DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY

MINERAL RESOURCES DIVISION

CLAY SHALE DEPOSITS, GLEN OSMOND

Part Section 1079, Hd.Adelaide, County Adelaide

- City Bricks Limited -

by

J.T. VALENTINE
GEOLOGIST
NON-METALLICS SECTION

Rept.Bk.No. 72/32

7th April, 1972

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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Part Section 1079, Hd. Adelaide, County Adelaide

Client: City Bricks Limited

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Rept.Bk.No. 72/32
G.S. No. 4804
D.M. No. 917/71

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SOUTH AUSTRALIA

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ABSTRACT

City Bricks Ltd. is quarrying clay-shale for brickmaking at Glen Osmond. At present the shale is being won from a lower unit of a three unit sequence of two shales separated by quartzite.

Geological mapping and a knowledge of topography enable an estimate of reserves of 6.9 million cubic yards (5.3 million cubic metres) to be made for the upper shale unit.

INTRODUCTION

The shale mining area is 67 acres in area, and is situated on Mt. Barker Road, four miles southeast of Adelaide in part section 1079, Hundred of Adelaide (see illustration S 9685).

City Bricks Ltd. acquired the land from the Hardy family many years ago. A 25 year lease began on 1st June, 1941 to Glen Osmond Quarries. The property is now private land, having been owned by P.G.H. Industries Ltd. since 14th February, 1972.

The area is one of fairly rugged topography, especially in the eastern part of the shale mining area, and extends westward into broad gently sloping hills. The steep slopes are everywhere associated with quartzite outcrop, and the more gentle slopes with shale. Overlying the upper shale is

a thin, widespread soil and grass cover, which results in large areas of poor outcrop. Eucalypts are common throughout and in the south-west part of the shale mining area olive trees abound.

In 1947, J.E. Ridgway conducted a geological survey of the 17 acres then leased by City Bricks Ltd., and using the results from four boreholes prepared a plan and a number of sections (Ridgway (1948). The report includes a reserve estimate by A.T. Armstrong of the lower shale unit only of 2 million tons down to a reduced level of 300 feet - 56 feet below the floor of the City Bricks Quarry at that time (assumed datum).

In August, 1971, M.N. Hiern, Supervising Geologist, and D. Nichol, Geologist, Non-Metallics Section, both of the Mineral Resources Division, carried out a preliminary inspection of the existing and proposed City Bricks workings. D. Nichol reported the existence of two shale units separated by a unit of quartzite, all units dipping approximately south.

The purpose of this investigation was to estimate the reserves, within the City Bricks Ltd. shale mining area of an upper shale unit of a three unit sequence comprising two shale units separated by a unit of feldspathic quartzite.

The shale mining area and environs were geologically mapped using a 1965 Lands Department aerial photograph at a scale of one inch to five chains, and the data was then transferred to an overlay. This was enlarged to scale one inch to 200 feet to correspond with the topographic plan of B.J. O'Callaghan and Associates, surveyors.

At present, shale is being won in the northern quarry, from the lower shale unit. To the south of the present workings lies a higher quarry bench, above which rises a face of quartzite, with an exposure of upper

shale for about 10 feet below the top.

The upper shale is also exposed in the southwestern quarries, and although the upper and lower shales are hard and not weathered to the degree normally required for brickmaking purposes, the proximity of the plant to the quarry (½ mile north-west) makes fine grinding of the shale an economic proposition. An extension of the present operations is proposed to include the upper shale unit.

GEOLOGICAL SETTING

The sequence lies within the Adelaide System, in the north-west of the area bounded by the Eden, Beaumont and Clarendon-Ochre Cove Faults (Sprigg, et al. 1951). Thomson, (1969) gives the position of the sequence as that part of the Burra Group spanning the Sturtian-Torrensian boundary. The upper shale is probably a Mintaro Shale equivalent, and the quartzite the Mitcham Quartzite, both being part of the Belair Sub-Group. The lower shale is possibly a Saddleworth Formation equivalent. (see illustration S 9685).

GEOLOGY OF THE DEPOSIT

STRUCTURE

The sequence is gently folded with folds plunging 5-10° towards 160-180°. The lower (northern) quarry bench is located in a synclinal trough, and the dips steepen to the east and west towards adjacent anticlinal crests.

Faulting in the shale mining area is minor and displacements are small. Near the top of the lower shale unit in the northern quarry face, an arkose band 6 feet in thickness can be seen to have been vertically

displaced 10 feet, west side down. This feature may be due to a north-south fault, passing through an area of anomalous (steeper) dips about 200 feet south southwest of the southern pistol range.

In addition, a fault may be present following a small valley trending northwest from the area of anomalous dips. A large amount of quartzite float is evident at the northwest end of the valley, and suggests that shattering has taken place due to faulting.

Intense fracturing is evident especially in the quartzite unit. Two dominant sets of vertically dipping joints were recognised striking 210 and 070.

LITHOLOGY

Lower Shales: The rocks in this unit are well bedded, soft and highly weathered in the upper part, and grey, green, pink, and yellow in colour. A dominant cleavage is evident, and iron staining is common.

The arkose band near the top of this unit contains abundant quartz veins, is brown in colour, and has a very weathered appearance due to the decomposition of the feldspar. The quartz/feldspar ratio in this band is about 60/40.

A white quartzite band, trending northwest was observed near the top of the lower shale unit, just outside the western boundary of the shale mining area due west of the present workings.

Quartzite: This unit is about 150 feet thick, feldspathic in part, and varies in colour from pink to white. Shaley pockets containing sulphides are evident, and fracturing is common. In the east of the area, the boundary between the upper shale and the quartzite was observed to be transitional, the shale having poorly cemented, coarser quartz rich bands in its lower part.

Upper Shale: The shale in this unit is generally green or grey in colour with a yellow weathered horizon about 8 feet thick, which forms a

cap to the unit in the southwestern quarries. Purple shales exist outside the shale mining area to the south.

The unit is of low clay content, not well bedded, has a dominant cleavage, and exhibits a marked fissility at some locations.

RESERVES ESTIMATE

The reserves of upper shale within the shale mining area were calculated assuming that the regional plunge was 10 degrees south, and that the shale contained no quartzite bands. The estimate allows for 20 foot benches and 60 degrees batter slopes with vertical falls of 65 feet. Allowance was also made for a 30 feet wide buffer zone along the western boundary of the shale mining area adjacent to a housing subdivision.

The calculation was made from eight north-south sections, 200 feet apart, each drawn at a scale of one inch to 100 feet. The sum of the products of half the sum of the areas of two adjacent sections, and the distance between the two sections gave the total volume of upper shale. (Note: The reserves on page 6 were derived from Sections drawn at a scale of one inch to 100 feet, and not from the Sections on illustration 72-87 which are at a scale of one inch to 200 feet).

The S.G. of a sample of upper shale was found by the Geophysics Laboratory at the Thebarton Depot to be 2.5% dry, and 2.62 damp. An S.G. of 2.60 (1.96 tons per cubic yard) was used in the tonnage calculation.

CROSS SECTION	AREA OF CROSS SECTION (sq. inches)	TOTAL (sq. inches) A	DISTANCE BETWEEN SECTIONS (feet) B	VOLUME $\frac{A}{2} \times 10^4 \times B$ (c. ft.)
0 (buffer zone)	0	7.79	60	2,337,000
1	7.79	22.54	200	22,540,000
2	14.75	28.37	200	20,370,000
3	13.62	29.46	200	29,460,000
4	15.84	25.18	200	25,180,000
5	9.34	21.64	200	21,640,000
6	12.30	29.53	200	29,530,000
7	17.23	24.59	200	24,590,000
8	7.36	7.36	90	3,312,000
9 (edge of shale-quartzite boundary)	0			

TOTAL VOLUME 186,959,000 cubic feet

Calculations

$$2.60 = \frac{\text{weight 1 c. ft. of shale}}{\text{weight 1 c. ft. of water}}$$

Weight 1 cubic foot of water = 62.5 lbs

Weight 1 cubic foot of shale = 2.60 x 62.5

= 162.5 lbs

Total reserves = 186,959,000 cubic feet

= $187.0 \times 163 \times 10^6$ lbs

= 3.04×10^{10} lbs

= $3.04/_{2.24} \times 10^7$ tons

= 1.356×10^7 tons

= 13,560,000 tons

= 6,918,400 cubic yards (1 cubic yard = 1.96 tons)

= 5,294,000 cubic metres (35.3 cubic feet = 1 cubic metre)

CONCLUSIONS AND RECOMMENDATIONS

Significant errors in the reserves estimate would be introduced if the upper shale is not all of brickmaking quality, and if the plunge of the unit is at all removed from 10 degrees south.

It is therefore recommended that an air-rotary drill hole be put down on section line 5W, as near as possible to the southern boundary of the shale mining area to:

a) determine the position and attitude of any intervals other than shale, and,

b) to check on the attitude of the regional dip of the sequence.

7.4.72

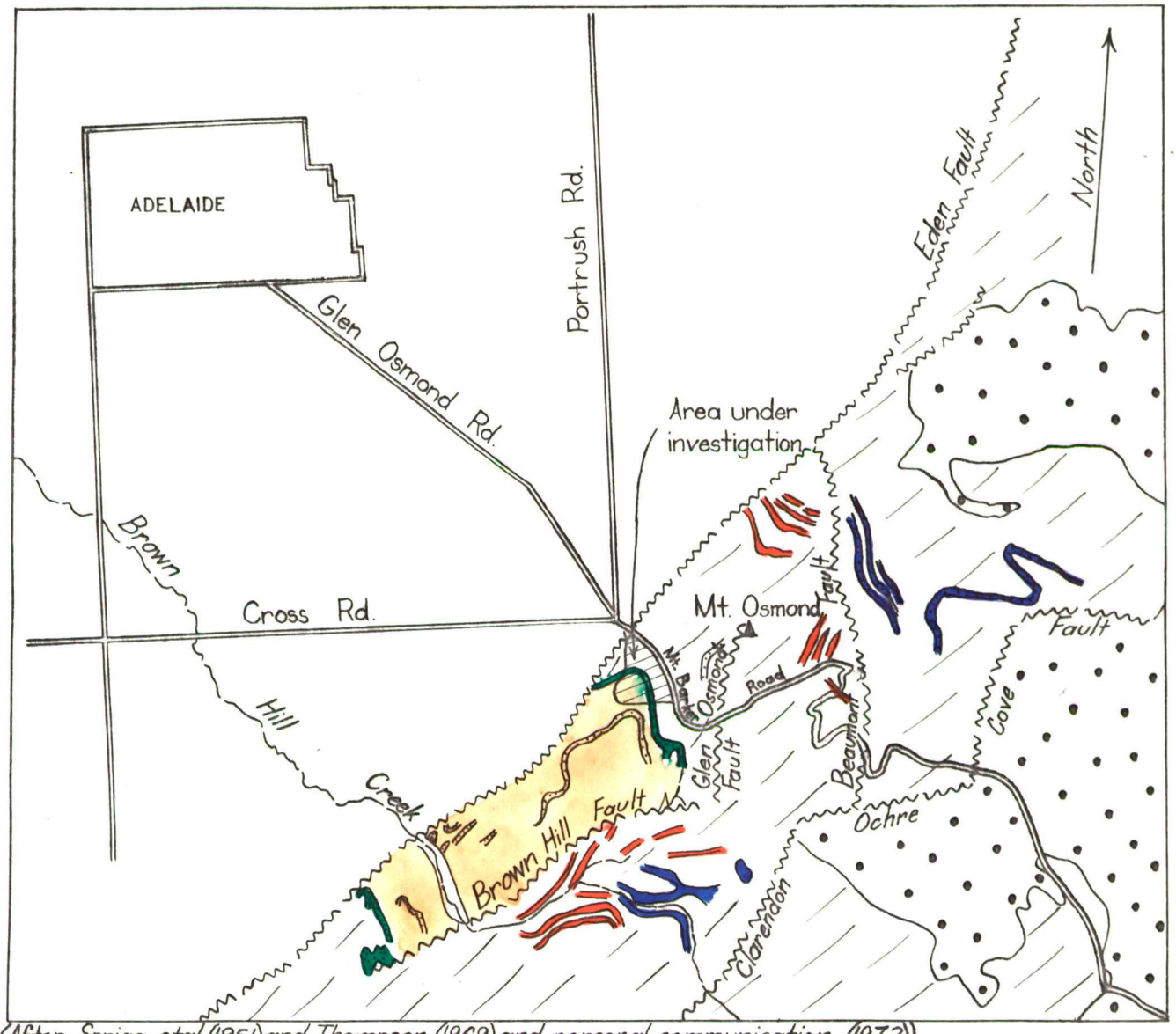
J.T. VALENTINE
GEOLOGIST

REFERENCES

Ridgway, J.E., 1948. Clay slate deposits for brickmaking - City Bricks Ltd., lease, Glen Osmond. Min. Rev. Adelaide, 90: 177.

Sprigg, R.C., Whittle, A.W.G., Campana, B., 1951. Adelaide map sheet, Geological Atlas of South Australia, 1:63 360 series, geol. Surv. S.Aust.

Thomson, B.P., 1969. ADELAIDE map sheet, Geological Atlas of South Australia, 1:250 000 series, geol. Surv. S.Aust.



(After Sprigg, et al, (1951,) and Thompson, (1969,) and personal communication, (1972))

STURTIAN RECENT

UMBERATANA GROUP
FARINA SUB GROUP

Tapley Hill Formation. Sandy shale and slate, siliceous limestone, intraformational breccia.

Geological boundaries

Faults

STURTIAN

BELAIR SUB-GROUP

Green and grey laminated shale (Mintaro Shale equivalent Upper Shale of City Bricks area) Mitcham Quartzite (quartzite of the area) at base.

TORRENSIAN

BURRA GROUP

Beaumont Dolomite minor quartzite bands.

Saddleworth Formation equivalent green and grey laminated shale. (Lower shale of City Bricks area)

Stonyfell Quartzite

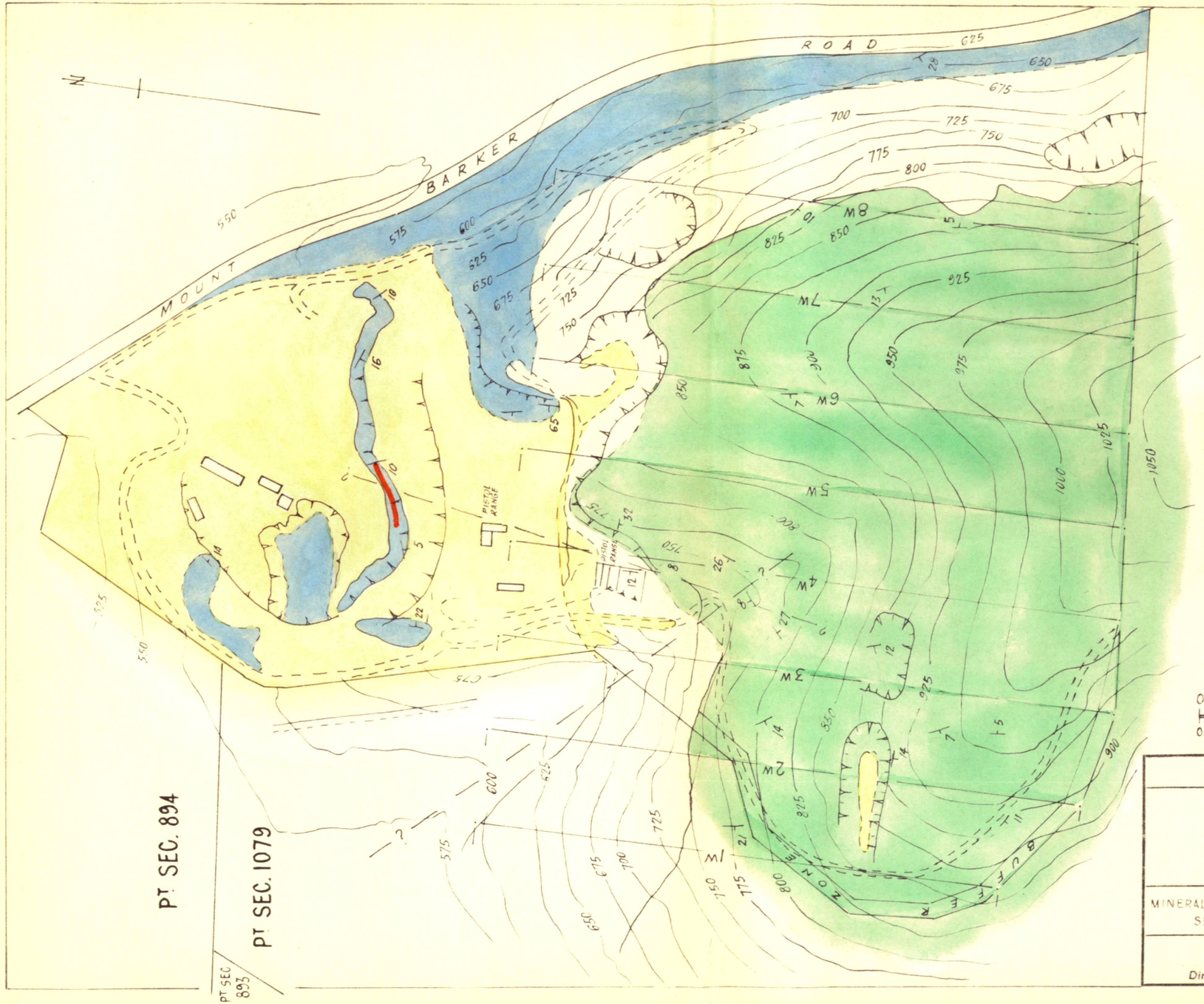
SCALE

Metres 1000 0 1000 2000 3000 4000 5000 Metres

Chains 40 20 0 80 160 240 Chains

NON-METALLIC MINERALS SECTION	**DEPARTMENT OF MINES — SOUTH AUSTRALIA**	Scale: 1:63,360 (ORIG.)
Compiled: J.V.	GLEN OSMOND QUARRY PT. SEC. 1079 HD ADELAIDE REGIONAL GEOLOGICAL PLAN (CITY BRICKS LTD.)	Date: 28·2·72
Drn. S.J.C. Ckd. R.H.		Drg. No. S9685 Ha 6

1M—2.70 A1810



LEGEND

- Upper Shale
- Quartzite
  - Principally waste rock or rubble.
  - White quartzite band
  - Arkose band
- Lower Shale
- Lithological Boundary
- " " (approx)
- Strike & dip of Bedding (Layering)
- Fault - existence uncertain
- Contours at 25 ft intervals (Datum - Mean Sea Level Pt Adelaide)
- Section Line 3W
- Quarry
- Track

0 200 400 600 800 1000 FEET
0 100 200 300 METRES

DEPARTMENT OF MINES -- SOUTH AUSTRALIA

GLEN OSMOND QUARRY
CITY BRICKS LTD.
PT SEC. 1079 Hd ADELAIDE
GEOLOGICAL PLAN

MINERAL RESOURCES SECTION	Compiled by J Valentine	Drn. J V	SCALE: 200 FT.
		Tcd. B.S.G.	72-55 Hd 6
Director of Mines		Ckd.	
		Exd.	DATE: 14th February 1979

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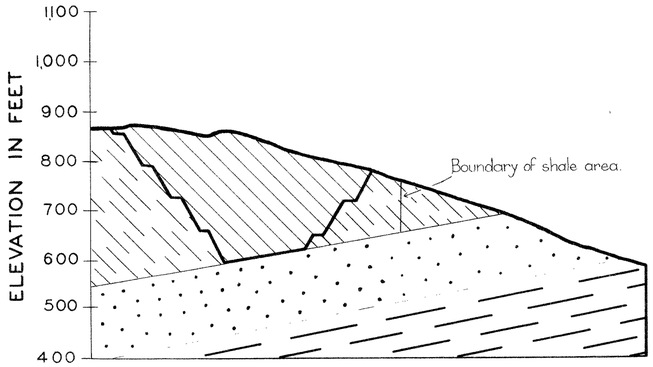

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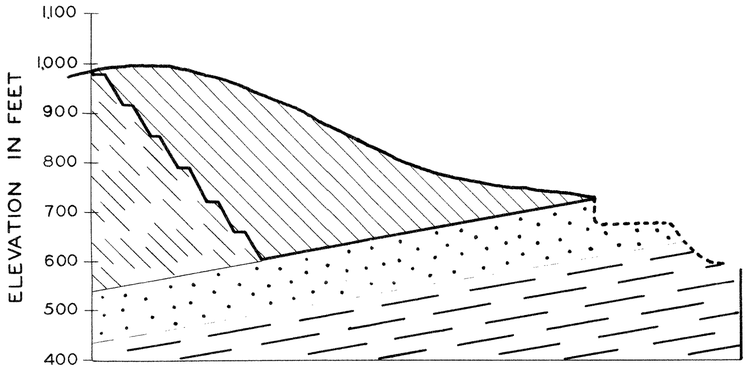

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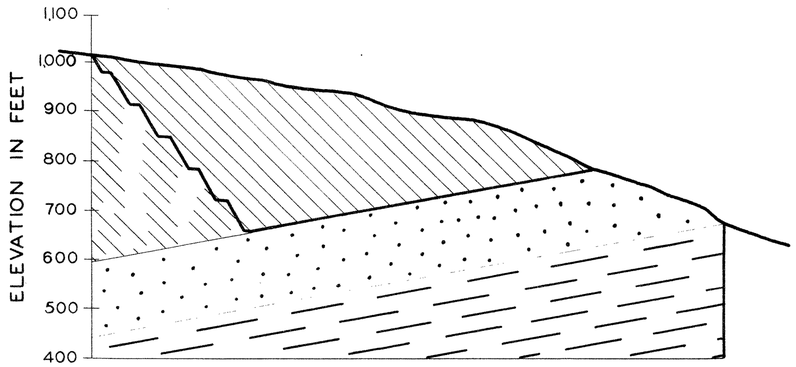

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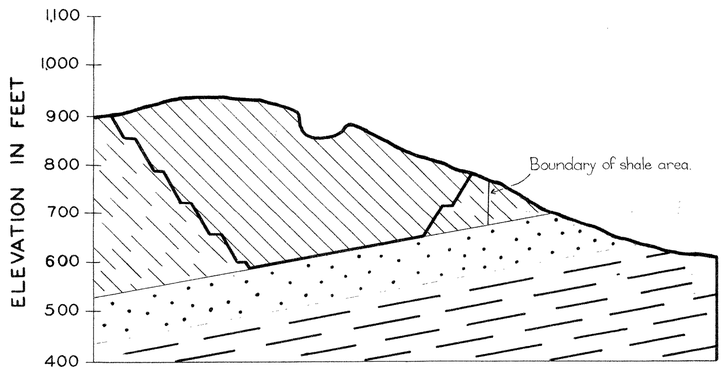

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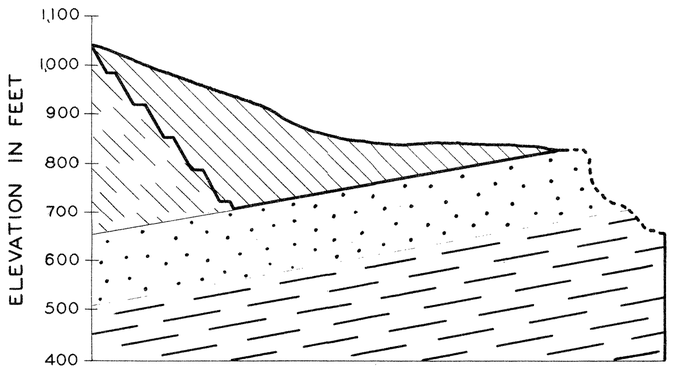

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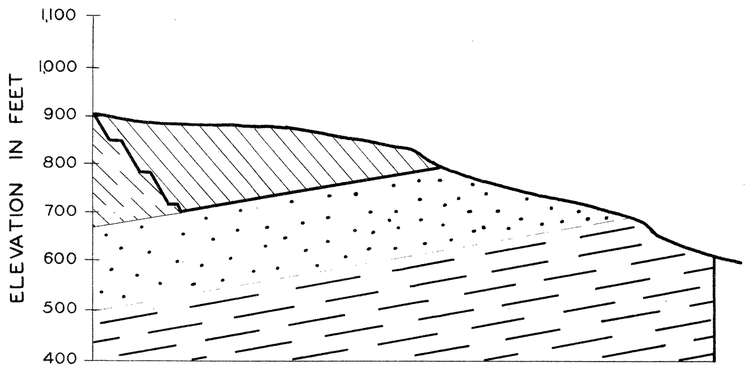

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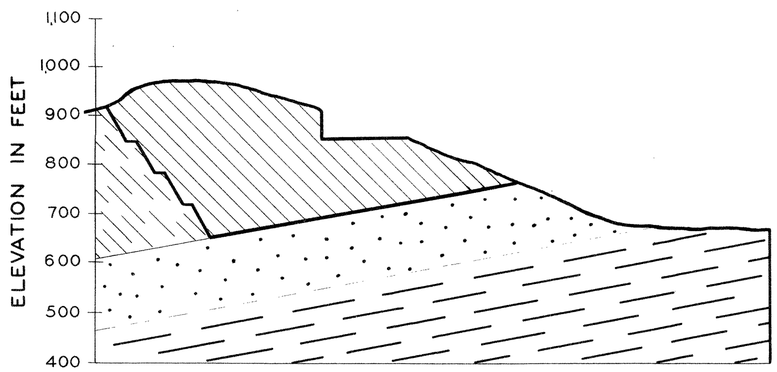

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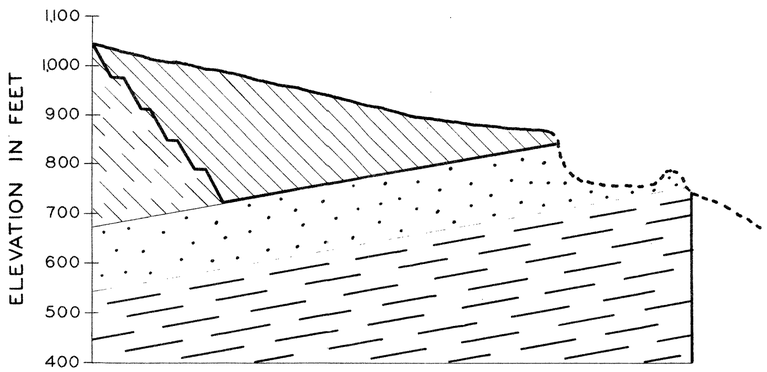

LEGEND

- Available shale reserves.
- Upper shale.
- Quartzite.
- Lower shale.

SCALE IN METRES
100 0 100 200 300
SCALE IN FEET
200 0 200 400 600 800 1000

DEPARTMENT OF MINES — SOUTH AUSTRALIA

GLEN OSMOND QUARRY
CITY BRICKS LTD.
PT. SEC. 1079 Hd. ADELAIDE
GEOLOGICAL SECTIONS

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		Exd.	DATE: 29TH FEB. 1972