DEPARTMENT OF MINES

SOUTH AUSTRALIA

PARA HILLS QUARTZITE QUARRY

Sections 2104, 2105, Hd. Yatala Co. Adelaide

(Boral Resources (S.A.) Pty. Ltd.)

by

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and

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Geologist

Extractive Minerals Section

Rept.Bk.No. 77/91
G.S. No. 5913
D.M. No. 1142/73

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ABSTRACT

A small quarry in Sections 2104, 2105 Hd. Yatala was re-opened by Albion Reid (S.A.) Pty. Ltd. (now Boral Resources (S.A.) Pty. Ltd.) in November, 1974.

New exposures in the present quarry have revealed a thinly bedded sequence of quartzites, sandstones and shales asymmetrically folded about axes with gentle southerly plunges of about 4 degrees.

Probable reserves to stage III of the Company's proposed development plan total 15 million tonnes; 2.6 million tonnes being suitable for concrete aggregate, 4.8 million tonnes for crushed rock, 4.1. million tonnes of unknown quality, and 3.5 million tonnes of waste and overburden.

INTRODUCTION

The quarry is located on the western scarp of the ranges at Para Hills, 16 km north-east of Adelaide, in land which is zoned Rural A.

A small quarry in section 2104 had not been worked for many years.

Following submission by Albion Reid (S.A.) Pty. Ltd. under the Planning and Development Act 1966-1969, consent to quarry in sections 2104, and 2105 was granted by the State Planning Authority. Operations commenced in November 1974.

The present investigation is part of an appraisal of the quartzite quarrying operations in the Adelaide Metropolitan Area.

Detailed mapping of new exposures in the quarry faces was carried out in December 1976 using a stadia survey plan drawn by R.J. Harris (Technical Assistant). This and previous Company data have been related to Department of Lands 1:2 500 topographic map sheets 6628-29-p and n. Logs of diamond drill holes are presented in the Appendix and their locations are shown on the accompanying plans.

PREVIOUS INVESTIGATIONS

An initial appraisal of the deposit was carried out for the Company by Dr. H.T. Moors, Company Geologist, (Moors, 1971).

Nine diamond holes totalling 337 m were drilled at this stage.

This information was forwarded to the Department of Mines through the Extractive Industries Advisory Committee for appraisal. Mr. M.N. Hiern (Supervising Geologist, Department of Mines) examined the data and inspected the proposed quarry site. The Department supported the Company's submission that quarrying was a feasible proposition, and consent was granted.

Ten additional diamond holes totalling 299 m were drilled by the Company in 1976.

The abandoned quarries adjoining the southern boundary of the property were mapped by D.I. Young (Student Geologist) in December, 1972.

PRODUCTION

Since the commencement of operations in 1974 production

has increased to more than ½ million tonnes per year. Production figures for the small abandoned quarry in section 2104 are not available.

GEOLOGY

Regional Setting

The quarry is located in interbedded Burra Group quartzites, sandstones and shales of Adelaidean age which underlie low rounded hills to the east of the Para Fault Scarp.

The regional geology is shown on Gawler (Campana, 1953) and ADELAIDE (Thomson, 1969).

The hills are steeply incised by west-flowing creeks near the northern boundary of Section 2104.

Outcrop is generally poor. The best exposures are on the southern banks of the creeks, and even in these areas, generally only the more massive quartzites outcrop with any persistence. On the hill slopes and crests, irregular small outcrops of quartzites occur, but it is usually difficult to distinguish rock in situ from the abundant coarse float.

Lithology

The rocks consist of a thinly bedded sequence of quartzites, sandstones and shales. Fourteen units totalling more than 66 metres in thickness have been recognised; the upper units (1-5) from drill cores and the lower units (6-14) by mapping within the quarry area.

These are summarised in table 1 and on plan 77-640.

The uses for which the different units are suitable have been tabulated after consultation with Mr. A. Bennett (Quarry Manager).

TABLE I

Rock Units

Unit No.	Thickness (m)	Description	Uses
1	6	SANDSTONE. Medium to coarse grained. Hard, white.	
2	8	SILTSTONE. Pale brown Laminated. Moderately hard in places.	30% waste 70% crushed rock
3	4	SANDSTONE. Med.-coarse grained, brown & white. Some quartz veining (up to 2 cm thick). Hard & quartzitic in part.	
4	25	SHALE	
5	45	SHALE AND SANDSTONE. Brown, fine grained with shale beds throughout. Thinly bedded.	70% waste 30% crushed rock
6	6	SHALE. Dark brown, laminated, thinly bedded, soft.	
7	45	SANDSTONE. Friable, fine grained with siliceous quartzite bands.	Crushed rock
8	15	SHALE. Brown, fissile. Thinly bedded.	Waste
9	4	QUARTZITE. Massive blue & white. Hard tough rock.	Concrete aggregate
10	55	QUARTZITE. Massive, white. Hard but grades to sandstone at base.	
11	34	BLOCKY SHALE. Brown, fissile. Jointing prominent perpendicular to bedding.	Waste
12	8	QUARTZITE. Brown & white. Hard but grades locally to sandstone.	Crushed rock
13	2	SHALE. Brown to black in colour, moderately hard in places. Heavy minerals throughout with traces of pyrite.	Waste
14	6+	QUARTZITE. As for unit 12. Base not exposed.	Crushed rock

Structure

The most common fold style in the area can be seen in the southern faces of the quarry, where an asymmetric anticline consists of a long shallow dipping eastern limb and a relatively short, steeply dipping to slightly overturned western limb. The structure has a gentle southerly plunge of four degrees.

Similar structures are exposed in the abandoned quarries to the south in Section 2102, where high quality quartzites corresponding to unit 10 on plan 77-640 were selectively mined from the crests of asymmetrical anticlines.

Minor faulting within the cores of the tight fold structures is generally restricted to the softer shale units. The more competent quartzite units define the overall fold shape.

The structure shown on cross-sections to the west of the quarry area has been deduced from structures exposed in the abandoned quarries adjoining the southern boundary, and from drill holes (see plan 77-641).

RESERVES

Reserves of stone for each of the first three stages of development shown in the Company's Development Plan No. 72SQ1-2 are shown in Table 2.

Volumes have been calculated from east-west sections drawn at 50 m intervals. A mean density of 2.5 has been assumed for the stone.

Beds below unit 14 have not been encountered in quarrying or drilling, and consequently the quality is unknown.

TABLE 2 (Millions of tonnes)

Stage	Concrete Aggregate	Crushed Rock	Waste and Over-burden	Unknown Quality
I	0.16	0.25	0.20	1.50
II	0.60	1.05	0.80	0.25
III	1.80	3.50	2.50	2.40
TOTAL	2.6	4.8	3.5	4.1

CONCLUSIONS AND RECOMMENDATIONS

Approximately 4.8 million tonnes of crushed rock, 2.6 million tonnes of concrete aggregate, 3.5 million tonnes of waste and overburden, and 4.1 million tonnes of stone of unknown quality exist to Stage III of the Company's development plan. These tonnages are regarded as "probable" until the structure to the west of the existing quarry is exposed as workings progress in this direction.

Additional diamond drilling is required to assess the nature of stone in the "unknown" category, and to determine the quality of material below Stage III. A vertical hole in the present quarry floor to the north of the primary crusher will provide this information by establishing the sequence below the existing exposures.

Mike Martin
Student Geologist

Tony Pain
Senior Geologist

19th September, 1977
TP:MM:ZV

REFERENCES

CAMPANA, B. et. al. 1953: Gawler Map Sheet. Geological Atlas of South Australia 1:63 360 series. Geol. Surv. S. Aust.

MOORS, H.T., 1971: Para Hills Quarry. Unpub. Report to Albion Reid S.A. Pty. Ltd.

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APPENDIX

Logs of Diamond Drill Holes

Note: Holes which have since been quarried out have been omitted.

Hd. YATALA Section 2104 DDH2.

From (m)	To (m)	LOG
0	10.4	Soft brown argillaceous sandstone with thin weathered phyllite bands - banding 45°. Well cemented quartz 7.93 m - 8.24 m.
10.4	14.3	Hard fine grained quartzite with thin coarse grained friable bands from 11.4 m - 11.9 m.
14.3	16.5	Quartzite grading to brown semi-friable sandstone.
16.5	21.7	Mainly thinly bedded quartzite, semi-friable in parts. Broken and argillaceous 21.35 m - 21.66 m.
21.7	25.6	Hard quartzite
25.6	37.8	Soft thinly bedded argillaceous sandstone and phyllite - phyllite slightly to moderately weathered.
37.8	40.0	Soft brown argillaceous sandstone.
40.0	47.6	Hard Quartzite

END HOLE

Logged: M.N. Hiern

Hd. YATALA Section 2104 DDH3

From (m)	To (m)	LOG
0	2.75	No core.
2.75	4.3	Mainly thinly bedded sandstone - partly cemented - friable. Banding 70° to core axis.
4.3	5.8	Hard quartzite - fine grained massive.
5.8	7.3	Soft thinly bedded friable sandstone bedding 60-70°.
7.3	11	Phyllite - weathered and soft argillaceous sandstone 16.68 m - 11 m Coarse grained.
11	15	Hard quartzite - massive

END HOLE

Logged: M.N. Hiern

Hd. YATALA Section 2104 DDH4

From (m)	To (m)	LOG
0	2.2	No core.
2.2	3.5	Mainly well cemented quartzite, some thin friable bands.
3.5	13.7	Mainly fine grained and generally massive sandstone, with some coarse grained bands.
13.7	17.4	Mainly thin bedded, semi friable sandstone - brownish with weathered argillaceous bands, a few well cemented bands.
17.4	21.0	Well cemented quartzite.
21.0	28.5	Mainly thinly bedded friable argillaceous sandstone with weathered phyllite.
28.5	32.3	Slight to moderately weathered. phyllite.
32.3	34.5	Fine grained argillaceous sandstone- massive, slightly weathered light brown, moderately hard.
34.5	36.0	Coarse grained friable sandstone.
35.0	40.0	Hard quartzite

END HOLE

Logged: M.N. Hiern

Hd. YATALA Section 2104 DDH16

From (m)	To (m)	LOG
0	1.6	Clay, weathered sandstone and quarry overburden.
1.6	2.1	Fine grained, brown well cemented sandstone.
2.1	3.2	Weathered phyllite, light brown colour with some fine grained sand throughout.
3.2	4.7	Fine grained brown sandy quartzite. Medium grained and white in places.
4.7	5.7	Siltstone with bands of grey weathered shale.
5.7	8.6	Phyllite, hard in places with weathered bands between sandy beds.
8.6	17.3	Brown phyllite with bands of dark heavy minerals showing evidence of slumping. Bedding 10^{o} to core axis.
17.3	18.7	Coarse grained sandstone, poorly cemented with well rounded quartz grains.
18.7	22.5	Quartzitic sandstone. Coarse grained, hard white.
22.5	23.1	Hard white Quartzite.
23.1	30.6	Quartzite grading to a hard white medium grained sandstone with a phyllite bed 29.1 - 29.4.

END HOLE

Logged: M.W. Martin

Hd. YATALA Section 2104 DDH17

From (m)	To (m)	LOG
0	1	No core
1	1.2	Alluvial clay.
1.2	7.4	White, coarse grained sandstone Quartz veining 3.2 - 3.4 m.
7.4	8.3	Siltstone with thin beds of weathered phyllite.
8.3	10.1	Fine grained white sandstone
10.1	10.9	Sandy phyllite
10.9	11.9	Coarse grained brown sandstone.
11.9	12.7	Brown phyllite
12.7	13.5	Coarse grained brown sandstone
13.5	16.4	Fine grained argillaceous sandstone
16.4	27.0	Brown slightly weathered phyllite.

END HOLE

Logged: M.W. Martin

Hd. YATALA Section 2104 DHH18

From (m)	To (m)	LOG
0	1	No core.
1	2.1	Alluvial clay
2.1	4.0	Weathered sandstone with thin beds of weathered phyllite varying in colour from brown to white.
4.0	4.1	Weathered siltstone - off white in colour.
4.1	6.2	Sandy phyllite, highly weathered with some quartz veins.
6.2	10.6	Argillaceous siltstone, hard white with brown phyllite bands throughout first 1.3 m, then grading into a hard white fine grained sandstone.
10.6	10.8	Sandy phyllite
10.8	13.5	Fine grained to medium grained hard white sandstone with considerable quartz veining, becoming finer grained lower in the sequence.
13.5	16.5	Coarse grained brown sandstone Hard at first, but becoming friable
16.5	19.0	Medium grained hard white sandstone tending to quartzite in places. Some quartz veining.
19.0	20.1	Fine grained hard white quartzitic sandstone with thin phyllite bed at 19.4 m.
20.1	23.3	Fine grained - coarse grained argillaceous sandstone with phyllitic beds up to 4 cm thick.
23.3	24.9	Soft, light brown phyllite

END HOLE

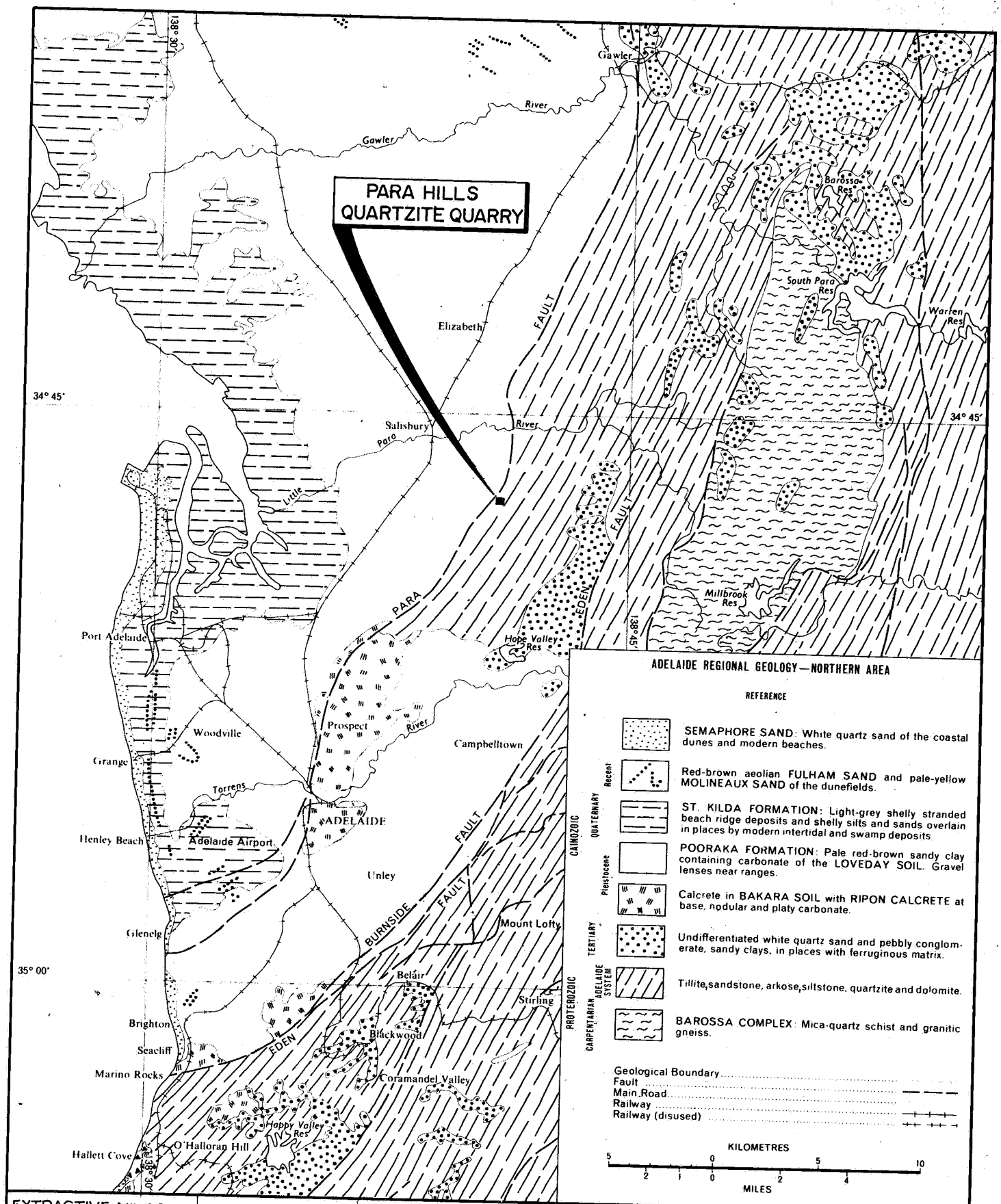
Logged: M.W. Martin

Hd. YATALA Section 2104 DDH19

From (m)	To (m)	LOG
0	0.9	No core.
0.9	2.8	Clay, weathered phyllite and sandstone.
2.8	4.0	Fine grained white sandstone.
4.0	6.3	Argillaceous siltstone. Thin laminations of phyllite throughout.
6.3	9.7	Soft creamy orange phyllite.
9.7	12.0	Hard white quartzitic sandstone, medium grained with quartz veining.
12.0	13.9	Massive blue-white quartzite
13.9	19.7	Medium grained hard sandstone with thin phyllite bands.
19.7	24.0	Medium grained hard white sandstone
24.0	24.5	White siltstone
24.5	25.1	Dark-brown phyllite
25.1	26.3	Fine grained hard brown sandstone with thin phyllite beds.
26.3	29.4	Well laminated black brown phyllite

END HOLE

Logged: M.W. Martin



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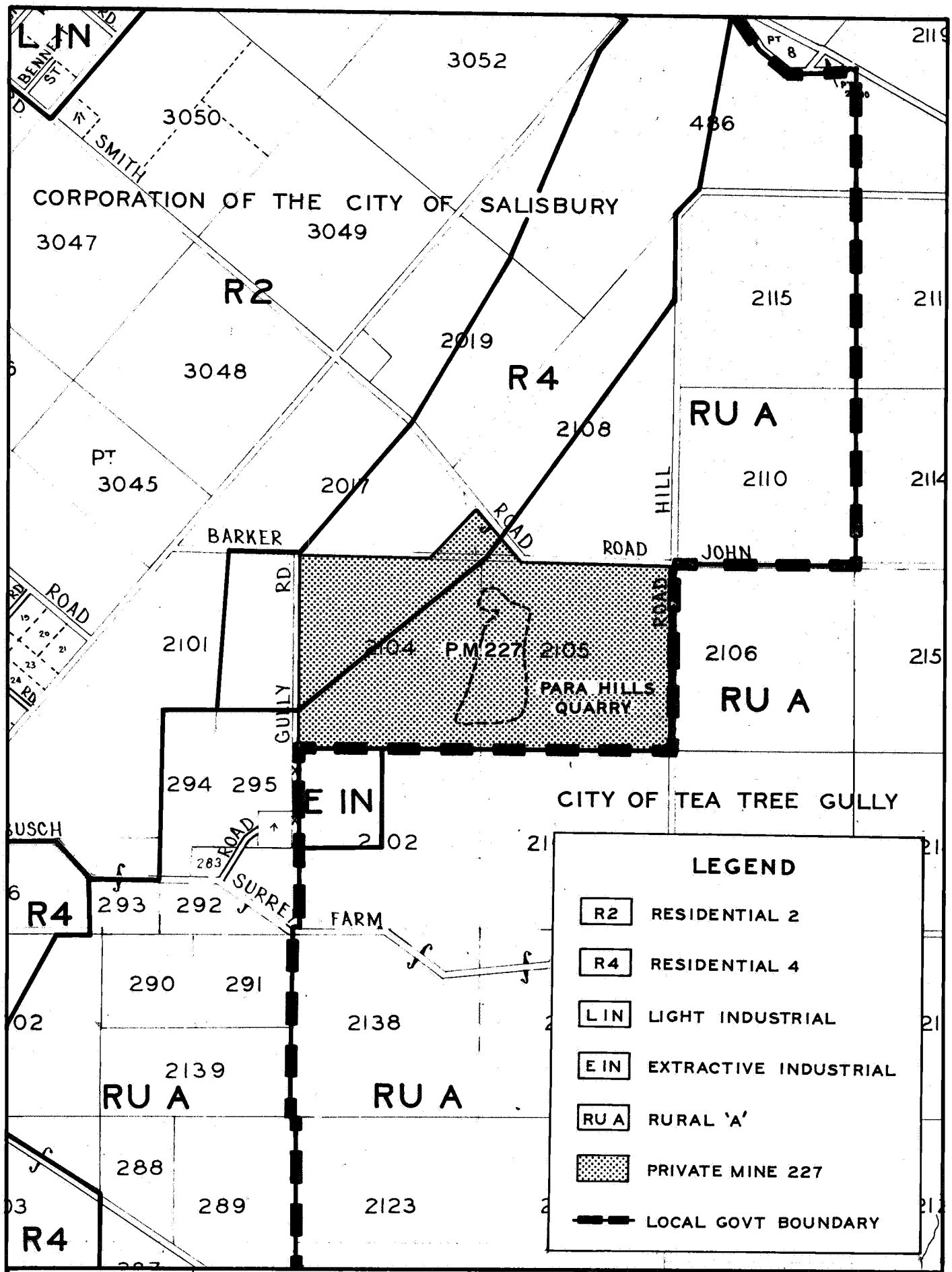
Compiled: T. Pain	PARA HILLS QUARTZITE QUARRY SECS 2104 & 2105 HD. YATALA LOCATION AND REGIONAL GEOLOGY	Date: 4-8-77
Drn. J.W Ckd.		Drg. No. S12857
Geology from Adelaide and Barker 1:250 000 Geological Atlas Series		

PF No S9992 GH



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DRN . RBF CKD .	SECS 2104 & 2105 HD YATALA	PLAN NUMBER :
	LAND USE ZONING	S 12998

LEGEND

Unit No.	Thickness (m)	Description	Uses
1	6	SANDSTONE. Medium to coarse grained. Hard white.	30% waste. 70% crushed rock
2	8	SILTSTONE. Phyllitic pale brown. Laminated. Moderately hard in places.	
3	4	SANDSTONE. Med - coarse grained, brown & white. Some quartz veining (up to 2cm thick). Hard and quartzitic in part.	
4	25	SHALE - Phyllitic.	70% waste. 30% crushed rock
5	45	SHALE AND SANDSTONE. Brown, fine grained with shale beds throughout. Thinly bedded.	
6	6	SHALE. Dark brown, laminated, thinly bedded, soft.	
7	45	SANDSTONE. Friable, fine grained but siliceous and quartzitic in pockets.	► Crushed rock
8	15	SHALE. Brown and medium hard, strong parting along bedding. Considerable lensing, thinly bedded	► Waste
9	4	QUARTZITE. Massive blue & white. Hard tough rock.	Concrete aggregate
10	55	QUARTZITE. Massive, white. Hard but grades to sandstone at base	
11	34	BLOCKY SHALE. Brown. Strong parting along bedding and extensive fracturing perp. to strike.	► Waste
12	8	QUARTZITE. Brown & white. Hard but grades to a sandstone in places.	► Crushed rock
13	2	SHALE. Phyllitic, brown to black in colour, & hard in places. Heavy minerals throughout with traces of pyrite	► Waste
14	6+	QUARTZITE. As for unit 12. Base not exposed	

Stockpile.

45° Strike and dip of bedding.

120 Contour interval in metres.

A Cross section

Quarry face.

DD2 Drill hole.

Geological boundary.

Inferred geological boundary.

N

STAGE II

STAGE I

STAGE III

QUARTZITE

FLOAT

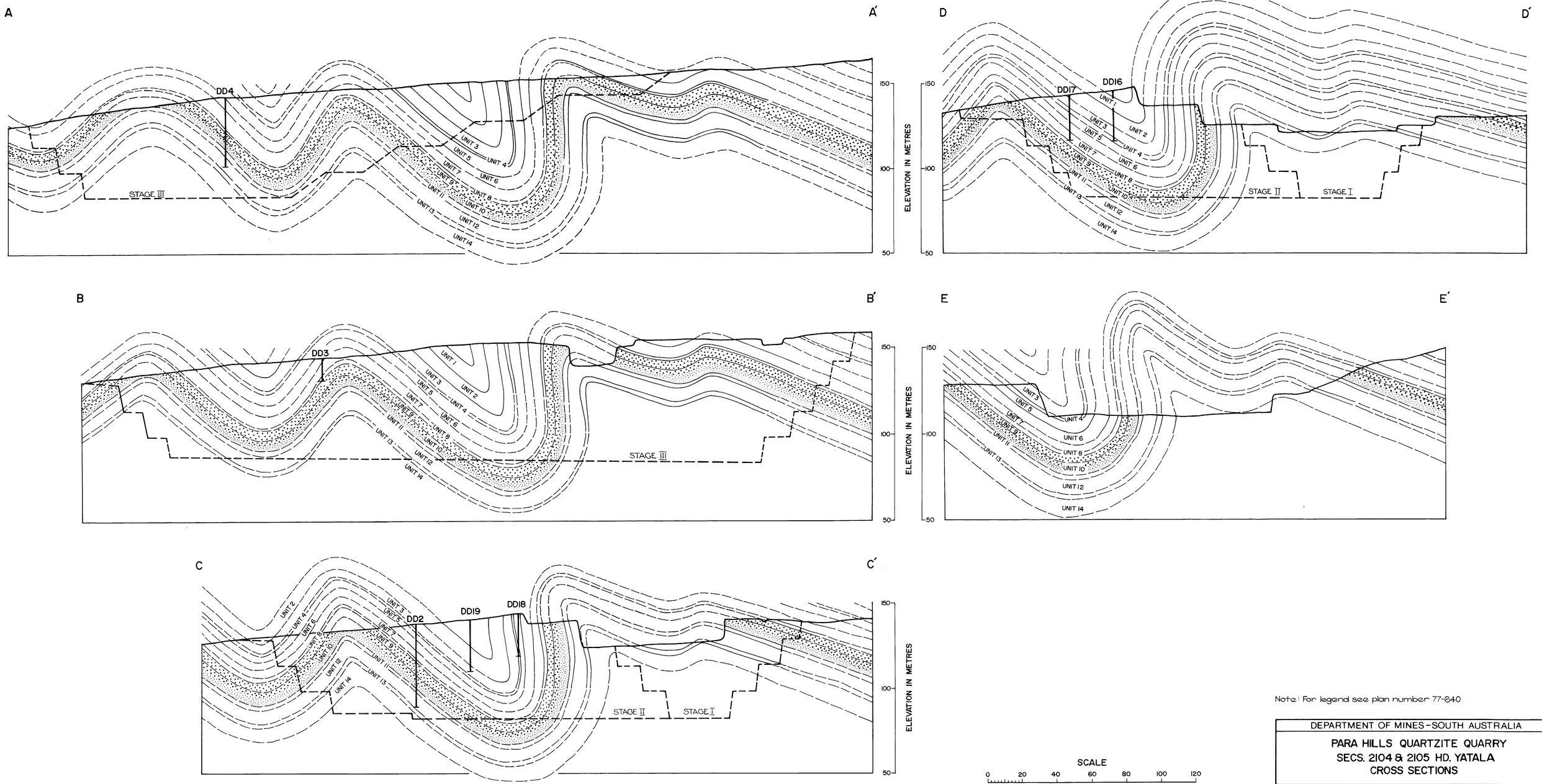
QUARTZITE

FLOAT

DD1 DD2 DD3 DD4 DD16 DD17 DD18 DD19

METRES 0 20 40 60 80 100 120

DEPARTMENT OF MINES - SOUTH AUSTRALIA				
PARA HILLS QUARTZITE QUARRY SECS. 2104 & 2105 HD. YATALA GEOLOGICAL PLAN				
EXTRACTIVE MINERALS SECTION	COMPILED A.M.P. M.M.	DRN J.W.	SCALE 1:1000	PLAN NUMBER
DIRECTOR OF MINES		CKD A.F.	DATE 5-8-77	77-640



Note: For legend see plan number 77-640

SCALE

0 20 40 60 80 100 120

DEPARTMENT OF MINES-SOUTH AUSTRALIA

PARA HILLS QUARTZITE QUARRY
SECS. 2104 & 2105 HD. YATALA
CROSS SECTIONS

EXTRACTIVE MINERALS SECTION	COMPILED A.M.P. M.M.	DRN J.W.	SCALE 1:1000	PLAN NUMBER 77-641
DIRECTOR OF MINES		CKD A.F.	DATE 5-8-77	