DEPARTMENT OF MINES

SOUTH AUSTRALIA

GEOLOGICAL SURVEY

NON-METALLIC RESOURCES DIVISION

CRAFERS SHALE QUARRY

Section 961, Hd. Adelaide, Co. Adelaide

(P.M. 59 - P.G.H. Industries Pty. Ltd.)

by

WAYNE S. McCALLUM,
GEOLOGIST.

14th March, 1977

Rept.Bk. No. 77/32
G.S. No. 5860
D.M. No. 1405/54

CONTENTS

PLANS ACCOMPANYING REPORT

Fig. No.	Plan No.	Title	Scale
1	S12605	Locality Plan	1:50 000
2	75 398	Geological Plan and Sections	1:2 000
3	S11420	Stereographic plot of poles to bedding and jointing.	

DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 77/32
G.S. No. 5860
D.M. No. 1405/54

CRAFERS SHALE QUARRY

Section 961, Hd. Adelaide, Co. Adelaide

ABSTRACT

At the Crafers brick shale pit, large reserves of shale (1.2 million tonnes) on the western limb of a southerly pitching syncline are overlain by small remnant patches of red Quaternary gravelly clay. Depth of weathering is variable and the suitability of available reserves for brickmaking will vary accordingly. The quality is adversely affected by thin quartzite interbeds and ferruginuous concentrations within the shales.

INTRODUCTION

The Crafers shale quarry was mapped on the 5th September, 1975, as part of a survey of brick shale deposits in the Adelaide region. Aerial photography at 1:2 000 scale was used, followed by a plane table survey on the 18th September, 1975. This data was combined with that of Gibson (1955), and Department of Lands Ortho-photo Sheet No. 6628-49-n (see Fig. II)

LOCATION AND TENURE

The Crafers Shale Deposit lies within section 961, Hd. Adelaide, on the western side of the South Eastern Freeway, 1.3 km northwest of Crafers and 10 km by road southeast of the Glen Osmond brick works.

The quarry is on the top of a rise, with a steep tree covered slope to the south, and cleared pasture to the west. The South Eastern Freeway is adjacent to Hillcrest Avenue to the east of the pit, and housing is extending along Emmett Road to the north.

P.G.H. Industries Pty. Ltd. hold the deposit which was proclaimed a Private Mine on 8th March, 1973. The Private Mine lies within the Hills Face Zone in which extractive industry is subject to the consent of the State Planning Authority. This pit operates under provisions which enable the continuation of existing land use at the time of proclamation of the Hills Face Zone.

PREVIOUS INVESTIGATIONS

Gibson (1955) prepared a report for City Bricks Ltd., on the results of 3 percussion drill holes, drilled prior to the commencement of quarrying (see Fig. 2).

Samples from these holes were suitable for the production of pressed bricks but required blending with plastic clay to make extruded bricks (Ellerton, 1955).

Gibson (1955) calculated reserves of 1.27 million tonnes within the area leased at that time.

P.M. 59 covers a considerably larger area than the previous mining lease, and reserves quoted in this report cover the whole private mine area.

In 1972 P.G.H. Industries drilled 14 test holes. The driller's logs are contained in Appendix I.

QUARRYING ACTIVITY

A significant portion of P.M. 59 has been cleared. Production since P.G.H. acquired the deposit in 1974 is detailed in Table 1.

TABLE 1

PRODUCTION IN TONNES

Year	Tonnes
1970	11 332
1971	7 497
1972	13 625
1973	16 055
1974	23 109
1975	21 755
6 months ending June, 1976	11 449
Total	104 822

GEOLOGICAL SETTING

The Crafer pit has been developed on the Glen Osmond Slate, the youngest Torrensian unit in the Burra Group sediments of the Adelaide Geosyncline.

Stratadip gently to the south and east.

Deep weathering during Tertiary times converted the formerly hard slates to relatively soft claystones which in places are overlain by patches of Quaternary gravel.

SITE GEOLOGY

In the quarry the shale is typically dark grey or brown, weathering to a soft orange-brown or cream to light grey colour. In the extreme west of the quarry, the shale is hard and unweathered with patches of white powdery slate. Cleavage is generally parallel to the bedding plane (together with a visible grain orientation and foliation).

Lenses of white quartzite up to 0.3 m thick and several metres long occur parallel to the bedding.

In the south of the quarry hard brown or grey, slightly weathered shale contains numerous quartzite interbeds up to 0.5 m thick, constituting 30% of the rock. Along strike to the northeast, quartzite beds, 0.1 m to 0.2 m thick, are less frequent and constitute up to 15% of the total rock.

In the east of the quarry, ferruginisation has produced hard red, iron - rich concretions (up to 0.1 m by 0.3 m) within the shale, and oriented parallel to bedding.

The zone of iron enrichment in the east of the quarry is probably equivalent in part to the interbedded shale and quartzite in the south. Thus this poorer material is expected to be confined to the southeast of the quarry.

Occasional quartzite interbeds less than 0.1 m thick in the rest of the quarry do not detrimentally affect the quality of the shale for brick making.

Strata in the quarry dip between 15° and 40° to the east-southeast (see sections A-A to C-C, Fig. 2). Minor folds have a fold axis plunging 20° to the south (187°). Fold limbs dip approximately 30° to the east and west (see Fig. 3).

Two dominant joint sets in the northwest of the quarry dip 65° to the southeast (130°) and 75° to the northeast (45°). However, in the south of the quarry, the jointing dips 80° to the north (17°), and 85° to the east (119°).

Within the quarry area there are several patches of Quaternary red gravelly clay, 1 to 2 m thick, including fragments of weathered shale. This unit is too thin to be quarried selectively.

RESULTS OF DRILLING

Between 17th and 25th May, 1972, 14 rotary holes were drilled by P.G.H. Industries Pty. Ltd. at localities shown on Fig. 2. The results of these holes are summarised in Table 2 from the driller's logs in Appendix I.

TABLE 2

DRILLING RESULTS
(m)

Hole No.	Quaternary Gravel	Weathered Shale	Unweathered Shale
1	-	0 - 14.6	-
2	-	0 - 5.5	-
3	-	0 - 0.9	0.9
4	-	0 - 2.7	2.7
5	0 - 2.7	2.7 - 13.7	-
6	0 - 0.9	0.9 - 4.6	4.6
7	-	0 - 10.0	10.0
8	-	0 - 3.7	3.7
9	-	0 - 5.5	5.5
10	0 - 0.9	0.9 - 1.8	1.8
11	-	0 - 4.6	4.6
12	-	0 - 1.8	1.8
13	-	0 - 1.8	1.8
14	0 - 2.7	2.7 - 5.5	5.5

Significant thickness of weathered shale were recorded in Holes 1, 2, 5 and 7 in the western portion. Unweathered shale was close to the surface in the eastern portion, particularly in Holes 10, 12 and 13.

Drill holes 2, 3, and 4 were drilled within the area of the quarry, and no record was kept of the elevation of the drill holes. As the quarry topography has changed since 1972, the results of these three shallow holes are of little value.

RESERVES

The two drilling programmes give conflicting evidence as to the depth of weathering in the shale. The first programme (Gibson 1955) indicates a depth of weathering of 30 to 40 m (but with some harder interbeds of shale and quartzite) while the second (P.G.H., 1972) shows a depth of weathering ranging from 0.9 m to 14.6 m.

The drill holes in the second programme were probably stopped at a hard interbed within the shale and hence did not reach the base of the weathered zone.

Thus in P.M. 59 the weathering profile is probably sufficiently deep to allow quarrying over much of the area down to the level of the present quarry floor (approximately 558 m).

However southeast of the present pit, the weathered shale probably includes numerous quartzite and harder shale interbeds (all P.G.H. drill holes in this area intersected hard interbeds at shallow depth).

Reserves of weathered shale within the area of the existing quarry above the 558 m level (see Fig. 2) are 1 225 00 tonnes (see Appendix II). Approximately one-third of the reserves lie in the southeast of the quarry and include numerous harder interbeds. Thus extractable reserves are expected to be 820 000 tonnes.

If the shale is weathered throughout P.M. 59, then 2 750 000 tonnes of weathered shale are inferred above the 558 m level. One-third of this is expected to comprise hard shale and quartzite. Therefore extractable reserves are inferred to be 1 800 000 tonnes.

There is not sufficient drilling information below the 558 m level to define the extent of weathering.

CONCLUSIONS

The Crafers Brick shale quarry lies within weathered Upper Torrensian Glen Osmond Slates dipping to the east, and including numerous thin quartzite interbeds and ferruginous concretions which deleteriously affect the quality.

P.G.H. Industries is removing small quantities of weathered shale from several pit faces within the Private Mine. Quarrying is at present restricted to the northeast section of the Private Mine and reserves within this area are approximately 1 225 000 tonnes. At the present rate of removal (see Table 1) this reserve would last for a considerable number of years (up to 20 years, based on 1975 figures).

Quarrying to the south of the present quarry could yield a total reserve of 2 750 000 tonnes or more. The quantity of suitable material will vary considerably, dependant on local variations in the depth of the weathering profile.

W S McCallum

14th March, 1977.
WSMcC:ST

Wayne S. McCallum,
GEOLOGIST.

REFERENCES

ELLERTON, H., 1955: Crafers shale. Joint investigation of the C.S.I.R.O. and the S.A. School of Mines and Technology. Min. Rev. 102 : 48-51.

GIBSON, A.A., 1955: Brick clay deposit near Crafers section 961, Hd. Adelaide. Dept. Mines unpublished report, R.B.39/47.

O'DRISCOLL, E.P., 1960: Report on Groundwater Prospects, Pt. sec. 961, Hd. Adelaide, City Bricks Ltd. Dept. Mines unpublished report, R.B.51/157.

SHEPHERD, R.G., 1954. Preliminary report on a shale deposit, section 961, Hd. Adelaide. Dept. Mines unpublished report. R.B.38/102.

APPENDIX I

LOGS OF DRILL HOLES

(P.G.H. Industries Pty. Ltd.)

Driller's Logs

Hole No. 1

0 - 2.7 m	yellow shale
2.7 - 6.4	soft red brown shale
6.4 - 8.2	light yellow shale
8.2 - 14.6	soft red brown shale

Hole No. 2

0 - 0.9	soft red brown shale
0.9 - 5.5	yellow shale

Hole No. 3

0 - 0.9	yellow shale followed by hard grey shale

Hole No. 4

0 - 0.9	soft red brown shale
0.9 - 2.7	yellow shale followed by hard grey shale

Hole No. 5

0 - 2.7	earth
2.7 - 10.9	light yellow shale
10.9- 13.7	yellow and grey shale

Hole No. 6

0 - 0.9	earth
0.9 - 1.8	grey shale
1.8 - 4.6	light brown shale followed by hard grey shale

Hole No. 7

0 - 4.6	yellow shale
4.6 - 10.0	light brown shale followed by hard grey shale

Hole No. 8

0 - 2.7	soft red shale
2.7 - 3.7	grey shale followed by hard grey shale

Hole No. 9

0 - 3.7	soft light red shale
3.7 - 5.5	yellow shale followed by hard grey shale

Hole No. 10

0 - 0.9	earth
0.9 - 1.8	yellow shale, becoming hard.

Hole No. 11

0 - 2.7	soft red and yellow shale
2.7 - 4.6	yellow shale, becoming hard.

Hole No. 12

0 - 1.8	light yellow shale
1.8	hard

Hole No. 13

0 - 1.8	light yellow shale
1.8	hard

Hole No. 14

0 - 2.7	earth
2.7 - 4.6	yellow shale
4.6 - 5.5	grey shale
5.5	hard

APPENDIX II

CALCULATION OF RESERVES

I Reserves within the present quarry area

These reserves were calculated from cross sections A, B and C. Extension of the quarry to the southeast of the present area is restricted by a house.

The cross section of reserves on A-A' = A = 4 160 m^2

The cross section of reserves on B-B' = B = 3 200 m^2

The cross section of reserves on C-C' = C = 2 360 m^2

The distance between cross section A-A', B-B' and C-C' = 37 m

Therefore the volume of reserves

$$= \left(\frac{A + B}{2} + \frac{B + C}{2} + \frac{C + \frac{1}{2}C}{2} + \frac{A + \frac{2}{3}A}{2} + \frac{\frac{2}{3}A + 0}{2}\right) \times 37 \text{ m}^3$$

where $\left(\frac{C + \frac{1}{2}C}{2}\right) 37$ = estimated volume north of cross section C

and $\left(\frac{A + \frac{2}{3}A}{2} + \frac{\frac{2}{3}A + 0}{2}\right) 37$ = estimated volume south of cross = 491 808 m^3

= 491 808 m^3

= 490 000 m^3 (approximately)

Assuming an average S.G. for shale of 2.5
Reserves = 1 225 000 tonnes.

II Total reserves within the Private Mine

Reserves of shale within Private Mine 59 were calculated from cross sections D-D', E-E' and F-F'.

Reserves above the present quarry floor level (558 m)

The cross section of reserves on D-D' = D = 5 750 m^2

The cross section of reserves on E-E' = E = 4 310 m^2

The cross section of reserves on F-F' = F = 1 060 m^2

Reserves of shale

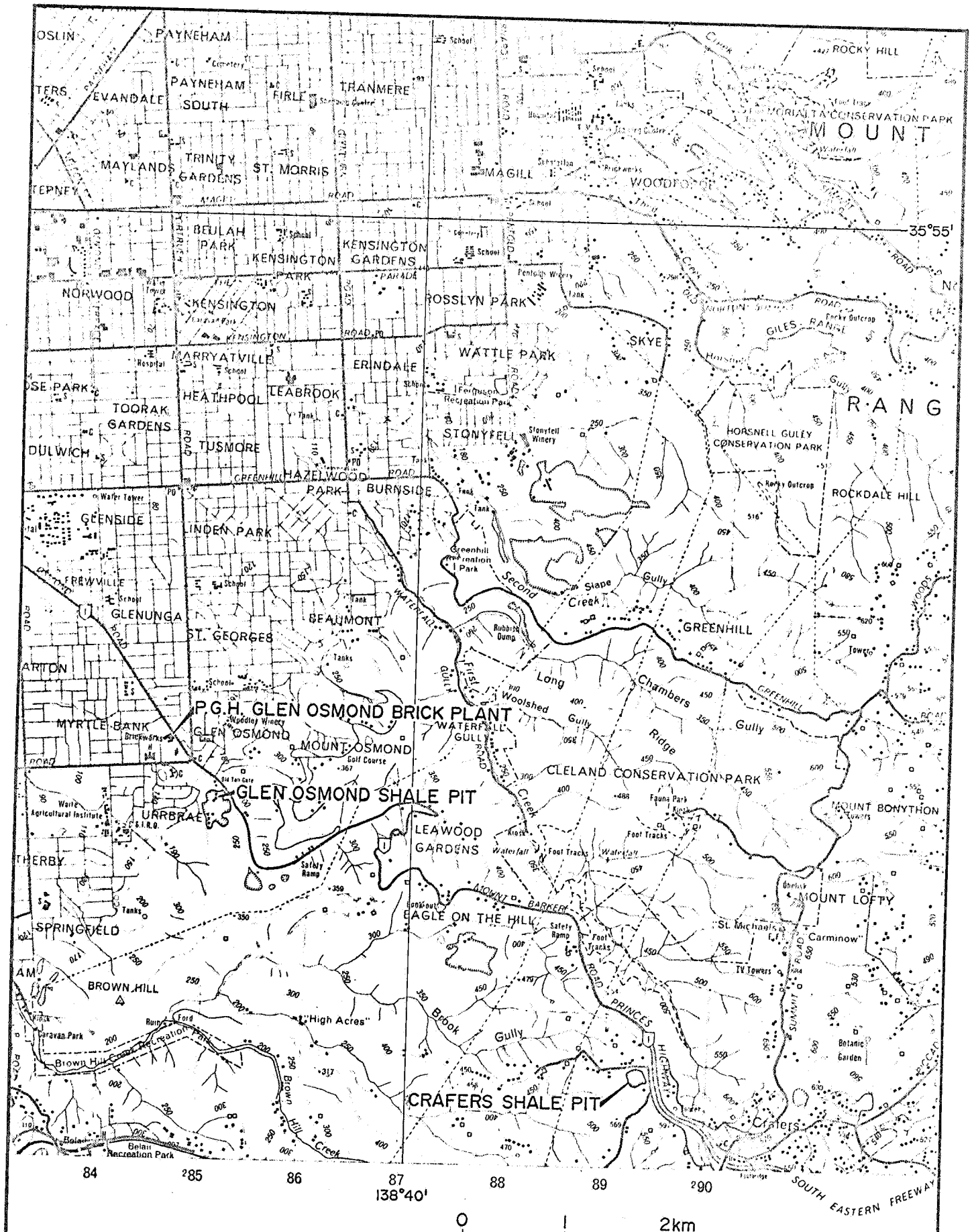
$$= \left(\frac{E + D}{2} + \frac{D + F}{2}\right) 125 + \left(\frac{F + 0}{2}\right) 87.5 \text{ m}^3$$

where the distance between cross sections D-D', E-E' and F-F' = 125 m and the distance between cross section F-F' and the northwest corner of the Private Mine = 87.5 m.

Reserves = 1 100 750 m^3

= 1 100 000 m^3 (approximately)

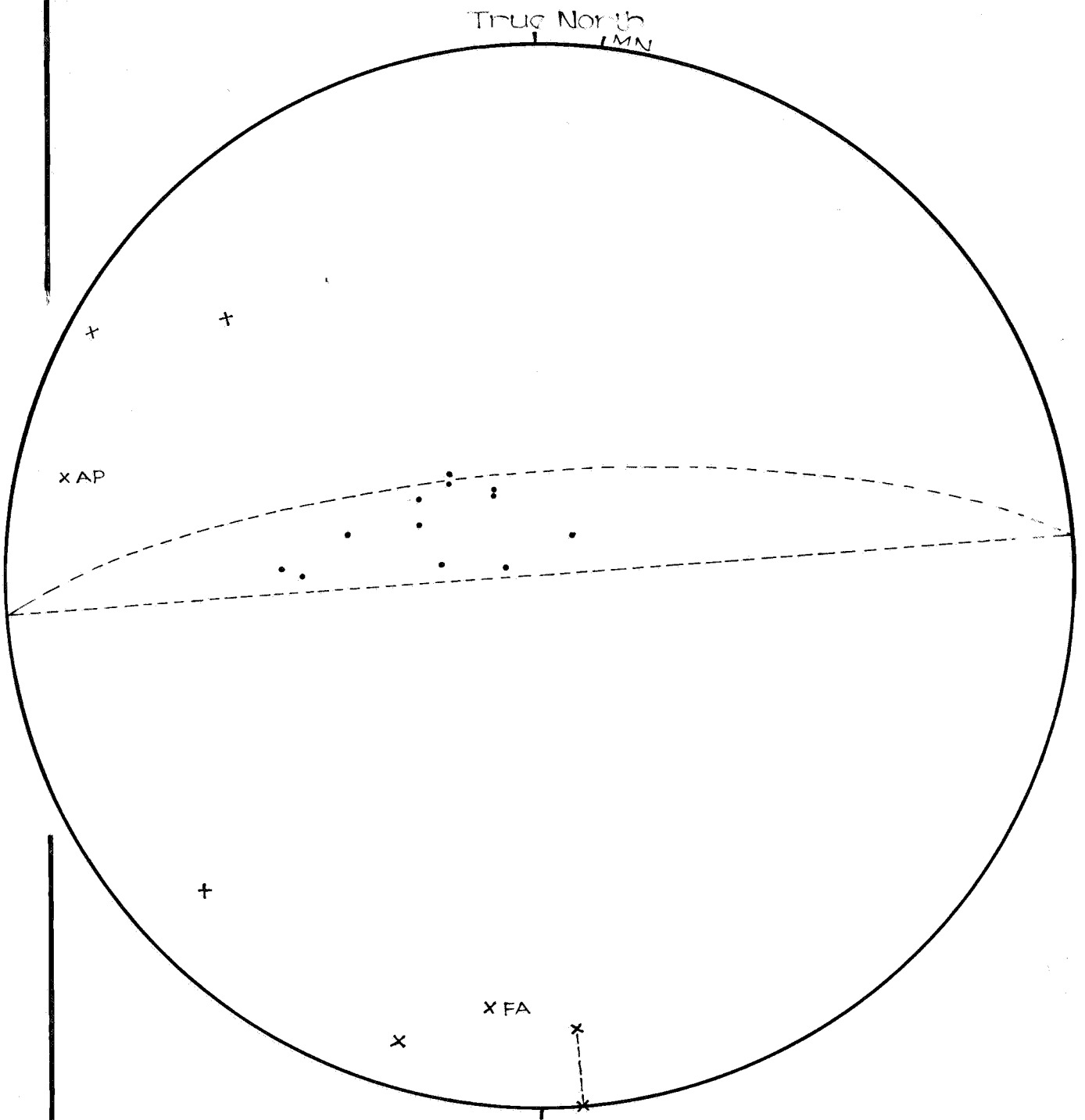
= 2 750 000 tonnes



Part of ADELAIDE 1:50 000 Topographical sheet.

Fig. 1

EXTRACTIVE MINERALS SECTION	DEPARTMENT OF MINES—SOUTH AUSTRALIA	SCALE: 1:50 000
COMPILED: W.S.McC.	GLEN OSMOND AND CRAFERS SHALE PITS LOCALITY MAP	DATE: 2·3·77
DRN: A.F. / CKD.		PLAN NUMBER: S12605



Equal Areas Stereographic Net

LEGEND

- • Poles to bedding plane
- × Poles to jointing plane
- XAP Pole to axial plane
- XFA Fold axis (measured)
- ---- Interpreted bounds to bedding distribution
- x---x Fold axis (interpreted from bedding)

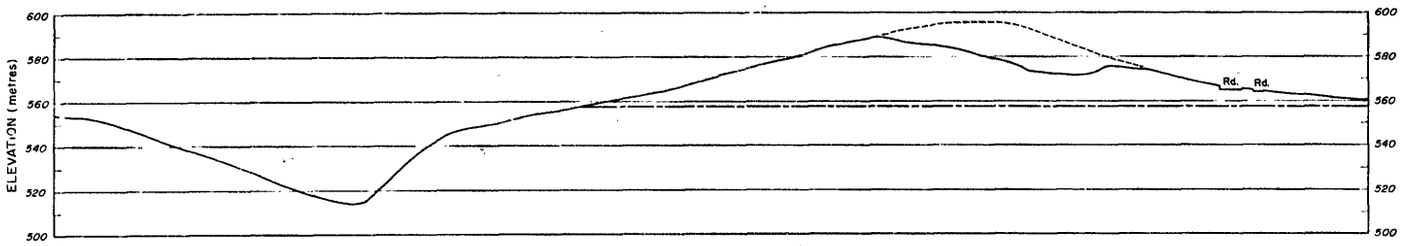
Therefore, Fold axis is in the range (0-20°)→(176° – 187°)

Pole to Axial Plane is in the range 80°→(86°-102°)

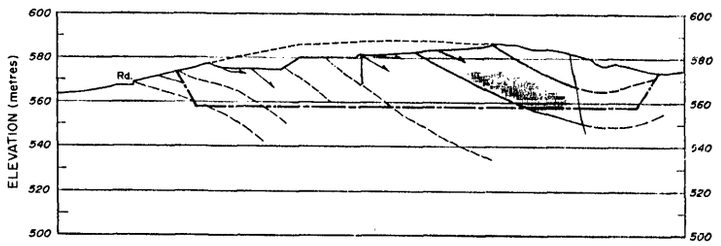
FIG.3

DEPARTMENT OF MINES — SOUTH AUSTRALIA

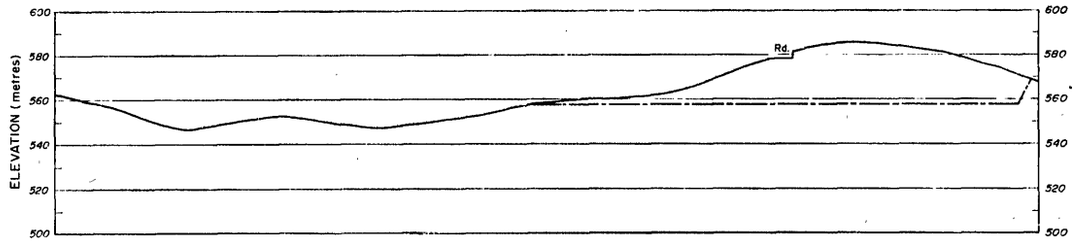
EXTRACTIVE MINERALS SECTION	Drn. WM Tcd. R B Ckd. Exd.	CRAFERS SHALE QUARRY SEC. 961 HD. ADELAIDE STEREOGRAPHIC PLOT OF POLES TO BEDDING & JOINTING	SCALE: DIAG. S11420 DATE: 28th FEB 1975



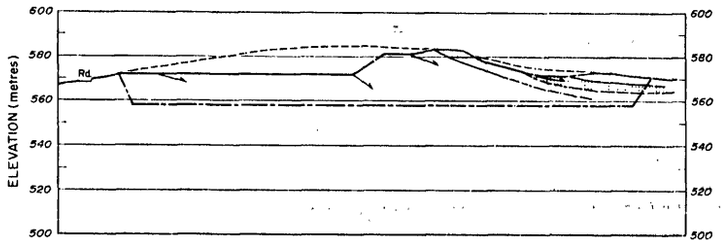
SECTION D-D'



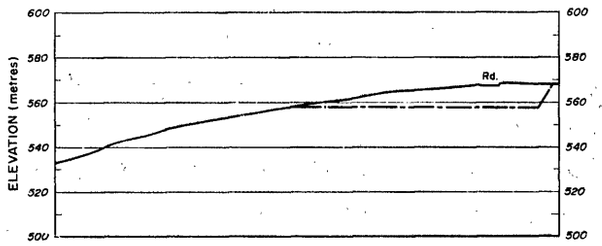
SECTION A-A'



SECTION E-E'

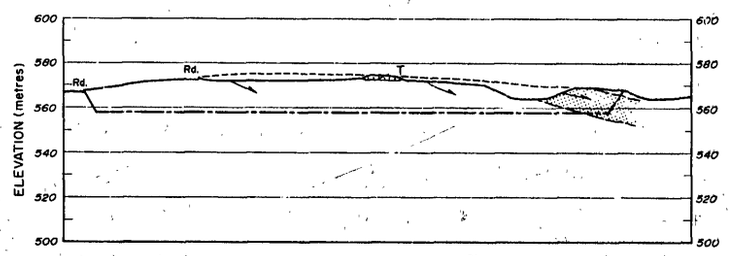


SECTION B-B'

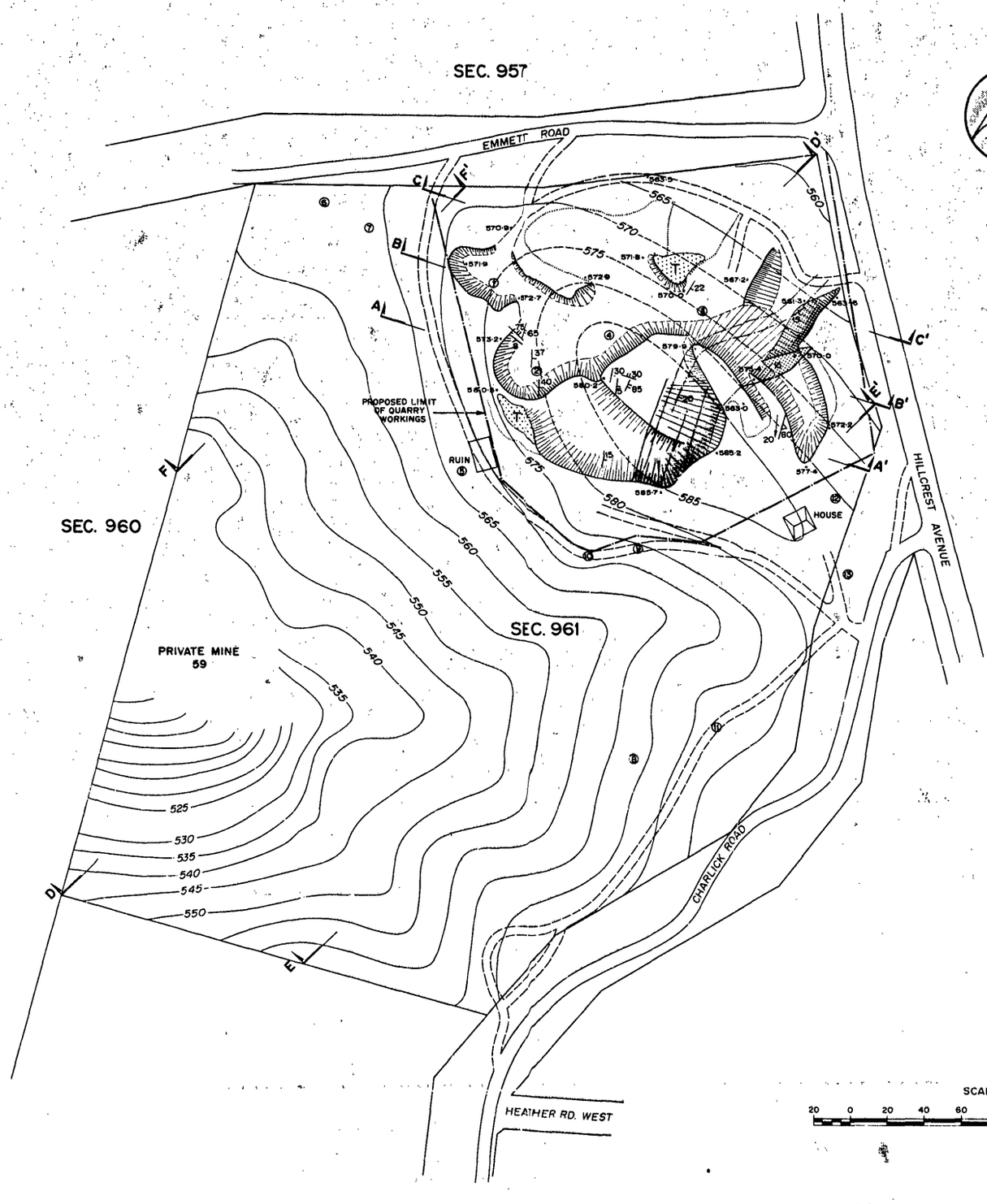


SECTION F-F'

- GEOLOGICAL BOUNDARIES
- POSSIBLE GEOLOGICAL BOUNDARIES & TREND LINES
- DIP OF BEDDING
- TOPOGRAPHY PRIOR TO QUARRYING
- POSSIBLE LIMIT OF QUARRY WORKINGS



SECTION C-C'



SCALE = 1:2000

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

metres

REFERENCE

TERTIARY

T — RED TERTIARY GRAVELLY CLAY WITH FRAGMENTS OF WEATHERED SLATE

UPPER TORRENSIAN

GLEN OSMOND SLATES: BROWN AND GREY SLATE WITH VARYING DEGREES OF WEATHERING. PROMINENT CLEAVAGE PARALLEL TO FINE LAMINATIONS

BROWN WEATHERED SLATE WITH FERRUGINIZATION LEADING TO PISOLITES 10cm x 30cm AND ORIENTATED PARALLEL TO BEDDING. IRON STAINING AND CEMENTATION

GREY SLATES WITH HARD QUARTZITE INTERBEDS 10-20cm. THICK AND CONSTITUTING 5-10% OF THE ROCK, INCREASING TO 30% IN EXTREME SOUTH OF QUARRY

- TREND LINES WITHIN GEOLOGICAL UNITS
- POSSIBLE LIMIT OF QUARRY WORKINGS
- 30 — BEDDING
- 30 — JOINTING
- 20 — AXIAL PLANE
- FOLD AXIS
- ⑥ — P.G.H. DRILL HOLE
- EDGE OF CLEARED AREA
- 580 — INTERPRETED CONTOURS PRIOR TO QUARRYING
- ·572·9 — SPOT HEIGHT
- QUARRY FACE

DEPARTMENT OF MINES — SOUTH AUSTRALIA

CRAFERS QUARRY
SEC. 961 HD. ADELAIDE
GEOLOGICAL PLAN & SECTIONS

EXTRACTIVE MINERALS SECTION	W.S. McCALLUM GEOLOGIST	Drn: W. Mc.	SCALE: 1:2000
		Tcd: R.G.	75-398
Director of Mines		Ckd:	
		Exd:	DATE: AUGUST 1975