	1135	Blue shale, no lignite seen
1135	-	1264	Dark carbonaceous shale and lignite
1264	-	1303	Grey shale
1303	-	1306	Hard limestone
1306	-	1382	Blue shale (with lignite between 1346' and 1367')

MUNGERANIE BORE (continued)

Feet		Feet		
1382	-	1385	Hard limestone	Lower Cretaceous
1385	-	1419	Blue shale, somewhat sandy	
1419	-	1421	Hard limestone	
1421	-	1531	Blue shale	
1531	-	1532	Hard limestone (with calcareous sparite)	
1532	-	1640	Blue shale	
1640	-	1642	Hard limestone	
1642	-	1712	Blue shale	
1712	-	1716	Hard limestone	
1716	-	1740	Blue shale	
1740	-	1741	Hard limestone	
1741	-	1831	Blue shale	
1831	-	1832	Hard limestone	
1832	-	2328	Blue shale with limestone at 1855'-1862', 1869'-1873' and 2081'-2083'.	
2328	-	2725	Blue shale	
2725	-	2728	Limestone	
2728	-	2905	Blue shale	
2905	-	2910	Limestone	
2910	-	2916	Blue shale	
2916	-	2929	Limestone	
2929	-	2939	Blue shale	
2939	-	2945	Limestone	
2948	-	3097	Blue shale	
3097	-	3099	Hard calcareous sandy rock	
3099	-	3264	Blue sandy shale	
3264	-	2369	Blue shale	
3269	-	3290	Indurated sand	
3290	-	3296	Coarse siliceous sand	
3296	-	3299	Sandy shale	
3299	-	3302	Fine grey sand	
3302	-	3326	Fawn coloured shale, no mica	
3326	-	3335	White sand rock, soft	
3335	-	3360	Grey sandrock, soft	
3360	-	3370	Slightly indurated, siliceous sand.	
		3370	Total depth.	

MULKA BORE

Completed 1906
Lat: 28°22'15"
Long: 138°39'15"

Feet		Feet	
0	-	16	Gypsum
16	-	60	White, very fine sand clay
60	-	80	Sandstone, white, fine
80	-	123	Sandstone, yellow, fine
123	-	215	Grey shale
215	-	239	Grey sandy shale
239	-	270	Dark sand
270	-	579	Light grey shale
579	-	600	Grey fine sand
600	-	658	Grey shale
658	-	664	Grey fine sand
664	-	950	Grey shale
950	-	952	Calcareous shale
952	-	996	Sandy grey shale
996	-	1000	Grey fine sand
1000	-	1160	Grey shale with a little fine sand
1160	-	1180	Shale with lignite
1180	-	1340	Shale slightly carbonaceous
1340	-	1372	Lignite
1372	-	1392	Sandy shale with carbonaceous matter
1392	-	1454	Grey sand
1454	-	1580	Grey shale
1580	-	1596	Sandy shales
1596	-	1600	Calcareous shale
1600	-	1610	Grey shale
1610	-	3338	Blue shale Lower Cretaceous
3338	-	3378	Fine sand
3378	-	3431	Greyish blue shale
3431	-	3435	Hard sandstone, very crystalline sand
3435	-	3445	Sand brown coal or lignite
		3445	Total depth.

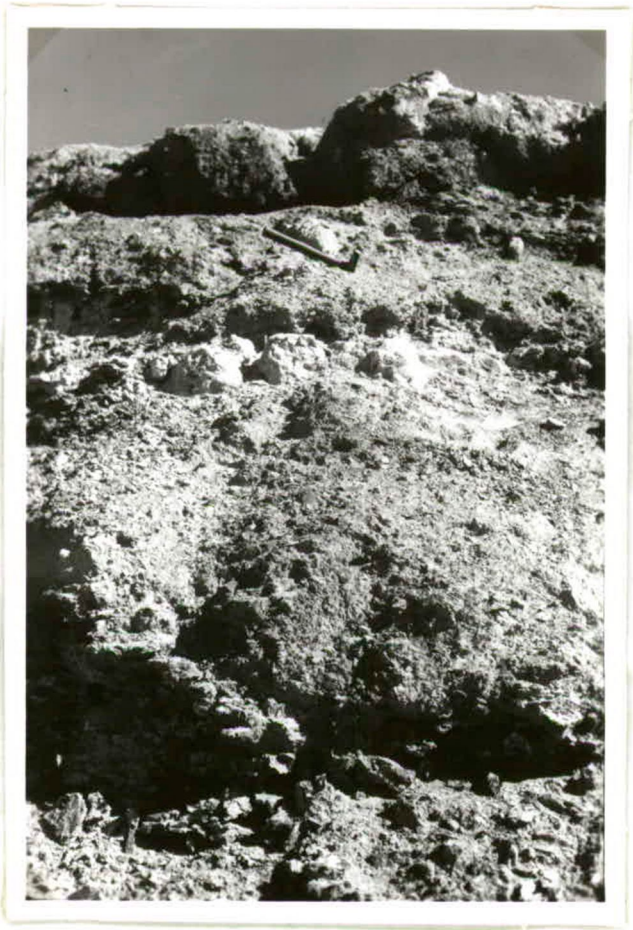
Frontispiece - Cretaceous Winton Formation mesas,
west of Uwinya Hill, GASON.

#20857

5/2

20858

Photo 1. #20858 Winton Formation outcrop, 6-miles west of the Mirra Mitta Bore



4/2 20859

Photo 2. #20859 Satin spar veined gypsum masking a cliff of possible Cretaceous outcrop 2-miles southeast of Cowarie Homestead

J/2 20860

Photo 3. #20860 Silcrete boulders incorporated in gypsiferous clay, 1 mile east of Cowarie Homestead

J/2

20861

Photo 4.
#20861

Ferruginized sandstone, part of the base of the gypsite profile, 12 miles west of Kalladeina Bore.

J/2

20862

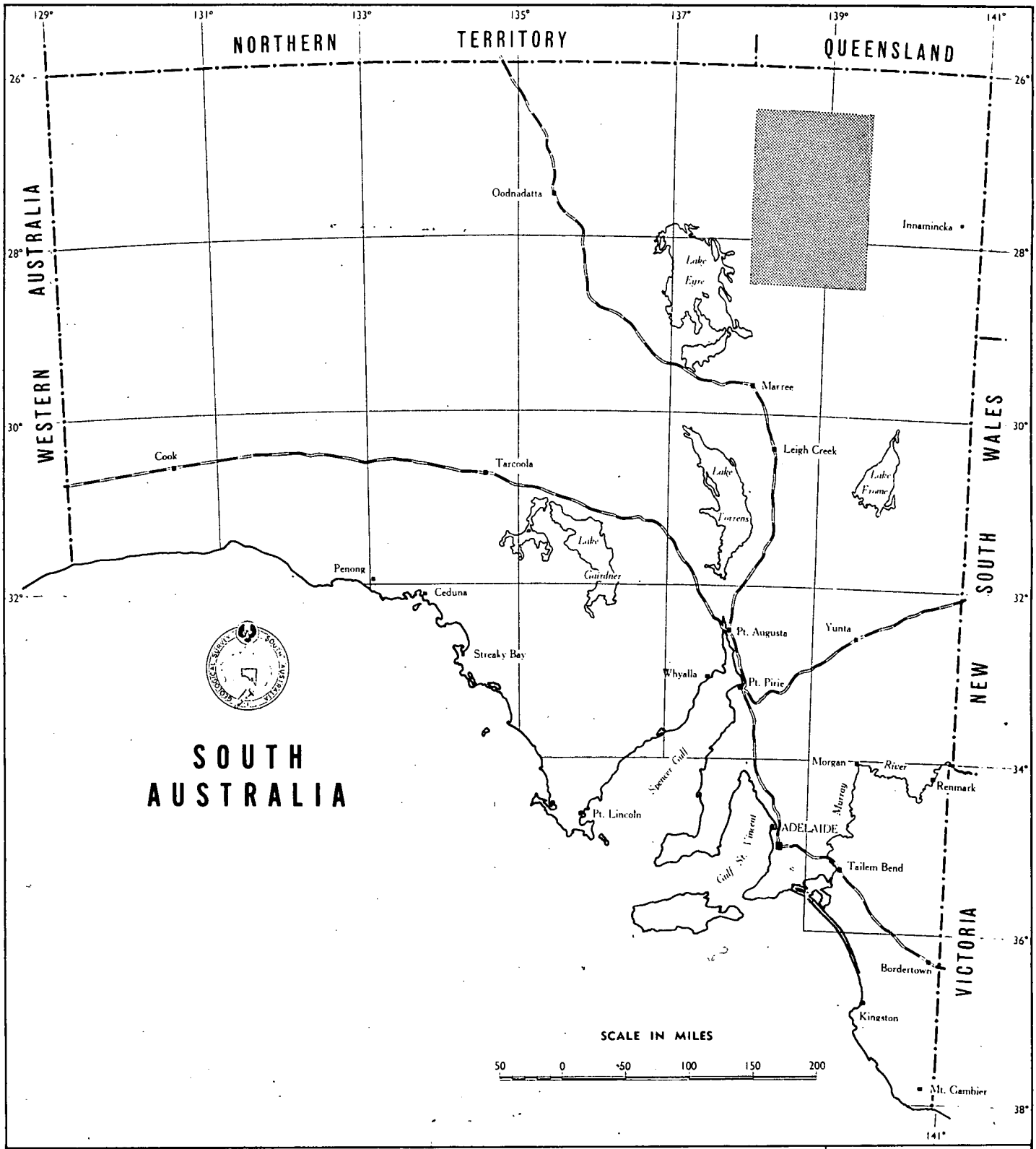
Photo 5. #20862 Highly folded ironstone outcrop 1 mile east of Mirra Mitta Bore.

5/2

20863

Photo 6.
#20863

Gibber 'pavement' - a smooth surface of silcrete cobbles on a hill, south of Clifton Hills Homestead.



	DEPARTMENT OF MINES — SOUTH AUSTRALIA	Scale:
Compiled:	LOCALITY MAP	Date: 14·7·70
Drn: Ckd:	GASON DOME AREA	Drg. No. 70-517

GASON

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA
DEPARTMENT OF MINES ADELAIDE

AUSTRALIA 1:250,000

SHEET G54-13 ZONE 5

REFERENCE

CAINOZOIC — QUATERNARY — RECENT

- Qrl — Recent lake deposits
- Qrr — Extensive gibbers consisting of transported boulders and pebbles
- Qrt / K — Gibber cover on Cretaceous
- Qra — Stream and flood plain alluvium
- Qrd — Recent sand dunes and sand spread
- Qrr — Low level reworked gypsite profile
- Qrh — Ancient dunes
- Qpr — Gypsite, gypsiferous gravels, sand and green clay, also high level gravels
- Ferruginisation at the base of the gypsite profile showing typical folding and box patterning
- Qpt — TIRARI FORMATION Generally an argillaceous sandshow but including the Kallakoopah Sands with Diprotodon and other fossil remains and also some gypsiferous sand and silt

CAINOZOIC — TERTIARY — PLIOCENE

- Tsi — Siliceous duricrust, commonly collapsed as large boulders on gibber surface

MESOZOIC — CRETACEOUS

- Kuw — WINTON FORMATION Interbedded siltstone, fine grained sandstone and carbonaceous shale

(PD) indicates position doubtful
(ES) indicates photo interpretation doubtful

- Built-up area
- Road sealed surface first class, route marker
- Road sealed surface second class, mileage
- Road loose surface all weather
- Road loose surface dry weather
- Road unimproved earth
- Track, foot or pack, footbridge
- Embankment, cutting
- Gate, cattle grid
- Bridge road, bridge railway
- Railway multiple track
- Railway single track
- Light railway or tramway
- Station, siding, station with siding
- Telephone line, power transmission line
- Fence, stone wall
- Levee or dyke, quarry
- Mine, windpump, yard
- Building(s), church, school
- Post office, wireless transceiver, cemetery
- Airport or airfield, landing ground
- Control point major, minor, astronomical
- Spot elevation in feet, accurate, approximate — 750 / 750
- Bench mark, mud, gravel — BM 750
- Waterhole, water tank, dam, dry lake
- Lake, river or stream perennial
- Lake, river or stream intermittent
- Dam or weir, falls, rapids
- Drain or ditch perennial, intermittent
- Spring perennial, intermittent, rockhole
- Marsh or swamp, perennial, intermittent

Preliminary Geological Map prepared by photo interpretation of aerial photographs

Planimetric data supplied by the Division of National Mapping

GASON
SHEET G54

INDEX TO ADJOINING SHEETS

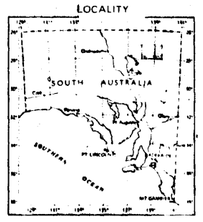
POOLOWANNA	PANDIE PANDIE	CORDILLO
NOOLYEANA	GASON	INNAMINCKA
LAKE EYRE	KOPPERAMANNA	STRZELECKI

SCALE

MILES 20 10 0 20 40 60 80 100 120 140 160 180 200 MILES

KILOMETRES 50 0 50 100 150 200 250 KILOMETRES

LOCALITY



TO ACCOMPANY REPORT BY D. GREGORY

70-518

PANDIE PANDIE

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA
DEPARTMENT OF MINES ADELAIDE

AUSTRALIA 1:250,000

SHEET G54-9 ZONE 6

QUEENSLAND
SOUTH AUSTRALIA

SIMPSON DESERT

SANDRIDGES APPROXIMATELY 100 FEET HIGH

SANDRIDGES APPROXIMATELY 50 FEET HIGH

SANDRIDGES APPROXIMATELY 100 FEET HIGH

AREA SUBJECT TO INUNDATION

Alton Downs

Pandie Pandie

Andrewilla

Eyre Creek

Qra Qrd Qrt Qrr

REFERENCE

CAINOZOIC
QUATERNARY
RECENT

- Qrl — Recent lake deposits
- Qrt — Extensive gibbers consisting of transported boulders and pebbles
- Qra — Stream and flood plain alluvium
- Qrd — Recent sand dunes and sand spread
- Qrr — Low-level reworked gypsite profile

PLEISTOCENE

- Qpr — Gypsite, gypsiferous sand, silt and gravel

(1) — indicates section deleted
(88) — indicates photo interpretation doubtful

- Built-up area
- Road sealed surface first class, route marker
- Road sealed surface second class, mileage
- Road loose surface all weather
- Road loose surface dry weather
- Road unimproved earth
- Track, foot or pack, footbridge
- Embankment, cutting
- Gate, cattle grid
- Bridge road, bridge railway
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- Telephone line, power transmission line
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- Building (s), church, school
- Post office, wireless transceiver, cemetery
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- Control point major, minor, astronomical
- Spot elevation in feet, accurate, approximate — 750 — 750
- Bench mark, mud, gravel — BM-750
- Water-hole, water tank, dam, dry lake
- Lake, river or stream perennial
- Lake, river or stream intermittent
- Dam or weir, falls, rapids
- Drain or ditch perennial, intermittent
- Spring perennial, intermittent, ricefields
- Marsh or swamp, perennial, intermittent

INDEX TO ADJOINING SHEETS

N.T.	QLD	
POOLOWANNA	PANDIE PANDIE	CORDILLO
NOOLYEANA	GASON	INNAMINCKA

SCALE

MILES 0 1 0 2 4 6 8 10 12 14 16 18 20 MILES

KILOMETRES 5 0 5 10 15 20 25 KILOMETRES

LOCALITY

SOUTH AUSTRALIA

Preliminary Geological Map prepared by photo interpretation of aerial photographs

Planimetric detail supplied by the Division of National Mapping

PANDIE PANDIE
SHEET G54 9

TO ACCOMPANY REPORT BY D GREGORY

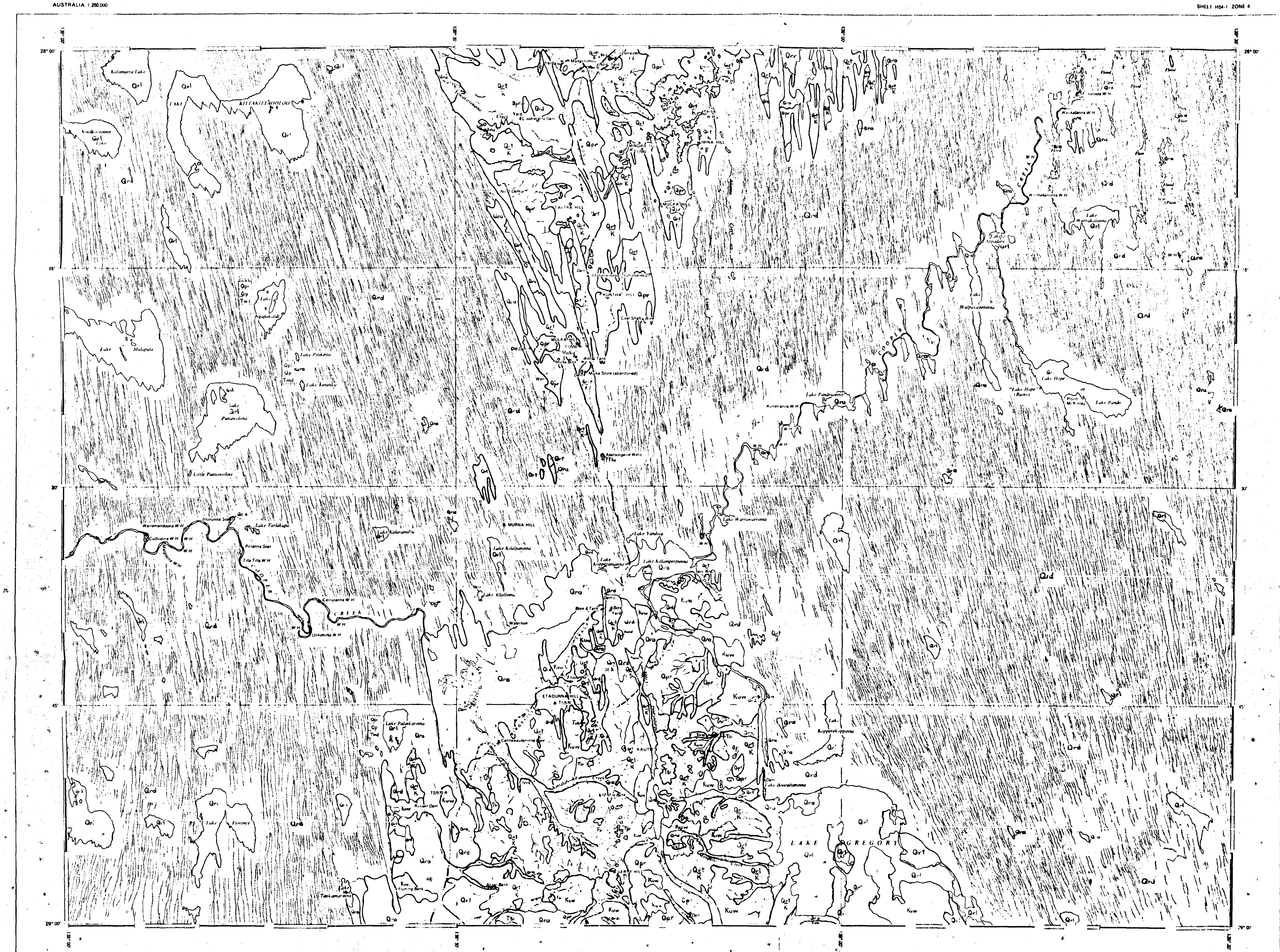
70-519

KOPPERAMANNA

GEOLOGICAL SURVEY OF SOUTH AUSTRALIA
DEPARTMENT OF MINES ADELAIDE

AUSTRALIA 1:250,000

SHEET H54-1 ZONE 6



REFERENCE

Symbol	Description	Period	Era
Qrl	Recent lake deposits	Quaternary – Recent	Cainozoic
Qrt	Extensive gibbers consisting of transported boulders and pebbles	Quaternary – Recent	Cainozoic
Qrt/K	Gibber cover on Cretaceous	Quaternary – Recent	Cainozoic
Qra	Stream and flood plain alluvium	Quaternary – Recent	Cainozoic
Qrd	Recent sand dunes and sand spread	Quaternary – Recent	Cainozoic
Qpi	Gypsite: gypsiferous gravels, sand and green clay, also high-level gravels	Quaternary – Pleistocene	Cainozoic
Qpi	TIRARI FORMATION Generally an argillaceous sandstone but including the Katipiri channel sands with Diprotodon and crocodile remnants and also some gypsiferous sand and silt	Quaternary – Pleistocene	Cainozoic
Qp	Mampuwordu Channel sands: occurs locally in the type section on Lake Palankarinna	Quaternary – Pleistocene	Cainozoic
Tmd	ETADUNNA FORMATION White to cream dolomite with dolomitic clays interbedded	Tertiary	Cainozoic
Tsi	Siliceous duricrust, generally collapsed as large boulders or gibber surface	Tertiary	Cainozoic
?Tlu	Fine to medium grained ferruginised sandstone, possibly equivalent to the MURNPEOWIE FORMATION	Tertiary	Cainozoic
Kuw	WINTON FORMATION Interbedded siltstone, fine grained sandstone and carbonaceous shale	Cretaceous	Mesozoic

GEOLOGICAL BOUNDARIES
- ACCURATE
- APPROXIMATE

FAULTS

BEDDING
- INCLINED

MAIN ROAD

SECONDARY ROAD

TRACK

RAILWAY

BOUNDARY FENCE

VERMIN PROOF OR DOG FENCE

EPHEMERAL STREAM

SWAMP

CLAY PAN

HOMESTEAD

TRIANGULATION STATION

ASTRONOMICAL STATION

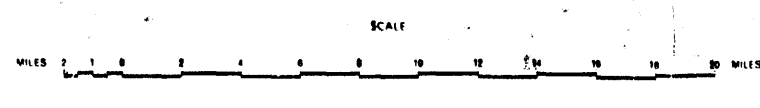
WATER FEATURES
- BORE
- WATERHOLE (W H)
- WELL (W)
- EARTH TANK OR DAM

MINE

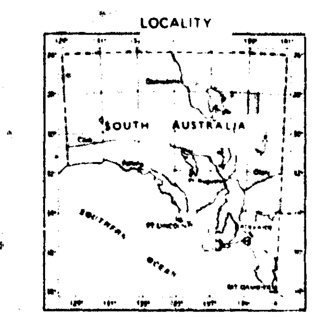
INDEX TO ADJOINING SHEETS

NOOLYEANA	GASON	INNAMINCKA
LAKE EYRE	KOPPERAMANNA 1	STRZELECKI
CURDIMURKA	MARREE	CALLABONNA

SCALE



LOCALITY



Preliminary Geological Map prepared by photo interpretation of aerial photographs

KOPPERAMANNA
SHEET H54-1

TO ACCOMPANY REPORT BY D. GREGORY

70-520