Open File Envelope No. 1022

SML 211

MOUNT GRAINGER

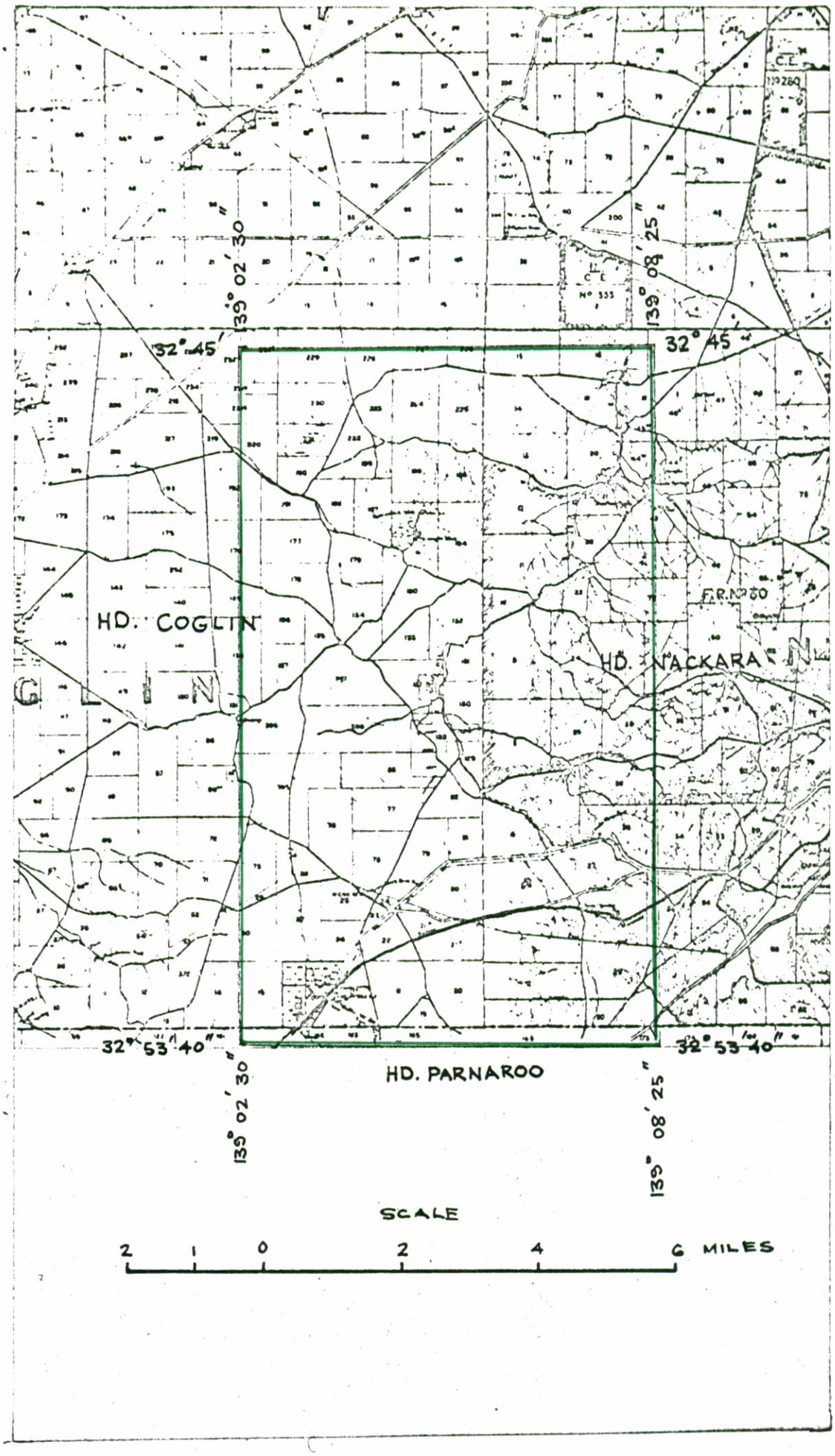
PROGRESS REPORT TO LICENCE EXPIRY/SURRENDER FOR THE PERIOD 8/7/1968 TO 7/5/1969

Submitted by
Geosurveys of Australia Pty Ltd
1969

Enquiries: Customer Services Branch
Minerals and Energy Resources
7th Floor
101 Grenfell Street, Adelaide 5000

Telephone: (08) 8463 3000
Facsimile: (08) 8204 1880

Government of South Australia
Primary Industries and Resources SA



GEOSURVEYS OF AUST.

D.M. 1017/68

S.M.L. 211

CONTENTS ENVELOPE 1022 DM 1017/68

TENEMENT: S.M.L. 211

TENEMENT HOLDER: Geosurveys of Australia Pty. Ltd

REPORTS:

JOHNSON, J.E. and VON SANDEN, A.T. 1969
Report on geological investigations of S.ML 211 - Mount Grainger. (pgs. 3-12)

Plan:

GEO 553 Geology of S.M.L. 211- Mount Grainger. (1022-1)

003

REPORT ON

GEOLOGICAL INVESTIGATIONS

OF S.M.L. 211,

MOUNT GRAINGER

by

J. E. Johnson and A. T. von Sanden

for

GEOSURVEYS OF AUSTRALIA PTY. LIMITED.

January, 1969.

1969/4

TABLE OF CONTENTS

MAP TO ACCOMPANY REPORT

Geology of S.M.L. 211, Mt. Grainger, S.A. GEO 553.

INTRODUCTION

During the month of January, 1969, the writers' carried out investigations into the mines, mineralisation and structure of the north plunging anticline, which forms the major tectonic feature within S.M.L. 211. Included within the S.M.L. are the gold mines of Mt. Grainger and Dustholes, the Penn Copper Mine and the iron deposits near Oodlawirra, formerly mined for furnace flux. These iron ores, which are lateritic alterations of a shaley dolomite, were also tested for phosphoric acid in the event that phosphates had been concentrated, along with the iron, during laterisation.

The Mt. Grainger Gold Mine (Gold Lease 2003) is at present held by Mr. Theodor Zolatovs, of Peterborough, who was not present at the mine while the writers' were in the field, and as a consequence could not be interviewed, although information gathered locally, indicated that principal activity was presently concentrated in attempting to unwater the bottom levels of the mine.

Much useful information has been gained by perusal of the published reports of various officers of the Department of Mines, and in particular those by R.W. Segnit on Dustholes and Mt. Grainger in Geological Survey Bulletin No. 18; by R.W. Segnit on the Golden Morn Mine (Dustholes) in Mining Review No. 67; by A.T. Armstrong on the Penn Copper Mine in the same publication, and lastly, by W.A. Fairburn and L.G.B. Nixon, on the Mt. Grainger Gold Mine, in Mining Review No. 124.

GEOLOGY

1. REGIONAL GEOLOGY

The regional geology of the area has been outlined on the Orroroo 4-mile map sheet, by the South Australian Department of Mines (1968).

2. STRATIGRAPHY OF S.M.L. 211.

A stratigraphic sequence as observed occurring in the lease area is as follows:-

AGE	GROUP	FORMATION
MARINOAN	WILPENA GROUP	(Ulupa Siltstone
		(Nuccaleena Formation
		(Grampus Quartzite
		(Pepuarta Tillite
		(Gumbowie Arkose Member
		(Tarcowie Siltstone
STURTIAN	UMBERATANA GROUP	(Pekina Formation
		(Tapley Hill Formation
		(Tindelpina Shale Member
		(Appila Tillite
- - - - - - - - - - - - - - - -	? - - - -	UNCONFORMITY? - - - - - - - - - - - - -
TORRENSIAN	BURRA GROUP	Shales and Siltstones
- - - - - - - - - - - - - - - -	? - - - -	UNCONFORMITY? - - - - - - - - - - - - -
WILLOURAN	CALLANNA BEDS	(Not differentiated)

3. STRUCTURE

The clearly outlined Mt. Grainger anticline exhibits some meridional faulting, with downthrow to the east, and contains a core of deeply weathered rocks, shown by Fairburn and Nixon in their report on the Mt. Grainger Gold Mine, as Callanna Beds, an observation which the writers' of this report accept. The writers' however, definitely cannot agree with the statement that these Callanna Beds are diapirically emplaced, and that they are dismembered and discordantly exposed.

The Callanna Beds within the core of the Mt. Grainger anticline, include silicious shales, thin bedded cherts and earthy dolomites, all heavily

fractured, owing to their position on the culmination of the fold and are, as a consequence deeply weathered.

The bed of earthy dolomite, which has been superficially enriched in iron in processes of laterisation, has been worked for flux. It forms a useful marker horizon, as it is well exposed in outcrop and in numerous quarries and prospecting pits. The ferruginised dolomite bed is not dismembered, but on the contrary can be traced continuously from the Oodlawirra Flux Quarries to just south of Cox Nob, a distance of two miles. The associated shales and cherts preserve conformable contacts with the dolomite, and all dip west at angles varying from 40° to 80°.

On the eastern side of the outcrop of Callanna Beds, a small gully shows a few feet of a cleaved shaley rock, containing abundant small pebbles. This appears to be part of the Appila Tillite, a conclusion which could not be proven as the overlying Tindelpina Member was not observed due to poor outcrop. If this pebbly rock is indeed the Appila Tillite, then its narrow outcrop width reveals it to have been down-faulted against Callanna Beds lying to the west, and that the whole eastern boundary of the Callanna Beds is a fault contact. Undoubted Appila Tillite, on the nose and western flank of the anticline, contains abundant cobbles of dolomitic rocks of the Burra Group, as well as striated glacial erratics of a thin-bedded grey chert which is strongly reminiscent of the cherts within the nearby Callanna Beds. The contact of the Callanna Beds with the overlying Saddleworth Formation of the Burra Group is consistently obscured, so it is not possible to indicate whether this contact is faulted or represents a plane of unconformity.

The inlier of Callanna Beds, in the core of the Mt. Grainger Anticline, appears to have formed the nucleus of a minor centre of tectonic activity, having been upwarped enough to permit stripping during the Lower Sturtian glaciation, with subsequent re-folding of the rocks of the Umberatana Group about the nucleus. This folding is probably associated with high angle over-thrusting toward the east, as Fairburn and Nixon note that the eastern limb of Appila Tillite, in the nose of the fold, is overturned.

The Mt. Grainger anticlinal structure is totally dissimilar to the classic diapirs of Blinman, mapped and described by R.C. Coats, and those of Enorama, Orraparinna and Worumba, which have been mapped and described by C.R. Dalgarno and the senior writer of this report. These classic diapirs all contain "rafts" of a great diversity of rocks, which have been forced upward through the overlying, unconsolidated sediments and emplaced out of context in quite haphazard attitudes. During their slow rise, the diapirs have profoundly affected the sedimentation and lithofacies of the thousands of feet of sediments which mantle their flanks after final emplacement. These characteristic features of true diapiric emplacement are not present at the Mt. Grainger anticlinal structure, which is a "disharmonic ..... fold .... of concentric type formed by flexural slip", to quote from the report by Fairburn and Nixon.

It is the opinion of the writers' that the term "diapir" is becomming widely applied by many geologists for any enigmatic structure, whether of "piercement" origin or not, while its useage by prospectors in this state is even more unfortunate. The term is coming into common use for copper ore bodies of a wide variety of origin and type.

ECONOMIC GEOLOGY

1. The Mt. Grainger Gold Mine.

As the lease of this mine is not held by Geosurveys of Australia Pty. Ltd., it was not examined, although visited in search of the lease holder. Furthermore, the report on the mine by Fairburn and Nixon is sufficiently comprehensive that no additional useful purpose would have been served by further investigation on the part of the writers' at this stage.

2. Dustholes Gold Mines (Including Golden Morn Mine)

The Dustholes "line of lode" extends for 1½ miles from S.S.W. to N.N.E.

It is an intensely silicified and kaolinised member of the Gumbowie Arkose, and is cut by veins of auriferous quartz. This member of the Arkose exhibits excellent examples of depositional slump folding, particularly in the adit of the Golden Morn main shaft.

Most of the actual mining at Dustholes has been concentrated on the Golden Morn Mine, at the Northern end of the "line of lode", where an adit has been driven S.E. for 202 feet, to connect with the main vertical shaft, which is 53 feet deep. At a distance of 160 feet in from the adit portal, a lode dipping S.E. was cut, and driven on for 100 feet to the S.W. and for about 12 feet to the N.E. Limited overhand stoping was undertaken from these cross-cuts, and a winze 20 feet deep was sunk in the end of the S.W. cross-cut. A grab sample taken from the side of the stope, when dollied and panned, showed an estimated 2 dwt. of gold per ton. Values of 8 dwt. gold per ton have been reported from this mine.

At Dustholes the lode material is quartz containing large, irregular cavities, partly filled by pearly sericitic mica, spongey yellow limonite and blackish chlorite. The auriferous lodes are from a few inches to two feet wide, and their dip is S.E., almost at right angles to the dip of the silicified member of the Gumbowie Arkose in which they occur, although the "en echelon" lodes and the silicified Arkose strike in the same direction. In the Golden Morn adit some unmineralised quartz stringers were noted which were distributed parallel to the bedding, and also some closely spaced quartz stringers lying at right angles to the axes of lump folds. About 150 feet N.E. of the Golden Morn main shaft are two old shafts, about 30 feet deep, while some 250 feet S.W. of the main shaft is a small open cut from which two short irregular drives have been put in. Across the gully, south of these workings, is another, and even larger open cut.

At the Golden Morn Mine, the ruins exist of a treatment plant, composed of steam boiler and engines, grinding pan and ?amalgamating tables. Southwest from the Golden Morn Mine, many shallow shafts and pits have been sunk at intervals for over a mile. Four samples of lode material, taken from

the open cuts on the Golden Morn Mine, were dollied and panned, but none showed gold. Production from the whole Dustholes area, as given by R.W. Segnit in Mining Review No. 67, was 160 oz. of gold from 414 tons of ore, up to June 1937.

The mines along the Dustholes "line of lode" are at present of too low a grade to be economic, but would possibly yield large tonnages. A systematic sampling programme and reappraisal of this mine could only be justified in the event of a significant increase in the world price of gold.

3. The Penn Copper Mine

Mr. A.T. Armstrong has reported on this mine in Mining Review No. 67, and with the present collapsed and overgrown condition of the workings his report provides the only reliable information available relating to this old mine. Armstrong's account of the small size of the ore body indicates an unattractive proposition to a company, although perhaps of interest to prospectors. Geochemical prospecting was considered at this mine, but in view of the Armstrong report on the small size of the ore pockets, and the virtual absence of copper in the rest of the vein system, this project was abandoned.

4. The Oodlawirra Flux Quarry, and associated workings to the north.

These hard limonite deposits somewhat resemble gossans, but in the main quarry they are seen to be underlain by limonite stained kaolin, while pits along strike expose shaley grey dolomites, all more or less kaolinised or limonite stained. The iron mineralization seems to be lateritic in origin and only a few tens of thousands of tons of low grade iron ore are available, therefore the deposits are considered uneconomic.

As some South Australian phosphate rock deposits in Proterozoic limestones are associated with lateritic profiles, several samples from the Oodlawirra Flux Quarry were tested in the Woodville laboratory of Geosurveys of Australia Pty. Ltd. for phosphoric acid content. The results were negative.

At the same time samples were tested for zinc, also with negative results. Finally, as a great deal of shallow digging had been carried out on residual quartz float near the main flux quarry, a few gutter samples were collected and panned for gold, but once again the results proved to be negative.

CONCLUSIONS

No economic or potentially economic mineralisation was noted during the writers' survey. The Mt. Grainger anticlinal structure is considered to be quite different structurally from typical large diapirs containing known deposits of copper and other minerals elsewhere in the Flinders Ranges, and in consequence there is little reason to suspect the presence of ore bodies in the core of the Mt. Grainger anticline.

The writers' consider that there is at present no justification for the expenditure of more time and effort on this Special Mining Lease while more promising prospects require priority.

J. E. JOHNSON

A. T. VON SANDEN

REFERENCES.

ARMSTRONG, A.T., 1937; The Penn Copper Mine, Oodlawirra, South Australian Department of Mines Mining Review No.67, pp. 84 - 85.

BROWN, H.Y.L., 1908; Records of the Mines of South Australia: 4th Edition, South Australian Department of Mines. pp. 214, 219, 250 - 251, and 332.

BINKS, P.J., 1968; Orroroo Geological Atlas Series Sheet Sl 54 - 1. Scale 1:250, 000: Geological Survey of South Australia.

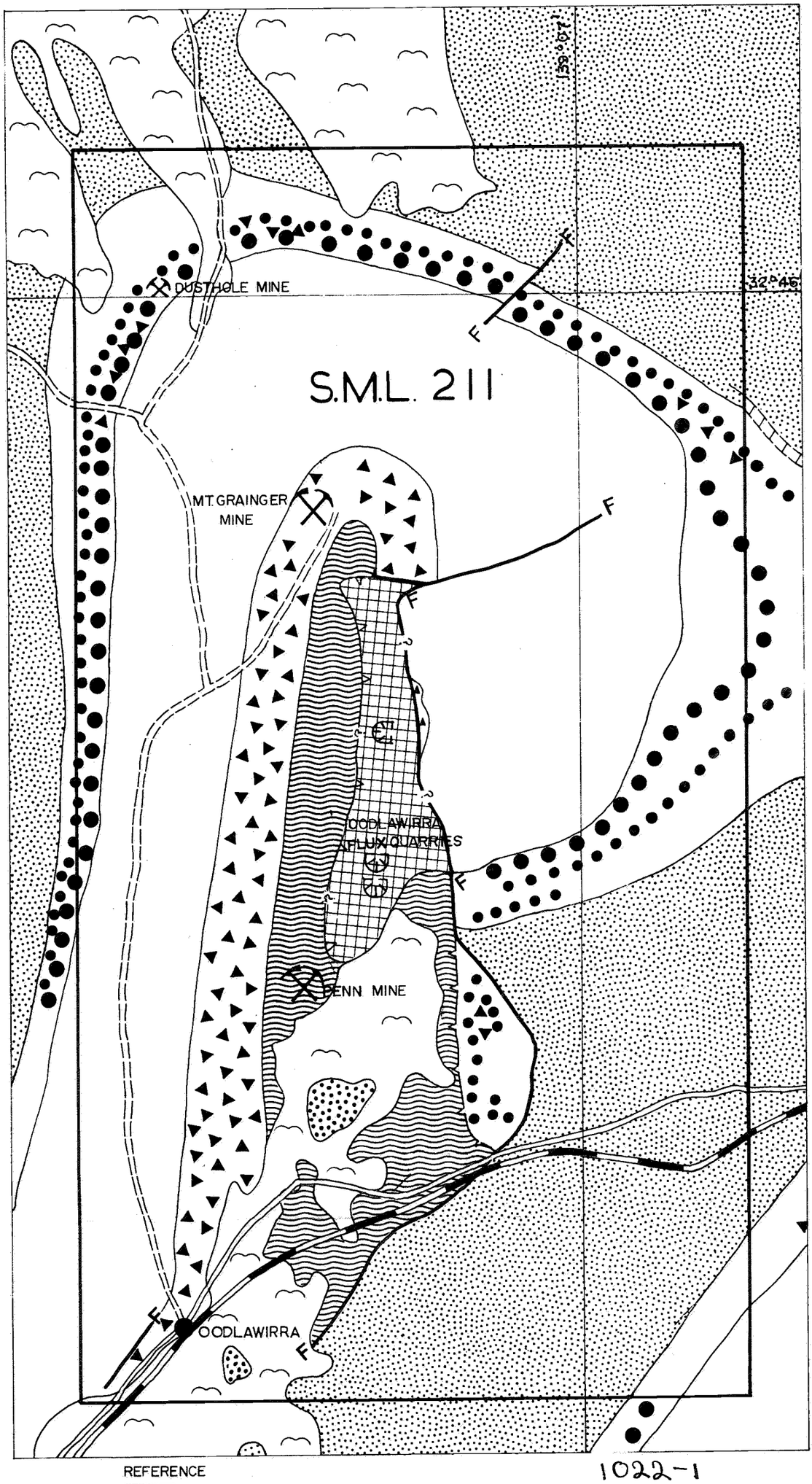
COATS, R.P., 1964; The Geology and Mineralisation of the Blinman Dome Diapir: South Australian Department of Mines Report of Investigations No. 26.

DALGARNO, C.R., and JOHNSON, J.E., 1968; Diapiric structures and Late PreCambrian-Early Cambrian Sedimentation in Flinders Ranges, South Australia: American Association of Petroleum Geologists Memoir No. 8, pp. 301 - 314.

FAIRBURN, W.A., and NIXON, L.G.B., 1966; Mount Grainger Gold Mine: South Australian Department of Mines Mining Review No. 124, pp. 5 - 33.

SEGNIT, R.W., 1939; The PreCambrian-Cambrian Succession: Geological Survey of South Australia, Bulletin No. 18, pp. 83 - 98.

SEGNIT, R.W., 1937; The Golden Morn Gold Mining Co., N.L. Mt. Grainger: South Australian Department of Mines Mining Review No. 67, pp. 78 - 81.



1022-1

REFERENCE

QUATERNARY			Alluvium
TERTIARY			Laterite
PROTEROZOIC	MARINOAN	WILPENA GR.	ULUPA S.S.
			NUCCALEENA FM.
		UMBERATANA GR.	GRAMPUS QTZITE
			PEPUARTA TILLITE
			GUMBOWIE ARKOSE (MEM.)
			TAPLEY HILL FM.
	STURTIAN		APPILA TILLITE
	TORRENSIAN	BURRA GR.	Shales and siltstones
	WILLOURAN	CALLANNA BEDS	(Not differentiated)

GEOSURVEYS of AUSTRALIA Pty. Ltd.

GEOLOGY of S.M.L. 211 MOUNT GRAINGER S.A.

(MODIFIED FROM WORK BY P. BINKS S.A. DEPT. of MINES)

SCALE MILES

0 1 2

F Fault

Unconformity

1969-4

GEO. 553