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SML 527 AND SML 641

MOUNT GUNSON DISTRICT

GEOLOGICAL MAPPING DATA, 1971-1972

Submitted by
Mount Gunson Mines Pty Ltd
1972

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Government of South Australia
Primary Industries and Resources SA

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TENEMENT HOLDER: Mt. Gunson Mines Pty. Ltd.

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REPORT ON GEOLOGIC MAPPING
ELIZABETH AREA, MT. GUNSON S.A.

PACMINEX PTY LTD

Dated in Sydney
10/8/71

Prepared by: J.M. Chisholm

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MAPS

Fig. 1 - Mt. Gunson - Elizabeth Area

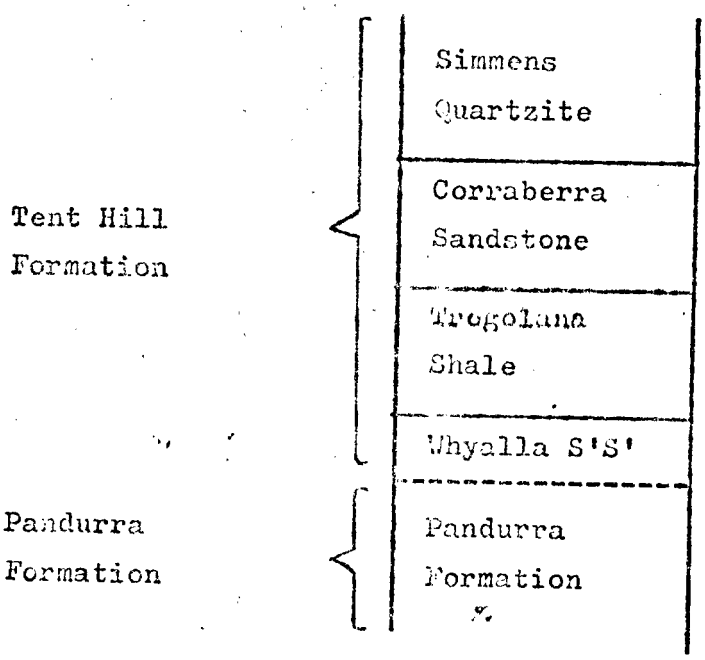
INTRODUCTION

The area covered in the mapping programme extends from the Elizabeth River, north of Pernatty Lagoon to the Western section of Bonney Bluff. Most of the area is covered by dune sand but sufficient outcrop is available for mapping. Silicification of the various lithologies makes it very difficult to identify the rock in hand specimen. In the vicinity of Bonney Bluff the stratigraphic relationships are masked by transported debris and erosional remnants.

The main aim of the programme was to test the possibility of the area being a suitable host environment for copper mineralisation. The exploration hypothesis used was that the copper mineralisation occurs in tectonic and/or topographic depressions in the Pandurra Formation.

STRATIGRAPHY

With the exception of the Woocalla Dolomite there is a complete stratigraphic sequence from the Red Quartzites of the Pandurra Formation through to the orthoquartzites of the Simmens Quartzite Member. The stratigraphic relationships are shown below:-



As mentioned earlier, there were complications due to silicification and transported debris which caused uncertainty in mapping the stratigraphic sequence. The boundary between the Tregolana Shale member and the overlying Corraberra Sandstone Member is transitional and is arbitrarily placed at a boundary where the sand content decreases below 25%. Where silification masks the grain sizes, and relative proportions of silt and sand it is impossible to ascertain the identity of the rock unit. The more resistant nature of the silicified lithologies has caused them to remain as erosion relics after the softer siltstones and mudstones have been removed and it is common to find areas of younger rock that appear to be lower stratigraphically than older less resistant strata. This is caused by less resistant sediments being preferentially eroded from below a resistant bed which remains after the underlying bed is removed. The prime example of this is at Bonney Bluff where flaggy quartzites of the Simmens Quartzite Member appear to occur below the Corraberra Sandstone Member in the form of an apron around the Bluff.

Pandurra Formation - Considerable lithological variation occurs within this formation with the occurrence of friable, coarse sandstones, gritty sandstones, pebbly sandstones and boulder conglomerates. Two units were delineated on the basis of colour and grain size. The lower unit is the characteristic red, coarse grained often gritty quartzite which comprises most of the Pandurra Formation. Conformably above the red coloured quartzite there occurs a white-buff-purple quartzite that is in part a friable sandstone. The white and buff quartzites are medium to coarse grained but generally equigranular within any bed. A boulder conglomerate has been included in this unit although the exact relationship is uncertain. There is a possibility that the conglomerate is of fluvial origin much younger than the other Pandurra Formations on account of its distribution. Only boulders of Pandurra Formation lithologies occur as clasts in the conglomerate.

Whyalla Sandstone Member - A thin strata of heavily Mn-Fe indurated lithic sandstone occurs unconformably above the Pandurra Formation. Rounding of the grains is exceptional and at the base there occur angular clasts of red quartzite which are typically not subjected to Mn-Fe induration. There is an observed gentle dip towards the NE (i.e. basinwards away from the ancient land mass) existing during deposition of this unit).

Tregolana Shale Member - The boundary between the underlying Whyalla Sandstone is not seen in outcrop but is seen to be conformable in the Gunyah Lake area to the south. The upper boundary with the Corraberra Sandstone is transitional which causes difficulty in field identification. This member is composed of a sequence of mudstones, siltstones and silty sandstones which show a wide variation in colour. Generally the mudstones are green, red and purple with white coloration where weathering has bleached the sediments. Fine grained sandstone interbeds occur within the sequence and these show considerable contortion (ball and pillow structures, load casts) due to plastic deformation of the sediments shortly after deposition (early diagenesis).

In one outcrop the argillaceous sediments are folded due to slumping. The Tregolana Shale Member is equivalent to the Woomera Shale Member of Johns (1968).

Corraberra Sandstone Member - Conformably overlies the Tregolana Shale with a transitional boundary. This sequence consists of siltstones, sandy siltstones, sandstones and quartzites that are frequently cross-bedded. The sediments are flat lying and pass conformably into the overlying sandstones and quartzites of the Simmens Quartzite Member.

Simmens Quartzite Member - Equivalent to the Arcoona Quartzite (Johns 1968) and forms the capping for the residual remnants of the Arcoona Plateau. In outcrop the quartzites appear as flaggy blocks that are very resistant to weathering and give a false impression as to the nature and affinity of the underlying bedrock.

In the vicinity of Permatty Lagoon the only outcrops of Simmens Quartzite are on Mt. Gunson and Bonney Bluff.

Land Surfaces - Three land surfaces are evident and they are:-

(1) Present day land surfaces which show medium relief.

(2) Tertiary land surface that shows up as a flat lying plane over which there is a marked silicification with the result that the land surface is now represented by remnant mesas. At one outcrop there occurred a fossilised pisolitic laterite profile which indicates that the climate in the area was probably once tropical-sub tropical. The laterite development is up to 4-5 feet in thickness with rounded grains of hematite (considerable size variation) cemented by a limonite - jarosite stained silica.

(3) Mesozoic land surface which is found at the top of the ancient Arcoona Plateau and is approximately 800-900 feet above sea level.

LITHOLOGY

Pandurra Formation - Composed primarily of subangular to sub-rounded quartzite grains with evidence of some geldspar minerals having been present. Any feldspar that was present has been heavily altered with only remnants of clay minerals remaining to fill the voids. The clasts that occur in the grits and quartzites indicate the nature of the distributive province and are mainly acid volcanics, chert, jasper and milky quartz. The composition of the boulders in the conglomerate are different in that they consist of older red quartzite. Silicification has masked the grain sizes and replaced the caly minerals to give the rocks the appearance of clean, quartz-rich quartzites.

Whyalla Sandstone - The blocks of red quartzite (Pandurra Formation) that occur at the base of the sandstone have been silicified and exhibit liesgang rings whereas the sandstone does not. The sandstone consists of extremely well rounded quartz grains in which the degree of sorting is well advanced. With the silicified quartzite below and a mudstone above the Whyalla sandstone has acted as an aquifer to aqueous solutions. This is evident by the heavy iron and manganese staining throughout the exposed outcrop.

Tregolana Shale - This sequence of sediments passes from fine grained laminated mudstones through interbedded sandstones and mudstones to a silty sandstone. Close examination of the mudstone sequence shows that fine-grained, sandstone layers, which contain both well rounded and angular quartz grains, occur within the laminations of fine grained argillaceous material. Within the argillaceous material there can be seen both micro-convolutions and micro-faults. The sandstone interbeds towards the top of the sequence have a bimodal distribution of grain sizes with an argillaceous matrix filling voids between the well rounded quartz grains. The argillaceous material is thought to be due to diagenetic remobilisation of material following deposition.

Transition - The boundary between the Tregolana Shale and the overlying Corraberra Sandstone is fixed at 25% sand content but the variability of the sediments makes this boundary very transitory. A close examination of samples selected from this transition some showed a silicified silty sandstone containing well rounded grains, in one case angular, with 5 - 10% argillaceous material.

Corraberra Sandstone - This sequence consists of a micaceous quartzite at the base above which is a purple sandy siltstone with a micaceous, crossbedded, purple sandstone at the top. The lower micaceous sandstone is a fine grained quartz sandstone interbedded with siltstone. The angular grains are close packed with some sericite to give a clean sandstone. Above this is a purple even grained quartz-sericite siltstone interbedded with a fine grained sandstone. The

upper pruple sandstone contains medium grained quartz, muscovite, sericite and iron stained argillaceous matter derived through the breakdown of feldspar minerals.

Simmens Quartzite - Generally cream and white fine grained orthoquartzites in which the grains are well rounded but silicification tends to mask the texture. Some heavy minerals (possibly tourmaline) occur and a small amount of argillaceous material occurs interstitialy. Interbeds of quartzite which contain significant feldspar remnants occur. Generally the Simmens Quartzite is better sorted, finer grained, more rounded, contains no mica and has less argillaceous material than the Corraberra Sandstone.

SEDIMENTATION

The pattern of sedimentation is the result of a marine transgression followed by a partial regression. Following deposition of the Pandurra Formation there occurred movement which terminated sedimentation and initial erosion. Deposition of the eroded Pandurra clastic material resulted in the Whyalla Sandstone and as the transgression progressed these changed to mudstones and siltstones of the Tregolana Shales. From the upper part of the Tregolana Shales there was a trend in which the sediments became better sorted and rounding improved as the erosion cycle reached maturity until the clean orthoquartzites of the Simmens Quartzite were deposited.

STRUCTURE

Two structual events are evident but neither is thought to be major. One includes the lithologies of the Pandurra Formation in which slight folding has undulated the strata thus producing variations in dip and strike reading. There is however a regional dip for the Pandurra Formation. Shearing is common and minor faulting occurs with the dips of strata disrupted adjacent to the faults being up to 30°. The second structural event included all of the post-Pandurra lithologies. There is a regional dip to the SE resulting from onlap of

of Youngs Formation on to the Pandurra lithologies but is not thought to exceed 5°. Within the sediments of the Tent Hill formation there are broad shallow synclinal and anticlinal structures with minor tight folds possibly caused by slumping.

ECONOMIC POTENTIAL

A working hypothesis is that the distribution of copper mineralisation is controlled by permeability of host rock, ground water conditions, structure of the depositional environment.

On this hypothesis there is only one area, that is regarded as a possible location for mineralisation in the Elizabeth area. This is in the Whyalla Sandstone that outcrop along the mouth of the Elizabeth River. The sandstones were once permeable and would have acted as an aquifer between the red quartzites and the overlying shales. As the regional dip is to the SE there would within the basin be Eh/pH conditions where any copper in solution would be precipiated out. It is unlikely that any copper would still be forming as the heavy iron - manganese formation has markedly reduced the permeability of the sandstones.

It is proposed that a few exploration holes be drilled through the Tregolana Shale into fresh Whyalla Sandstone. The location of these holes would be in the vicinity of where the Mt. Gunson-Yeltacowie road crosses the Elizabeth River as access to the area to the south east would be restricted to an airtrack and compressor.

Manganese occurs as pyrolusite and psilomelane but is of insufficient extent to be of interest. Hematite occurs in the laterite soil profile but is again very restricted in extent. Lilitic and kaolinitic clays occur in the pallid zone of the Tregolana Shales appears to be similar in quality to that being quarried at Magazine Hill near Woocalla.

LAKE WINDABOUT

MT. GUNSON Δ

GUNYAH LAKE

Mill site

Δ BONNEY BLUFF

ELIZABETH CK

POWER LINE

from Woomera

PERNATTY LAGOON

BIRTHDAY R.S.

TRANSCONTINENTAL RAILWAY

Mn

Manganese Workings

PERNATTY

PERNATTY RIDGE

BLACK OAK CK

Fair Nell Mines Cu

Sweet Nell Mines Cu

WOOCALLA R.S.

IRONSTONE LAGOON

MONALENA H.S.

To Pt Augusta

Lake and claypan deposits

Alluvium gravels and silts

S — Sand plains and dunes

Si — Stream deposits: boulder beds, ferrugious grits

Si — Silicified cappings

K — White kaolinitic siltstones

TENT HILL FORMATION

SQ — Simmens Quartzite Member

C — Corraberra Sandstone Member

T — Tregolana Shale Member

L — Whyalla Sandstone

D — Woocalla Dolomite

R — Pandurra Formation

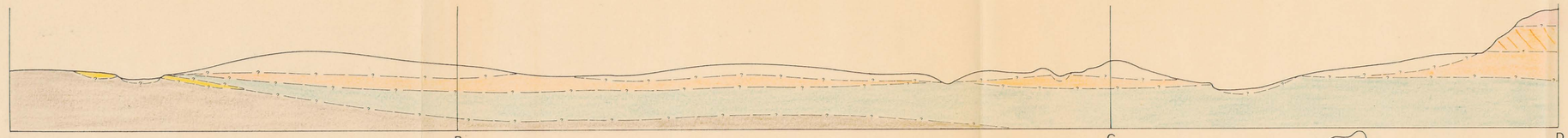
MOUNT GUNSON MINES PTY. LTD.

6664-1

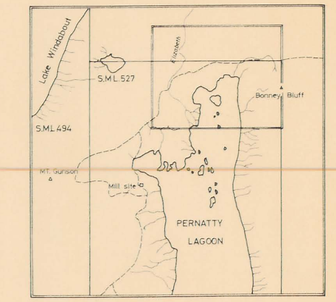
GEOLOGY

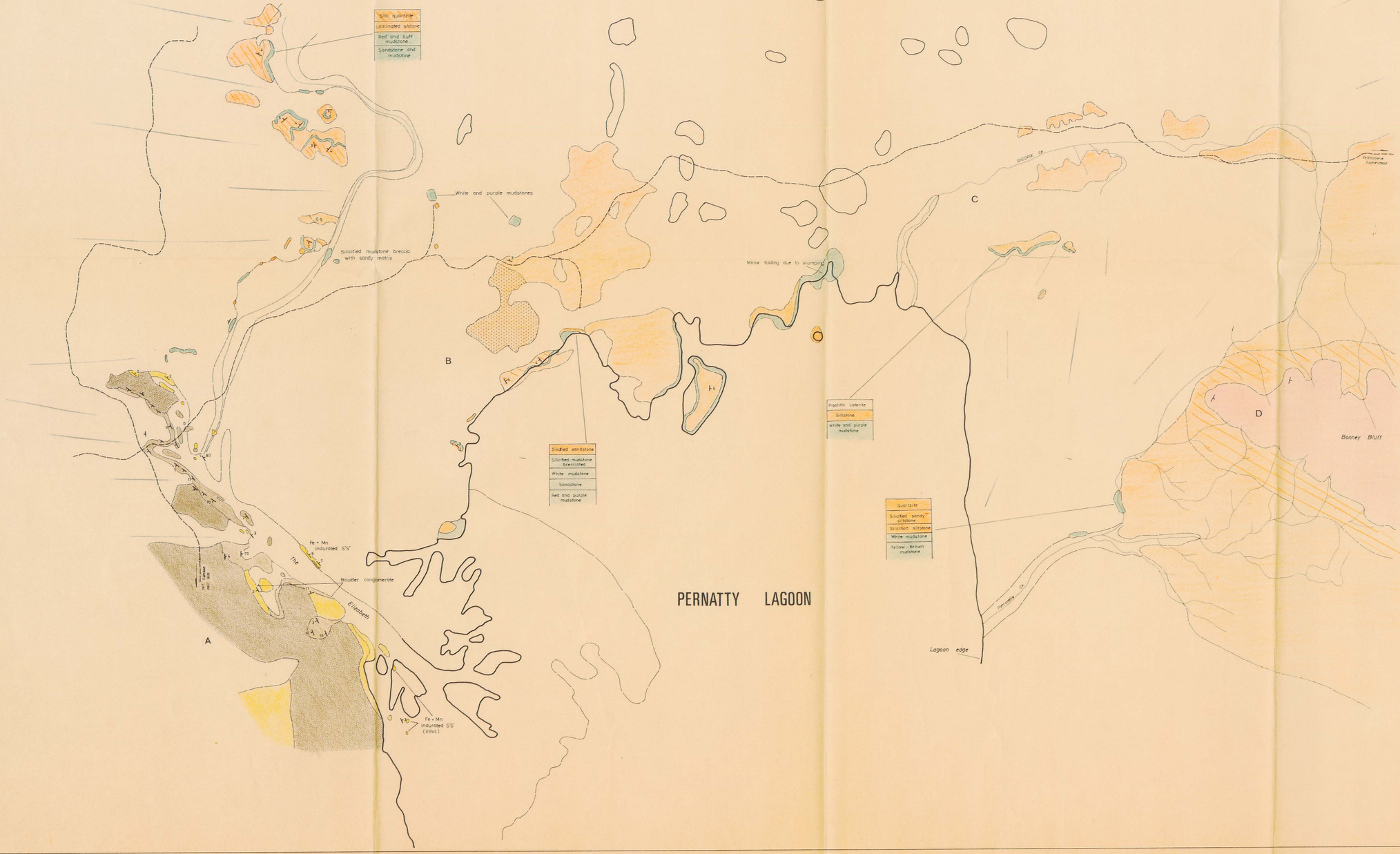
SCALE: 1:50,000	DRAWN: R.K.Y	DWG Nº
GEOLOGY:	CHECKED:	
SURVEYED:		
	DATE: 23-8-71	

REVISED 28-5-73



DIAGRAMATIC SECTION A-D





QUARTERNARY
- Claypan sediments
- Sand
- River alluvium

ADELAIDEAN
- SIMMENS QUARTZITE — Cream sandstones and quartzites
- CORRABERRA SANDSTONE — Purple sandy siltstones, micaceous sandstones. Silicified siltstones and flaggy quartzites
- Silicified mudstone, siltstones and sandstone of dubious affinity.
- TREGOLANA SHALE — Purple, red, green and white mudstones
- WHYALLA SANDSTONE — Round grained sandstone. Red quartzite clasts. Fe and Mn indurated.
- PANDURRA FORMATION — White and buff coloured boulder conglomerate and even grained sandstone. Red quartzite (gritty)

- Outcrop / Sub outcrop / Float
- Outcrop / Sub outcrop

LITHOLOGICAL BOUNDARIES
- Established
- Approximate
- Inferred
- Track
- Creek
- Sand dune trend
- Dip less than 5°

SCALE
500 400 300 200 100 0 500 1000 metres approx

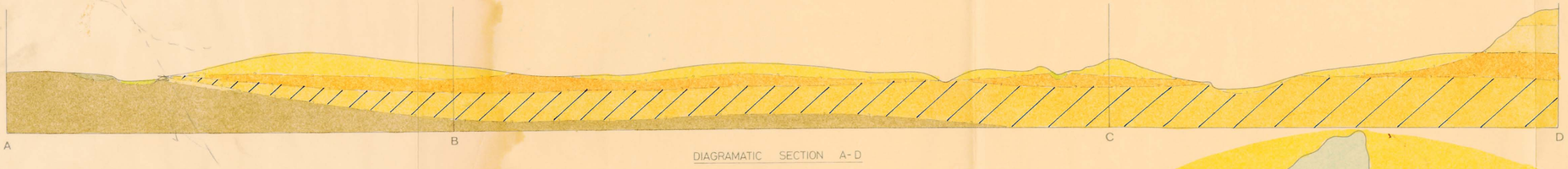
MOUNT GUNSON MINES PTY. LTD.

ELIZABETH AREA

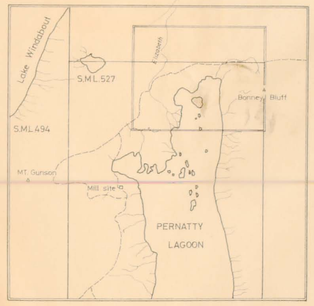
GEOLOGY

SCALE: 1:17,000 approx.	DRAWN: R.K.Y.	DWG N° 181
GEOLOGY: J. CHISOLM	CHECKED:	
	DATE: 21-7-71	

6664-2



DIAGRAMATIC SECTION A-D



PERNATTY LAGOON

QUARTERNARY

- Claypan sediments
- Sand
- River alluvium

ADELAIDEAN

SIMMENS QUARTZITE
Cream sandstones and quartzites

CORRABERRA SANDSTONE
Purple sandy siltstones, micaceous sandstones
Silicified siltstones and flaggy quartzites

Silicified mudstone, siltstones and sandstone of dubious affinity

TREGOLANA SHALE
Purple, red, green and white mudstones

WHYALLA SANDSTONE
Round grained sandstone Red quartzite clasts. Fe and Mn indurated.

PANDURRA FORMATION
White and buff coloured boulder conglomerate and even grained sandstone
Red quartzite (gritty)

Outcrop / Subcutcrop / Float

Outcrop / Sub outcrop

LITHOLOGICAL BOUNDARIES

Established
Approximate
Inferred

Track
Creek

Sand dune trend
Dip less than 5°

SCALE

MOUNT GUNSON MINES PTY. LTD.		
ELIZABETH AREA		
GEOLOGY		
SCALE: 1:17,000 approx.	DRAWN: R.K.Y.	DWG N°
GEOLOGY: J. CHISOLM	CHECKED:	181
	DATE: 21-7-71	

6664-3

J. Chisholm

WEST LAGOON DWG Nº 55

WEST LAGOON EASTERN AREA DWG Nº 69

EAST LAGOON DWG Nº 19

GUNYOT WORKINGS DWG. Nº 111

DAVIS CAMP

MILL SITE

MAIN OPEN CUT WORKINGS DWG Nº 60

HOUSE WORKINGS DWG Nº 105

PERNATTY LAGOON

suspect

information suspect

705 500m E · 6,000 m E · 6,500 m E · 7,000 m E · 7,500 m E · 8,000 m E · 8,500 m E · 9,000 m E · 709 500m E

6,520,500 m N · 20,000 m N · 19,500 m N · 19,000 m N · 18,500 m N · 6,518,000 mN

S Whyalla sandstone

D Woocalla dolomite

R Pandurra formation

MOUNT GUNSON MINES PTY LTD.

MOUNT GUNSON WORKINGS AREA

BEDROCK LITHOLOGY

COMPILED FROM DRILL HOLE DATA

SCALE 1:5000	GEOLOGY J. CHISOLM	DWG Nº 184
SURVEYED	DRAWN R.K.Y	
	CHECKED	
	DATE 23-7-71	

6669-9

GUNYAH LAKE

BORNITE WORKINGS

WEST LAGOON AREA

EAST LAGOON AREA

Bund wall

RAMSAY WORKINGS

Foundations of old Leaching Plant

Haul road

Davis Camp

GUNYOT WORKINGS

MAGAZINE

MAIN ACCESS ROAD

DAVIS WORKSHOP

MILL SITE

TAILINGS AREA

DAM

POWER LINE

WATER PIPELINE

65

60

MAIN OPEN CUT WORKINGS

TABLELAND SHAFT

ARNOLD SHAFT

N°1 SHAFT

BRENNANS WORKINGS

HOUSE WORKINGS

Water tank

HOUSE

GUN WORKINGS

DOLOMITE WORKINGS

St Mystery Workings

EXPLORATION CAMP

AIRSTRIP

OLD ACCESS TO PT. MUSGRAVE

6.522.500 m N

22,000 m N

21,500 m N

21,000 m N

20,500 m N

20,000 m N

19,500 m N

19,000 m N

18,500 m N

18,000 m N

17,500 m N

6,517,000 m N

7104,500 m E

5,000 m E

5,500 m E

6,000 m E

6,500 m E

7,000 m E

7,500 m E

8,000 m E

8,500 m E

Outcrop of Woocalla Dolomite and Shale

Limit of subsurface development of Woocalla Dolomite and Shale.

NOTE: Contours in 5 metre intervals above sea level.

MOUNT GUNSON MINES PTY. LTD.

MOUNT GUNSON WORKINGS AREA

Contours on upper surface of Woocalla Dolomite and Shale

SHEET 1

SCALE: 1:5000	GEOLOGY: J.T. J.H.	DWG N°
SURVEYED:	DRAWN: R.K.V.	308
	CHECKED:	
	DATE: 14/10/71	

6664-5

Ironstone (Hematite) Float

Silcrete

Silcrete and Lf

Roc

Roc
Cong. Fe enriched RQ. Pebbles in RQ matrix.

Rf

Lf and silcrete

Loc

Park Dam

Lf & silcrete

Roc

shallow dip

Loc
Very gentle dip to south west, ferruginouse with flaggy bedding

S

Roc
cong & grit

Purple clay

Rf

shallow dip

Occasional outcrop
Pebble cong. & grit bands with silt cement.

Occasional outcrop.
Purple clay cementing angular quartz grains.

Limonitic

Lf
Basal cong.

Upper RQ cong.

Rf
(pebble cong. (with quartzite pebbles) & grit

Rf
Pebble cong. & grit

Rf
grit

Rf
gritty

Rf
dark RQ

Rf
Dark RQ float with minor grit. Highly silicified may be weathered purple RQ.

Canegrass Dam

Lf, Silcrete & Rf

Rf, Silcrete & Lf

GUNYAH LAKE

4,500 m N

4,000 m N

3,500 m N

3,000 m N

6,522,500 m N

6,525,000 m N

7104,500 m E

5,000 m E

5,500 m E

6,000 m E

6,500 m E

7,000 m E

7,500 m E

8,000 m E

7104,500 m E

Surface Geology

S	Sand
Loc | Lf	Wyalla Sandstone (outcrop / float)
Roc | Rf	Pandurra Formation (outcrop / float)

MOUNT GUNSON MINES PTY. LTD.

CANEGRASS DAM AREA

GEOLOGY

SCALE: 1:5000		GEOLOGY: J.H.	DWG N° 334
SURVEYED:		DRAWN: R.K.Y	
		CHECKED	
		DATE: 16 / 12 / 71	

6664-6

Gritty red quartzite
Very thin Lf, Si, scattered Rf
Roc Scattered
Roc Blocky
Roc
Loc
Rf
S
Shallow dipping lithic sandstone flaggy nature
Lf
Very thin Lf & Sif
Sif
Loc
Lf Ferruginous
Roc
Si & Lf & occassional conglomerate floaters
Lf Ferruginous
Si, Lf + Rf
Ironstone with Lithic grains
Si
Cream red qtz overlain by brick red cross bedded red qtz with local small scale warping
Boulder conglomerate red qtz pebbles in red qtz matrix
Cream red qtz overlain by cross bedded red qtz with pebble conglomerate at top
Cross bedded red qtz
Fast bedding in cross bedding red qtz overlyitty massive purple red qtz
Occassional rounded conglomerate boulders of red qtz in red qtz matrix scattered up slope
Qr
Elizabeth River Delta
Fe
Df
Purple massive qtz with scattered qtz pebble bands riverlain by blocky deep red cross bedded red qtz
Silcrete
Silcrete overlying mauve massive red qtz
Pebble conglomerate poorly sorted rounded to subrounded qtz pebble in medium grained qtz matrix
Massive cross bedded mauve red qtz with large scattered pebbles qtz in 10 band current bedding dipping 15° East
Pebble conglomerate float overlying pale blocky massive red qtz
Flat dipping pebble conglomerate
Pernatty Lagoon
GUNYAH LAKE
6,525,000mN
4,500mN
4,000mN
3,500mN
3000m N
2500m N
6,522500 m N
6,500mE
7,000mE
7,500mE
8,000mE
8,500mE
9,000mE
9,500mE
10,000mE
10,500mE
11,000mE
11,500mE
12,000mE

- Gypseous muds & silts
- Qr — River alluvium
- S — Sand
- Si — Silcrete
- I — Ironstone
- Loc | Lf — Whyalla Sandstone – Outcrop / Float (Lithic sandstone)
- Doc | Df — Woocalla Dolomite – Outcrop / Float
- Roc | Rf — Pandurra Formation – Outcrop / Float (Red quartzite)
  - Boulder conglomerate
  - Deep red cross bedded
  - Pebble conglomerate qtz, jasper, pebbles
  - Purple to mauve, massive, minor cross bedding with occassional qtz pebble bands.

MOUNT GUNSON MINES PTY. LTD.

EASTERN CANEGRASS AREA

GEOLOGY

SCALE: 1:5000	GEOLOGY: J.H	DWG N°
SURVEYED:	DRAWN: R.K.Y	378
	CHECKED:	
	DATE: 31/3/72	

6664-7

Canegrass Dam

Flying Elephant Anomaly

Gunyah Lake

WEST LAGOON AREA

EAST LAGOON AREA

Camp

Magazine

GUNYOT WORKINGS

Workshop

Tailings Area

MILL SITE

Dam

MAIN OPEN CUT WORKINGS

Water tank

HOUSE WORKINGS

House

Airstrip

Water Tank

MOUNT GUNSON MINES PTY. LTD.

CENTRAL MINING AREA

OUTCROP & BEDROCK GEOLOGY

SCALE: 1:10,000	GEOLOGY: F.T.	DWG N° 381
SURVEYED:	DRAWN: R.K.Y	
REVISED:	CHECKED:	
	DATE: 18/4/72	

6664-8

Lake Windabout

Lagoon level approx. 60·9m a.s.l

Triangle Lake

Lagoon level approx. 83m a.s.l

Square Lake

Approx. 87m a.s.l

EXPLORER 709m

Tregolana Shale under scree material

Tregolana Shale overlain by pisolitic laterite

LAKE WINDBOUT

TRANSCONTINENTAL RAILWAY (Standard gauge)

STUART HIGHWAY

WIRRAPPA R.S.

Railway cottages

Old highway

Disputed Ck

Power line

Water pipeline

To Port Augusta

Our highway

ISLAND LAGOON approx. 670m

Carraberra Sandstone white to brown fine grained sandstone. Thin bedded. Grading down into sericitic siltstone overlying Tregolana Shale.

Tregolana Shale flat bedded, green brown to white. Finely laminated. Grading upwards into sericitic siltstone at Carraberra Sandstone contact.

Simmens Quartzite siliceous, white even grained, flat bedded with ripple marks, cross bedding and pebble bands.

+208·7m

+182·8m

-163·6m

167·6m

SQ Simmens Quartzite

C Carraberra Sandstone

T Tregolana Shale

Qr Alluvium gravels and silts

S Sand plains and dunes

Lake and claypan deposits

MOUNT GUNSON MINES PTY. LTD.

S.M.L. 641

Wirrappa Area

GEOLOGY

SCALE: 1:10,000	GEOLOGY: J.H.	DWG N°
SURVEYED:	DRAWN: R.K.Y	385
	CHECKED:	
REVISED:	DATE: 21/4/72	

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