DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 84/31

APPRAISAL OF GOLD TAILINGS - MT. GRAINGER GOLDFIELD

GEOLOGICAL SURVEY

by

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MAY 1984

DME.265/82

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DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT. BK. NO. 84/31
D.M.E. NO. 265/82
DISK NO. 74

APPRAISAL OF GOLD TAILINGS - MT. GRAINGER GOLDFIELD

ABSTRACT

Between 1901 and 1916 gold ore from Mount Grainger Goldfield, 10 km north of Oodla Wirra, was treated by battery amalgamation and cyanidation on Mount Grainger Mine. Tailings and slimes are stored on site. An indicated 1 900 tonnes of tailings, previously cyanided, containing 0.87 g/t gold and 370 tonnes of slimes containing 3.54 g/t gold are on Mineral Lease 4830. Cyanidation tests indicate that 46% of contained gold in tailings and 90% of contained gold in slimes is extractable.

INTRODUCTION

Many South Australian goldfields contain tailings stockpiles resulting from the treatment of gold ore during the active years of the field. Gold extraction processes were not always efficient and these stockpiles often contain significant quantities of gold. With the present high price of gold and improved gold extraction techniques, many of these tailings stockpiles can be reworked profitably.

To determine quantity and grade of tailings and slimes at Mount Grainger Mine, eleven hand auger holes, to 2.8 m depth, were drilled by the author and M.W. Flintoft (Field Assistant) in October 1982. Samples collected over 1 m intervals were analysed at Australian Mineral Development Laboratories (AMDEL) for gold by fire assay and for copper, cobalt and silver by atomic absorption spectroscopy. A bulk sample of tailings and slimes were each subjected to a cyanidation test to determine the amount of extractable gold.

The stockpiles were surveyed by tape and compass at the time of sampling and later by stadia theodolite by S. Aust. Dept. Mines and Energy, Survey Section.

LOCATION AND TENURE

Mount Grainger Goldfield is located 240 km north-northeast of Adelaide and 10 km north of Oodla Wirra and the Barrier Highway to Broken Hill (Fig. 1). Access from Oodla Wirra is via a graded road for 6.5 km, thence northeasterly along 5.5 km of station track that is impassable in wet weather.

The gold tailings and slimes at Mount Grainger Mine lie on section 183, hundred Coglin, county Herbert within the District Council of Peterborough, part of the Mid North Planning Area. The land is perpetual leasehold to E.F.M. Markey of Peterborough. Mineral Lease (ML) 4830 held by J.J. Simnovec covers the tailings and is surrounded by Exploration Licence (EL) 1190 held by Jarmand Minerals and Exploration Pty Ltd and Cambrian Exploration Ltd. and due to expire on 8 May 1984.

GEOLOGICAL SETTING

Mines within Mount Grainger Goldfield are distributed around the northwestern section of the north-south trending Mount Grainger Anticline (Fig. 1).

Gold occurs in hydrothermal quartz veins associated mainly with iron oxides and pyrite with minor chalcopyrite, pyrrhotite, specular hematite, siderite, kaolinite, tourmaline and sericite. Gold is generally fine grained free gold which Wright (1966) observed to rarely exceed 0.0025 mm in size.

Auriferous quartz veins are mainly contained within fractured, poorly sorted sandstone at base of Appila Tillite. Mount Grainger Mine, the largest producer of the goldfield, exploited an ore shoot controlled by a drag fold and accompanied by intense hydrothermal alteration of the basal sandstone (Fairbura and Nixon, 1966). Sandstone and quartzite beds within Appila Tillite, Tarcowie Siltstone (Aureous Line) and Pepuarta Tillite (Dustholes Mines), similar to the basal sandstone of Appila Tillite, also host mineralized quartz veins (Fig. 1). Gold has also been mined from fault controlled quartz veins within Burra Group shale and Tapley Hill Formation shale.

HISTORY OF MINING AND TREATMENT

A detailed account of the history and production at Mount Grainger Goldfield is being compiled by Fradd (In press).

Gold was first discovered in the area in 1882, however serious mining did not commence until 1893. The workings were first described by the Inspector of Mines in December 1894 (Brown, 1908). Ore was treated at the Government Cyanide Works at Peterborough until August 1901 when a 15 head stamp battery was installed at Mount Grainger Mine, followed by a cyanide plant in 1911. Active mining on the goldfield ceased around 1916, although there has been minor intermittent activity to the present day.

A recorded 2 688 tonnes of ore were treated at Government Batteries yielding 48 646 g of gold bullion. Production figures for Mount Grainger treatment plant are incomplete but show that 2 565 tonnes of ore were treated at the battery yielding 12 850 g of gold bullion and 1 038 tonnes of tailings were cyanided yielding 3 974 g of gold bullion.

GEOLOGY OF TAILINGS

Two stockpiles are present at Mount Grainger Mine (plates 1 and 2); an elongate stockpile of tailings and a rectangular slimes dam with retaining walls built of slimes (Figs. 2 and 3).

Geological logs plus gold, copper, cobalt and silver assays of 11 hand auger holes (MG. 1 - MG. 11) drilled to test the tailings are shown in Appendix A. Weighted average metal contents of tailings and slimes are shown on Table 1.

TABLE 1

Average Metal Content of Tailings and Slimes (in parts per million).

	Au	Cu	Co	Ag
Tailings	0.87	43	120	1
Slimes	3.54	53	120	1

The low grade of 0.87 g/t is evidence that the tailings have been cyanided, as tailings of Mount Grainger Goldfield ore at Peterborough Government Cyanide Works after cyanidation contain approximately 0.8 g/t gold. However, slimes contain 3.54 g/t gold evidence that they have not been cyanided. Fairburn and Nixon (1966) determined that the tailings and slimes stockpiles contain 0.62 g/t and 3.73 g/t gold respectively.

Tailings consist of pale yellow-brown fine silty sand mainly as quartz, iron oxide and mica. Slimes consist of clay-silt with minor bands of pale brown sand. Tailings have partially eroded from the northern flank of the stockpile and washed down a small creek (Fig. 2).

A composite of drill hole samples from tailings and slimes were each subjected to a cyanide leaching test. Each sample was milled to 75% minus 75 µm and agitated at 30% solids for 48 hours. Sodium cyanide and lime consumption were low and gold extraction after 24 hours for tailings and slimes was 46.2% and 90.2% respectively. Gold extraction was not significantly increased by longer leaching times (Appendix B).

RESERVES

Reserve and grade calculations are detailed in Appendix C and summarised on Table 2, ore reserves are classified as indicated.

TABLE 2

Reserves of Tailings and Slimes Stockpiles.

	Volume (m^3)	Tonnes	Au (g/t)	Au Content (g)	Recoverable Au (g)	Value ($)*
Tailings	1 100	1 900	0.87	1 650	760	9 800
Slimes	213	370	3.54	1 310	1 180	15 220

*Assumed value of $12.9 per gram (approx $400 per troy ounce).

The estimated 1 900 tonnes of tailings is comparable to the earlier figure of 1 038 tonnes that incomplete records show as being cyanided. Taking into account erosion and several small piles of tailings scattered around the old treatment site the estimated 2 270 tonnes of tailings plus slimes is also comparable to the recorded 2 668 tonnes of ore treated at Mount Grainger.

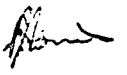
CONCLUSIONS

On ML 4830, an indicated 1 900 tonnes of tailings containing 0.87 g/t gold and 370 tonnes of slimes containing 3.54 g/t gold are present.

The tailings stockpile has previously been cyanided.

The tailings and slimes are suitable for cyanidation with an anticipated gold extraction of 46% and 90% respectively.

Tailings contain 1 650 g Au and slimes 1 310 g Au of which 760 g and 1 180 g respectively are expected to be recoverable by cyanidation.



BJM:DW

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Senior Geologist
Mineral Resources Section

REFERENCES

Brown, H.Y.L., 1908. Mount Grainger. Record of the Mines of South Australia (fourth edition). Government Printer, Adelaide, : 250-251.

Fairburn, W.A. and Nixon, L.G.B., 1966. Mount Grainger Gold Mine Min. Rev. Adelaide, 124 : 5-33

Fradd, W.P. In Press. Mount Grainger Goldfield - History and Production. S. Aust. Dept. Mines and Energy report (unpublished).

Wright, R.G., 1966. The Geology and Mineralization of the Mount Grainger Goldfield. University of Adelaide Honours Thesis (unpublished).

APPENDIX A

Geological Logs and Assays of Hand Auger Holes

Hand Auger Geological Logs

Hole No.	Sample Interval (m)	Log
MG. 1	0-1	Pale yellow-brown fine silty sand with mica.
	1-2	As above.
MG. 2	0-1	Pale yellow-brown fine silty sand with mica.
	1-1.6	As above.
MG. 3	0-1	Pale yellow-brown fine silty sand with mica.
	1-2	As above.
	2-2.8	As above.
MG. 4	0-1	Pale brown silt.
	1-1.5	As above, stopped on rock?
MG. 5	0-1	Pale yellow-brown fine silty sand with mica.
	1-1.8	As above with silt layers.
MG. 6	0-1	Pale brown silty sand with clay silt layers.
	1-1.6	As above, stopped on rock?
MG. 7	0-1	Clay-silt with silty sand 0.8-1 m.
MG. 8	0-1	Clay-silt with silty sand 0.9-1 m.
MG. 9	0-1	Clay-silt with silty sand 0.9-1 m.
MG. 10	0-1	Silty sand to 0.2 m then clay silt to 0.9 m, then silty sand 0.9-1 m.
MG. 11	0-1	Clay silt.
	1-1.5	As above.

Assays of Hand Auger Samples in parts per million from AMDEL Report AC 2315/83

Hole No.	Sample Interval (m)	Assay No.	Au	Cu	Co	Ag
MG. 1	0-1	A 2275/82	1.1	48	130	1
	1-2	A 2276	2.1	46	120	1
MG. 2	0-1	A 2277	0.7	48	110	1
	1-1.6	A 2278	0.7	44	140	1
MG. 3	0-1	A 2279	0.9	44	110	1
	1-2	A 2280/82	0.7	48	120	1
	2-2.8	A 2281	0.6	46	130	1
MG. 4	0-1	A 2282	0.7	36	110	1
	1-1.5	A 2283	0.5	34	100	1
MG. 5	0-1	A 2284	0.7	44	130	1
	1-1.8	A 2285/82	0.5	38	100	1
MG. 6	0-1	A 2286	3.1	44	110	1
	1-1.6	A 2287	2.7	42	90	1
MG. 7	0-1	A 2288	3.3	65	140	1
MG. 8	0-1	A 2289	3.1	60	110	1
MG. 9	0-1	A 2290/82	3.1	55	110	1
MG. 10	0-1	A 2291	4.6	55	190	1
MG. 11	0-1	A 2292	3.7	48	100	1
	1-1.5	A 2293/82	5.2	55	140	2

APPENDIX B

Cyanidation Leaching Test of Gold Tailings and Slimes from AMDEL Report OD 2315/83

The Australian
Mineral Development
Laboratories

emington Street, Frewville,
South Australia 5063
Phone Adelaide 79 1662
Telex AA 82520

Please address all
correspondence to
P.O. Box 114 Eastwood
SA 5063
In reply quote:

amdel

7 December 1982

OD 1/16/0

The Director-General
South Australian Department of Mines and Energy
191 Greenhill Road
PARKSIDE SA 5063

Attention: Mr B.J. Morris

REPORT: OD 2315/83

YOUR REFERENCE:	Application for examination of samples, 13 October 1982
MATERIAL:	Gold tailings samples
LOCALITY:	Mt Grainger
IDENTIFICATION:	A2275/82 to A2293/82
WORK REQUIRED:	Agitation cyanide leach tests

Investigation and Report by: P.G. Capps

Manager, Operations Division: Bruce E. Ashton

for Norton Jackson,
Managing Director

rp

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Flemington Street, Frewville
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Townsville
Queensland 4814
Telephone (077) 75 1377

1. INTRODUCTION

On 13 October 1982, a large number of samples comprising soil, rock chip and tailings dam auger samples were submitted to AMDEL for assays. Following assaying, tailings dam auger samples were to be combined into two composite samples and cyanide agitation leached to determine gold extraction.

2. PROCEDURE AND RESULTS

Samples labelled A2275/82 to A2285/82 were blended together to form Composite A while Samples A2286/82 to A2293/82 constituted Composite B. A head sample for gold assay and a 500 g sub-sample for cyanide leaching were riffled from each of the composites.

Samples for leaching were stage ground in a laboratory rod mill to 75% minus 75 µm and agitated at 30% solids in beakers. Lime (CaO) was added to achieve a slurry pH of 10.5 and slurries were conditioned at that pH for 16 hours to neutralise any acidic minerals present.

After conditioning, NaCN was added to a solution strength of 0.05% and the slurries were agitation leached, with continuous aeration, for a period of 48 hours. Throughout the leach, solution samples were taken for assay and titration to determine the NaCN concentration. NaCN and CaO were added as necessary to maintain the solution at 0.05% NaCN and pH 10.5. At the end of 48 hours, final solution samples were taken and residues washed, dried and weighed prior to assay sample preparation.

Results are shown in Table 1. All extraction figures and calculated head assays are obtained from residue and solution assays. Composite B responded well to cyanidation, the maximum extraction of 90% being achieved within 24 hours, possibly in less than 20 hours. NaCN consumption was low for this period, as was CaO addition. Leaching of Composite A, on the other hand, resulted in less than 50% gold extraction after 48 hours.

The apparent decrease in extraction at 30 hours for both samples is considered to be a result of incorrect solution assays.

TABLE 1: AGITATION CYANIDE LEACHING

	Composite A	Composite B
Head Assay, Au (g/t)	1.1	4.0
Calculated Head, Au (g/t)	0.9	3.4
Residue Assay, Au (g/t)	0.48	0.37
Gold Extraction (%)		
1 h	29.8	71.2
5	29.6	85.9
24	46.2	90.2
30	35.2	85.5
48	47.3	89.0
NaCN Consumption (kg/t)		
1 h	0.1	0.1
5	0.1	0.2
24	0.5	0.6
30	0.5	0.6
48	0.9	1.2
CaO Addition (kg/t)		
Conditioning	1.0	1.2
1 h	1.0	1.3
5	1.0	1.3
24	1.1	1.3
30	1.1	1.4

APPENDIX C

Reserve Calculations

Reserve Calculations

- The areas of tailings and slimes stockpiles were determined using a planimeter.
- The average depths of tailings and slimes stockpiles were determined from hand auger holes.
- Volume of batter of tailings stockpile was calculated as ½ batter width x average depth of stockpile x length of batter.
- An average specific gravity (S.G.) of tailings and slimes was assumed to be 1.73, which is the S.G. of loose quartz sand containing several percent heavy minerals.
- The average gold content was calculated as a weighted average from drill hole data.

Stockpile	Area (m^2)	Av. Depth (m)	Volume (m^3)	Tonnes
Tailings	271	2	540	930
Batter			560	970
TOTAL			1 100	1 900
Slimes				
Tanks	127	1	127	220
Walls	57	1.5	86	150
TOTAL			213	370

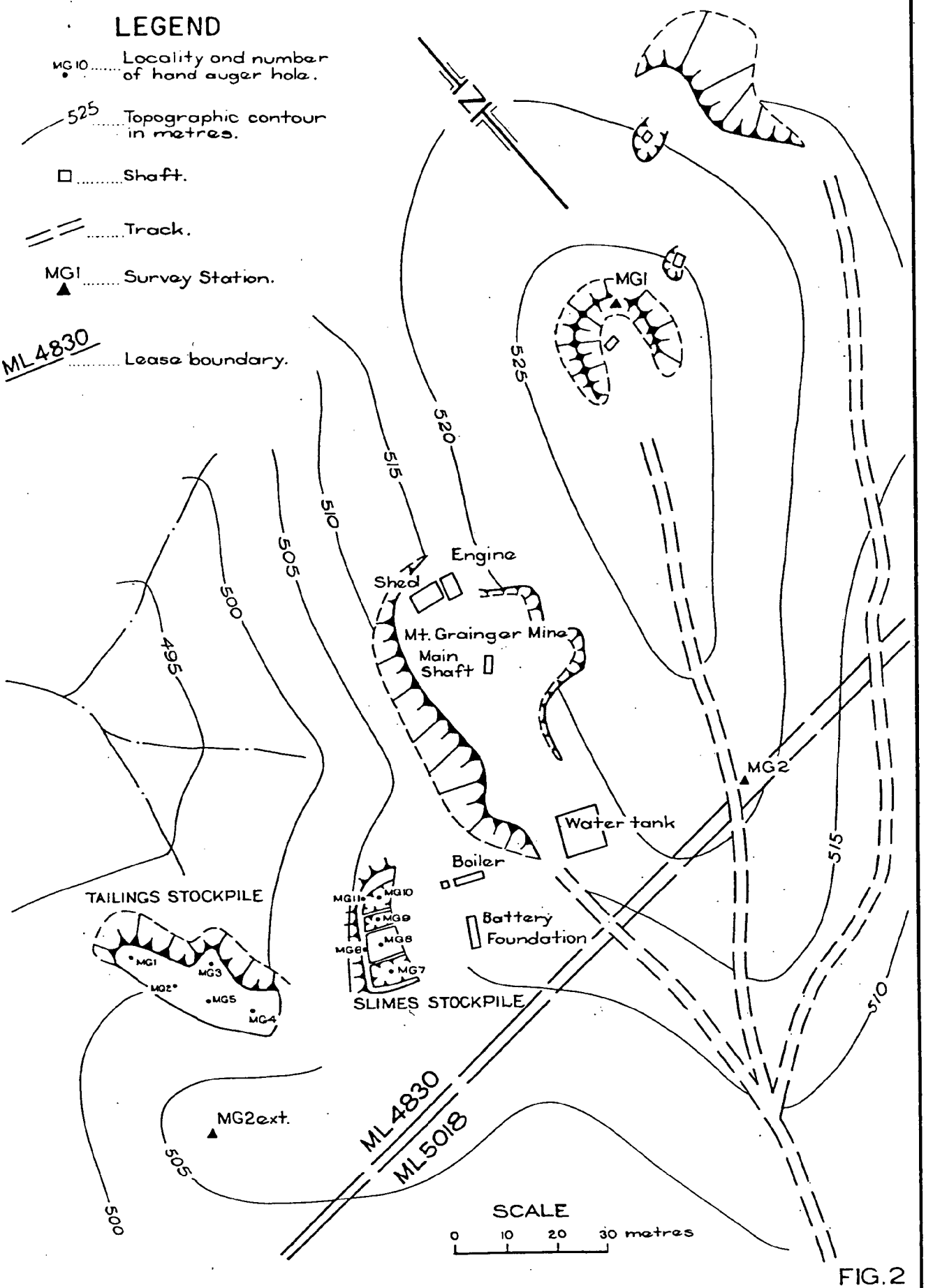


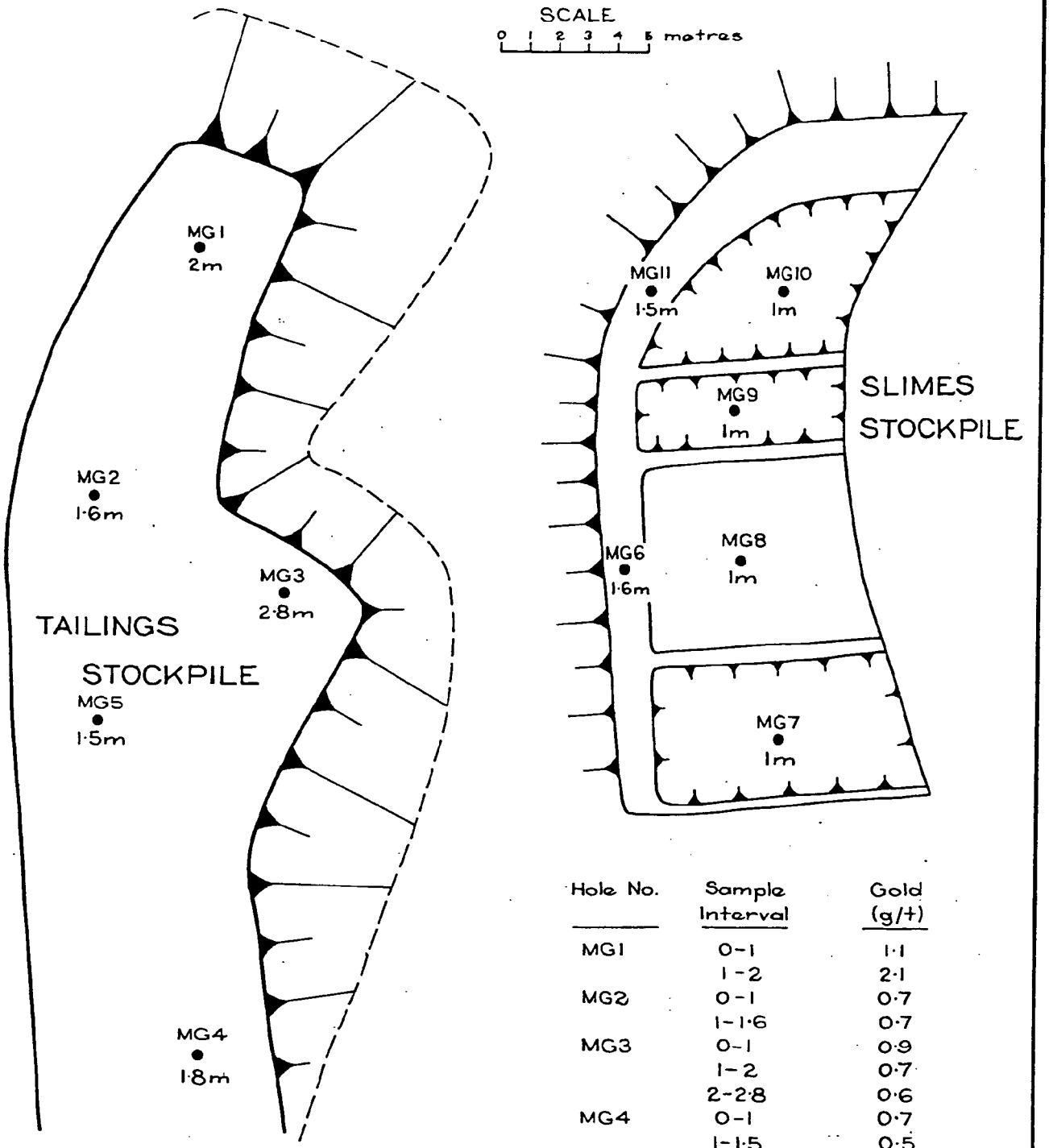
FIG. 2

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED	B.Morris
DRAWN	J.W.
DATE	April '84
TRACED	
SCALE	
DRAWING NUMBER	S17306

GOLD TAILINGS – MOUNT GRAINGER GOLDFIELD
TOPOGRAPHY AND LOCALITY OF TAILINGS

3482



Hole No.	Sample Interval	Gold (g/t)
MG1	0-1	1·1
	1-2	2·1
MG2	0-1	0·7
	1-1·6	0·7
MG3	0-1	0·9
	1-2	0·7
	2-2·8	0·6
MG4	0-1	0·7
	1-1·5	0·5
MG5	0-1	0·7
	1-1·8	0·5
MG6	0-1	3·1
	1-1·6	2·7
MG7	0-1	3·3
MG8	0-1	3·1
MG9	0-1	3·1
MG10	0-1	4·6
MG11	0-1	3·7
	1-1·5	5·2

Legend

MG2 .....Hand auger hole location and number

1·6m.....Depth of hole

Reserves

	Volume (m^3)	Tonnes	Grade Au(g/t)
Tailings	1100	1900	0·87
Slimes	213	370	3·54

FIG. 3

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED B. Morris | DRAWN J.W. | DATE April '84 | CHECKED

GOLD TAILINGS – MOUNT GRAINGER GOLDFIELD TAILINGS AND SLIMES STOCKPILES AND LOCATION OF HAND AUGER HOLES

PLAN NUMBER SI7307

3482

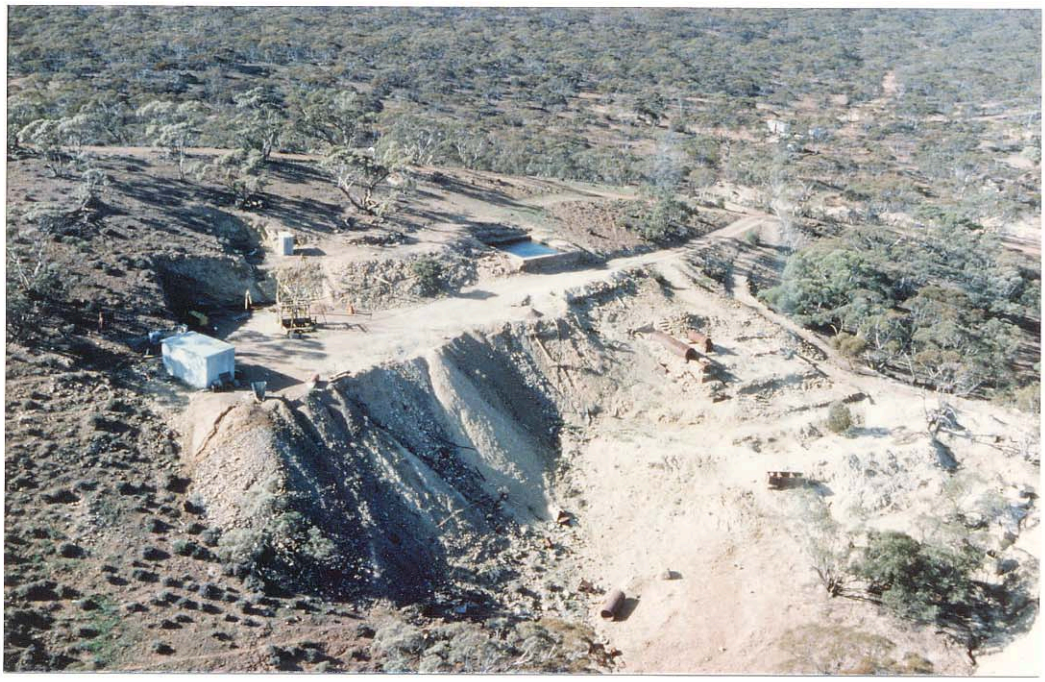


PLATE 1. Aerial view to southeast showing Mount Grainger Mine head frame. Remains of boiler and battery site with slimes stockpile at right (September, 1983). Slide No. 24407.

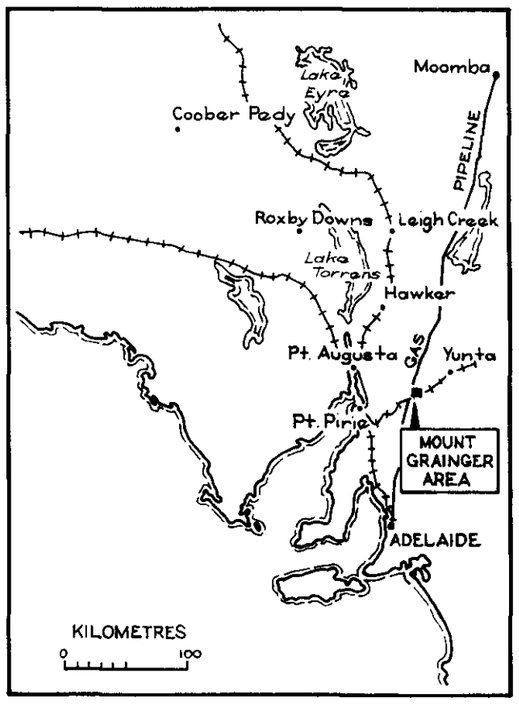
PLATE 2. View to west showing remains of boiler, battery site and elongate tailings stockpile (September, 1983). Slide No. 24408.

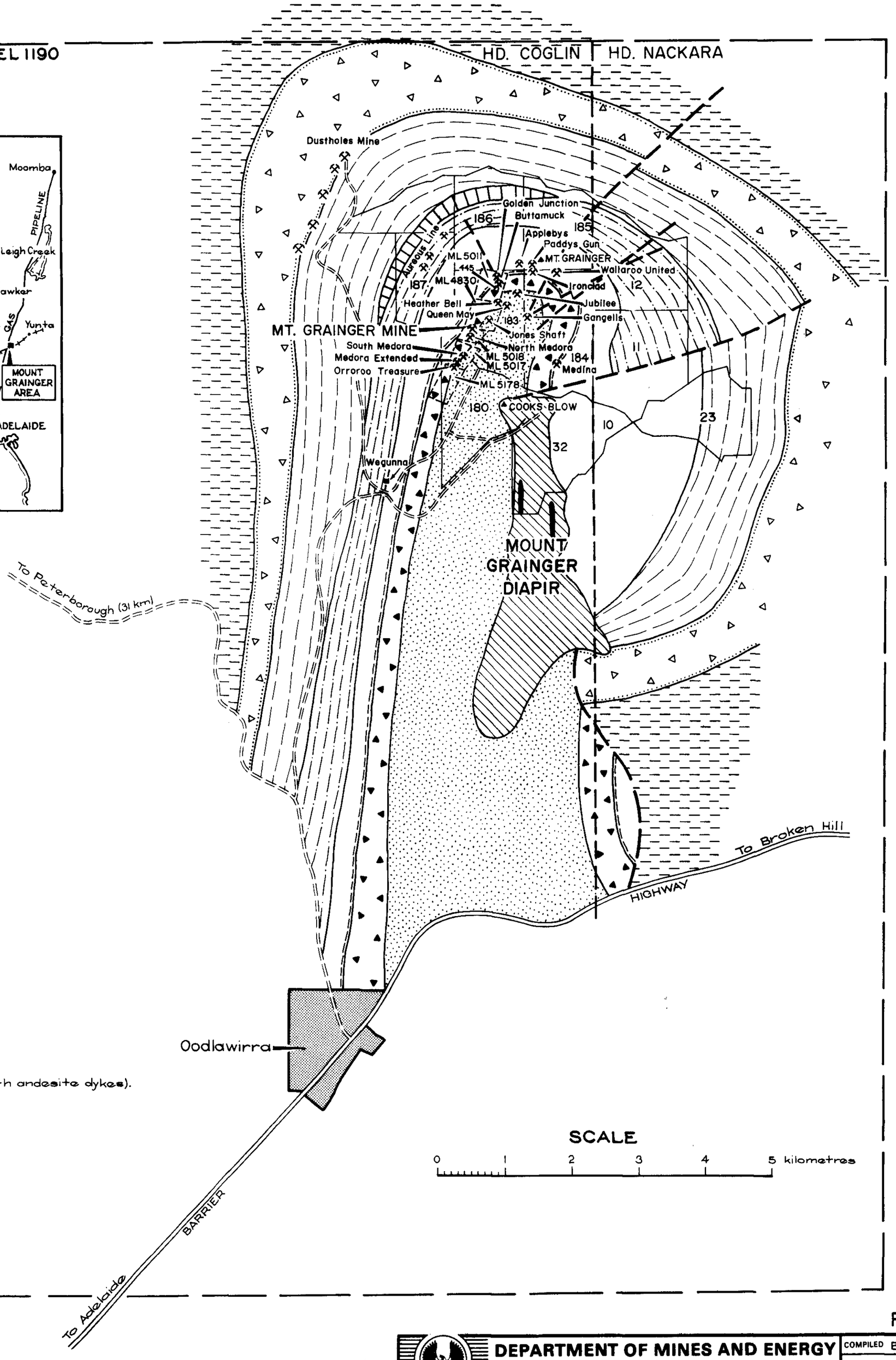
EL 1190

HD. COGLIN | HD. NACKARA

N

LOCALITY





LEGEND

PROTEROZOIC
Adelaide System

Marinoan

WILPENA GROUP

Ulupa Siltstone.

UMBERATANA GROUP

Grampus Quartzite.
Pepuarta Tillite.
Gumbowie Arkose Member.

Enorama Shale.

Etina Formation.
Taroowie Siltstone.

Sturtian

Tapley Hill Formation.
Tindelpina Shale Member.

Appila Tillite.

Torrensian

BURRA GROUP

Saddleworth Formation.

Callana Beds (Diapiric breccia with andesite dykes).

Fault.

186 Section boundary.

E.L.1190 Exploration Licence Boundary

Mineral Lease Boundary.

GEOLOGY AFTER BINKS (1968).

FIG. 1

DEPARTMENT OF MINES AND ENERGY SOUTH AUSTRALIA

GOLD TAILINGS – MOUNT GRAINGER GOLDFIELD

LOCALITY AND REGIONAL GEOLOGY PLAN

COMPILED	B. Morris
DRAWN	J.W.
DATE	April '84
CHECKED	
C.D.O. DATE	31·7·84
SCALE	1:50,000
PLAN NUMBER	84-156

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