DEPARTMENT OF MINES
SOUTH AUSTRALIA

GEOLOGICAL SURVEY
ENVIRONMENT AND RESOURCE DIVISION

BARITE DEPOSITS NEAR MT. JOHN OUT OF COUNTIES, FLINDERS RANGES

(ML. 4319 & 4320 - J.H. Coad)

by

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INDUSTRIAL MINERALS SECTION

Rept.Bk.No. 76/130
G.S. No. 5800
DM. No. 794/73

14th October, 1976

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PLANS

DEPARTMENT OF MINES
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ABSTRACT

Since 1942, 1 885 tonnes and 1 193 tonnes of industrial grade barite have been produced respectively from the Mt. John and Potato Patch barite deposits near Mt. John in a Class B Environmental Area in the eastern Flinders Ranges.

Barite has formed in fracture zones within the Mt. Chambers Diapir at the Mt. John deposit and along the faulted contact between Cambrian and Adelaidean sediments at the Potato Patch deposit.

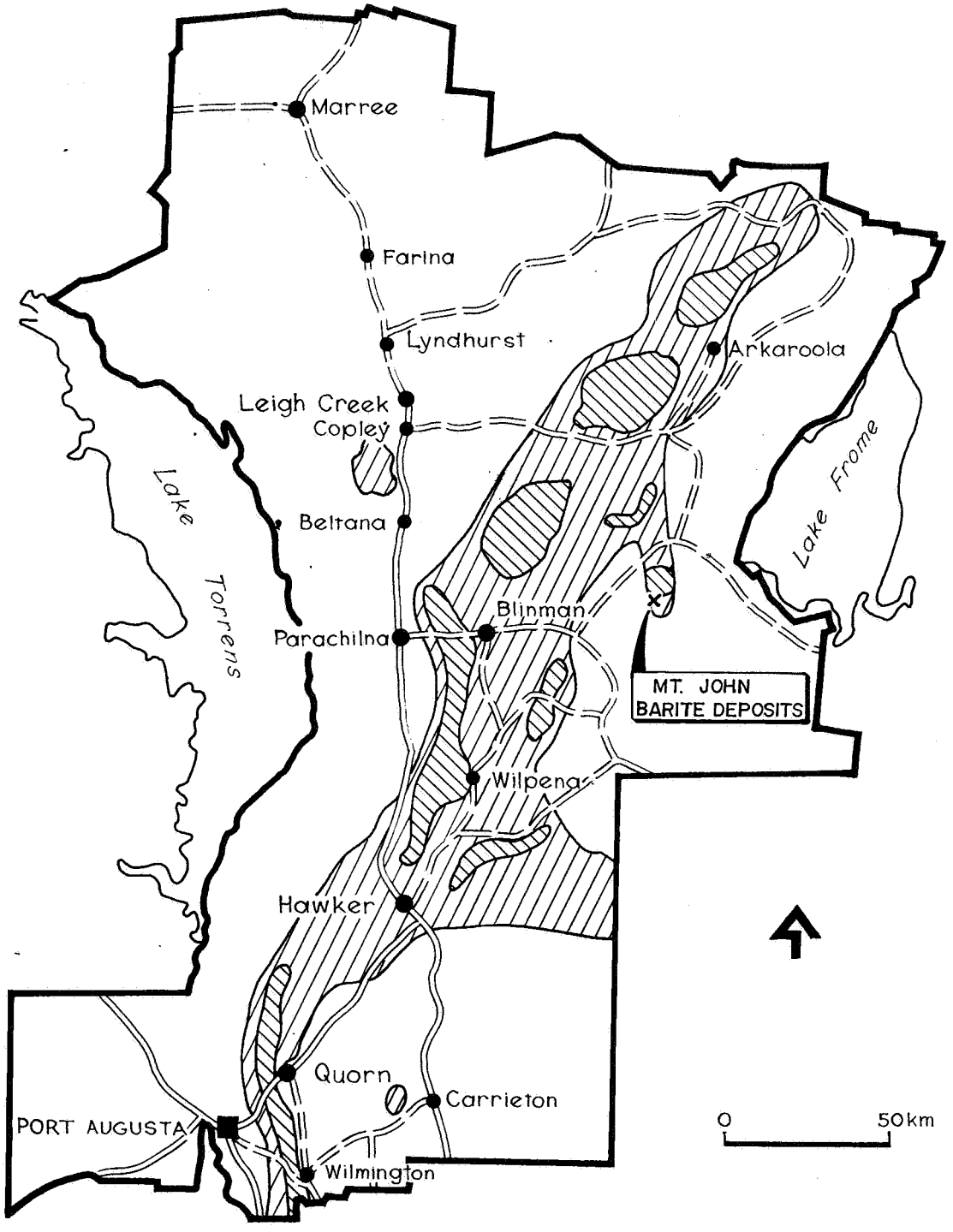
Unsorted barite from both deposits satisfies oil drilling requirements. High quality barite suitable for pigments can be obtained from both deposits by selective mining and hand sorting.

Mt. John deposit contains indicated reserves of 4 400 tonnes in Lode 1 and 3 200 tonnes in six smaller lodes. A further 6 000 tonnes is inferred in Lode 1 to 10 m below creek level. There are 140 tonnes of measured reserves at Potato Patch with a further 1 500 tonnes indicated and 2 700 tonnes inferred.

INTRODUCTION

During an inspection of barite deposits in the Flinders Ranges, the Mt. John and Potato Patch Barite Deposits were mapped on 1st and 2nd June, 1975. The accompanying geological plans and sections (Figs. 4 to 8) are based on stadia theodolite surveys by the authors and R.J. Harris (Technical Assistant). The deposits were revisited on 24th November, 1975 to record subsequent work by the lease holder

The western barite deposit was called Potato Patch by the leaseholder as the barite ocourred mainly as boulders, up to ½ tonne, with a dark grey skin.



ENVIRONMENTAL AREAS

- Class A
- Class B
- Class C

- Country Township
- Special Township
- Main road
- Secondary road

FIG. 1

DEPARTMENT OF MINES — SOUTH AUSTRALIA

INDUSTRIAL MINERALS SECTION	Drn. J.O.	FLINDERS RANGES PLANNING AREA	SCALE: 1:2000 000
	Tcd. J.W.	**BARITE DEPOSITS NEAR MT. JOHN**	S12370
	Ckd.	LOCALITY PLAN	
	Exd.		DATE: 20-9-76

500—2.69 665

Nine samples of barite were submitted to the Australian Mineral Development Laboratories (AMDEL) for physical and chemical analysis, the results of which are detailed in Appendix B. Appendix A contains petrographic descriptions of two of these samples.

LOCATION

The barite deposits are located on Wirrealpa Station, out of counties, approximately 5 km east-southeast of Mt. John (see Fig. 2). The deposits lie within a Class B Environmental Area as defined in the Flinders Ranges Planning Area Development Plan (see Fig. 1).

Access is northeastwards from Wirrealpa Station turning off 17 km along the road to Wertaloona. A well used track is followed eastwards for 11.4 km, thence northward across Bendieuta Creek for 8.6 km to the Potato Patch Deposit. The Mt. John Deposit is a further 1.2 km to the northeast (see Fig. 3). The tracks from the Wirrealpa-Wertaloona road are negotiable by all vehicles except after moderate rainfall.

Terrain is gently indulating, and sparcely vegetated east of a range of hills containing Mt. Chambers and Mt. Frome. Mt. John deposit is situated in a right angle bend of a major southerly draining creek whereas Potato Patch is in flat open ground (see Plate 1).

MINERAL TENURE AND PRODUCTION

Mineral tenure of the Mt. John and Potato Patch Barite Deposits, which have been held since 1942 and 1945 respectively, are detailed in Table 1.

Plate 1 (IBKF 008) Potato Patch Barite Deposit (June, 1975)

Open cut, west of Survey Station. Looking to the east. Terrain is flat with Mt. Chambers on skyline. Country rock in both walls is bleached and altered.

TABLE I

Mining Tenements, Near Mt. John

Mt. John Deposit

Tenement	Holder	Registered	Area	Termination
M.C. 454	E.M. Coad	13/10/42	40 a	Cancelled 21/10/46
M.C. 950	E.M. Coad	25/10/46	40 a	Cancelled 1/11/50
M.C. 1808	J.H. Coad	4/11/52	40 a	Converted to M.L. 4319
M.L. 4319	J.H. Coad	29/11/73	16 ha	Granted for 7 years, due to expire on 28/11/80.

Potato Patch Deposit

M.C. 730	E.M. Coad	20/6/45	40 a	Cancelled 5/12/49
M.C. 1809	J.H. Coad	4/11/52	15 a	Converted to M.L. 4320
M.L. 4320	J.H. Coad	29/11/73	6 ha	Granted for 7 years due to expire on 28/11/80

Corner posts for ML. 4319 are outside the area mapped on Figs. 4 and 5.

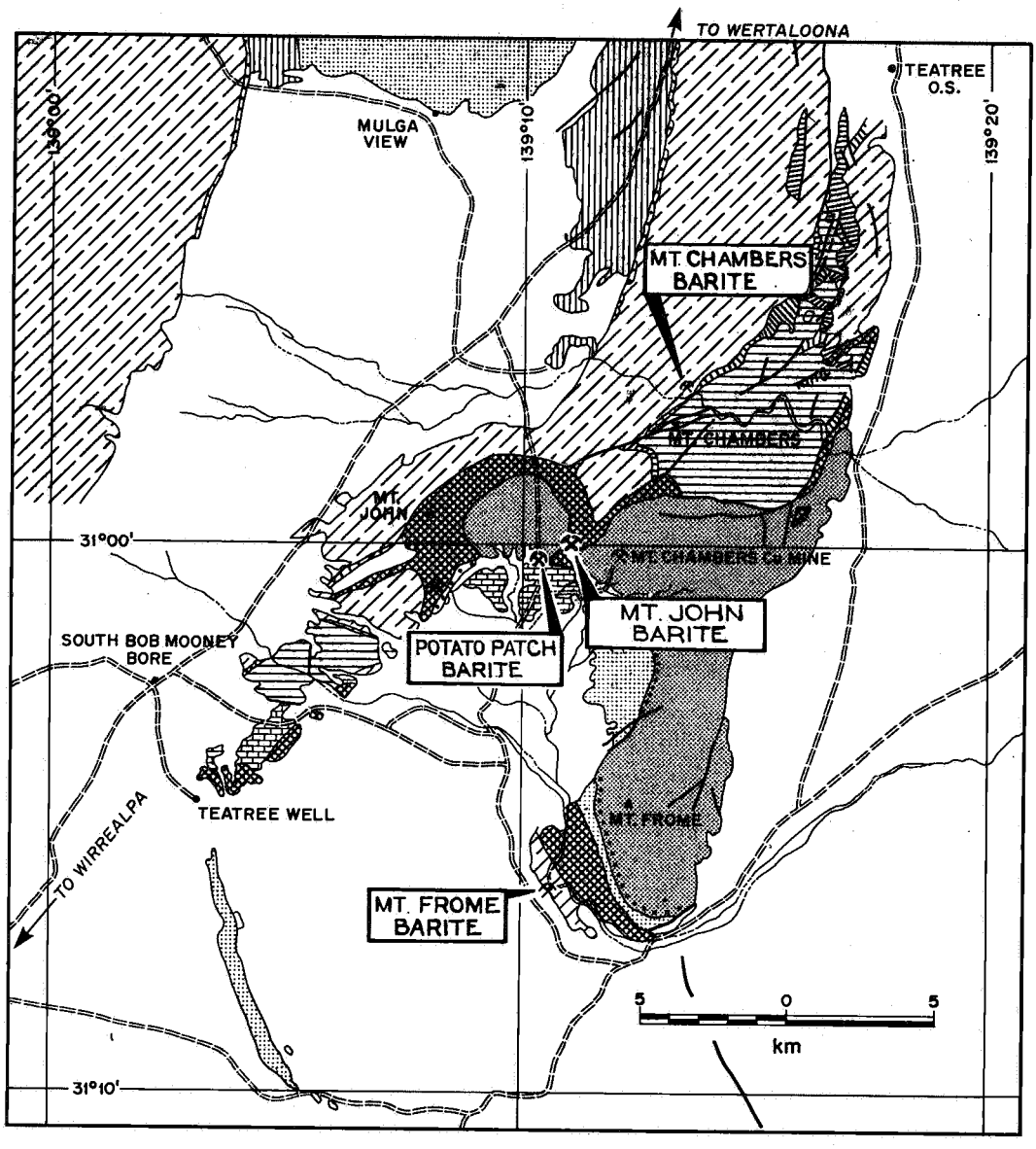
Actual area of M.L. 4320 is 1.5 ha based on dimensions as shown on Fig. 7.

Production of barite based on returns submitted to the Department of Mines is listed in Table 2.

TABLE 2

Production of Barite, near Mt. John

	Mt. John	Potato Patch
1942	210	Nil
1943	80	Nil
1944	Nil	Nil
1945	47	175
1946	280	461
1947	127	55
1948-59	Nil	Nil
1960	22	8
1961	9	Nil
1962	50	15
1963	12	Nil
1964-66	Nil	Nil
1967	37	70
1968	35	115
1969-71	Nil	Nil
1972	80	60



REFERENCE

QUATERNARY		UNDIFFERENTIATED ALLUVIUM SANDS, CLAYS, GRAVELS
CAMBRIAN		UNDIFFERENTIATED SANDSTONES, SHALES, LIMESTONES PARACHILNA FORMATION AT BASE – ARGILLACEOUS SANDSTONES, SHALES AND LENTICULAR LIMESTONES
WILPENA GROUP		POUND QUARTZITE: FELDSPATHIC QUARTZITES AND SANDSTONES WONOKA FORMATION: GREY-GREEN SHALES, CALCAREOUS SHALES, LIMESTONES AND PEBBLE BEDS BUNYEROO FORMATION: RED-PURPLE SHALES, MINOR LIMESTONES AND DOLOMITE ABC RANGE QUARTZITE: FELDSPATHIC SANDSTONE AND QUARTZITE BRACHINA FORMATION: GREEN-PURPLE SILTSTONES AND SHALES
UMBERATANA GROUP		NUCCALEENA FORMATION: DOLOMITE AND DOLOMITIC SHALE UNDIFFERENTIATED SANDSTONES, SILTSTONES AND SHALES WITH MINOR LIMESTONES AND DOLOMITES
WILLOURAN		TECTONIC CRUSH ZONES (DIAPIRS)
		FAULT

FIG. 2

	DEPARTMENT OF MINES – SOUTH AUSTRALIA	SCALE: 1:250000
COMPILED: D.SCOTT	MT. JOHN BARITE DEPOSITS LOCATION AND REGIONAL GEOLOGY	DATE: APRIL '76
DRN: R.G. CKD. A.F.		PLAN NUMBER: S 12328a

Total Tons	989	959
Equivalent tonnes	1 005	974
1973	300	117
1974	248	69
1975	332	33
TOTAL tonnes	1 885	1 193

MINING OPERATIONS

Mt. John

The deposit was opened up in 1946 (Mansfield, 1947). Shafts 1, 2 and 3 were sunk to depths of 5.3 m on Lode 1, 7 m on Lode 2 and 8 m on Lode 3 respectively. There was no driving from these shafts (J.H. Coad, pers. comm.).

Subsequent production was obtained from adits 1, 2 and 3. After establishing Open Cut 5 on the eastern end of Lode 4, adit 1 was driven on the lode into the hill, on a decline of about 20° in an arc for about 9 m (see Plate 3). The problem of hauling barite ore up this slope to the surface was solved by driving Adit 2 to connect with the lowest point of Adit 1. This connection is now blocked by debris.

Adit 3 on Lode 5, is a straight decline at about 15° which stopped 2 m short of breakthrough into Shaft 3 (see section C-C', Fig. 6 and Plate 4).

Twelve pits have been sunk, essentially for exploration, on the widest portions of Lodes 6-10, with the deepest being 6 m on Lode 9 near Station 2.

Recent activity has been confined to open cuts 1, 2 and 3 on Lode 1. Mining is proceeding towards Shaft 1 from both ends of the lode and future work will concentrate here.

Area disturbed by mining operations, including dumps and tracks, is:

1.1 ha - on Lodes 1-9, north west of creek.

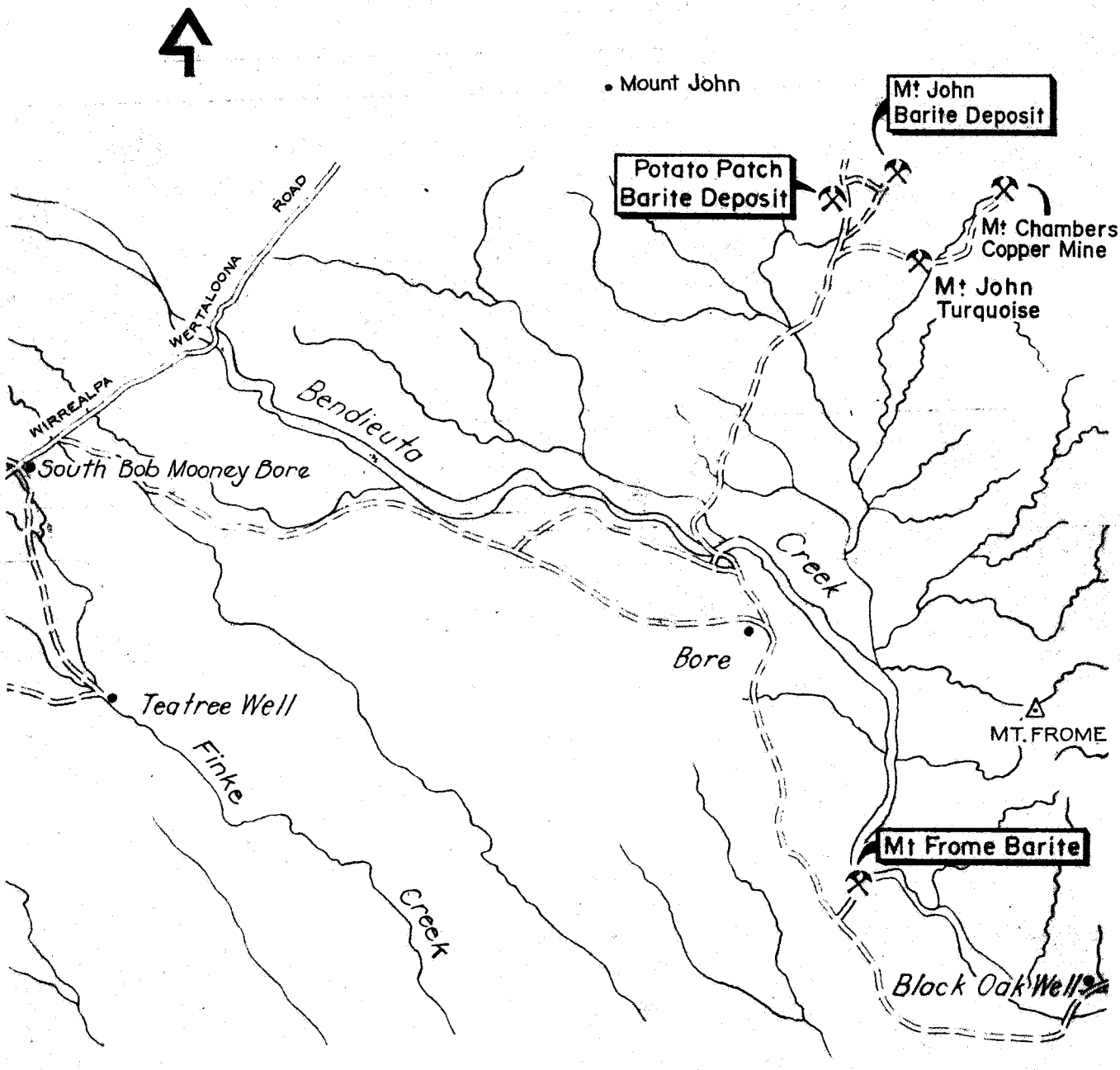
0.03 ha - on Lodes 10a and 10b, south of creek.

Plate 2 (IBKF011) Mt. John Barite Deposit (June, 1975)

Open cut 3, looking at western face. White coarsely crystalline barite is exposed below a strong near horizontal fracture which marks the base of a limestone block. Sample A1875/75 is a chip sample across this exposure.

Plate 3 (IBKF016) Mt. John Barite Deposit (June, 1975)

Portal of Adit 1, which is a decline at 20°. Hammer marks the footwall of the white barite lode, 0.6 m wide, which dips to the south at 40°.



SCALE 1:100,000

KILOMETRES 2 0 2 4 6 KILOMETRES

FIG.3

INDUSTRIAL MINERALS SECTION	DEPARTMENT OF MINES — SOUTH AUSTRALIA	Scale : 1:100000
Compiled D.C.SCOTT	BARITE DEPOSITS NEAR MOUNT JOHN	Date : JUNE 1976
Drn E.B.T. | Ckd	ACCESS PLAN	Drg. No. S 12254a

Potato Patch

This deposit was opened up east of Station 1 in 1945, By July, 1946, workings had reached a depth of 15 m (Mansfield, 1947). This shaft was abandoned at 21 m when conditions became unsafe(J.H. Coad pers. comm.). Backfilling and collapse of the walls have left a hole about 6 m deep (see longitudinal section A-A^1, and cross section D-D^1, Fig. 8).

In recent years, production has been from the open cut west of Station 1 (Plate 1). This opening is about 63 m long and 6 m wide with a face about 5 m high (see longitudinal section A-A^1, Fig. 8).

Area disturbed by mining operations, including dumps, approximates 0.23 ha.

Future mining operations planned by the leaseholder include

- extension of western cut to the east to remove barite above floor level.
- cleaning out of the collapsed area
- screening of the western dumps, which contain abundant small barite boulders up to 0.2 m in diameter in soft weathered siltstone.

Environmental Considerations

The Flinders Ranges Planning Area Development Plan which was authorised on 8th February, 1973 states the following criteria for mining operations in a Class B Environmental Area -

> "Any mining activities should be carried out so as to minimise their effects on the scenic and natural qualities of these areas".

Both deposits are located in an area of low scenic quality well away from tourist roads. Overburden dumps should be kept low and near to the workings for eventual backfilling.

GEOLOGICAL SETTING

The accompanying regional geology plan and stratigraphic table (Fig. 2) are based on the southeastern portion of COPLEY (Coats, 1973) and the northeastern portion of PARACHILNA (Dalgarno and Johnson, 1966).

Barite at the Mt. John deposit has formed in fault zones within the Mt. Chambers Diapir. At Potato Patch, the barite lode trends northeasterly in a fault zone emanating from the southeastern lobe of the diapir. This steeply dipping lode is bounded to the south by siltstones of the Wonoka Formation and to the north by Cambrian limestones.

The lodes have formed by the infilling of open fissures produced by structural movement.

SITE GEOLOGY

Mt. John

Country rock comprises carbonate-rich diapiric material with large randomly orientated rafts of blue-grey to brown fine grained limestone, sandy or shaley in places, in a soft weathered and brecciated matrix.

There are numerous small lenses and pods of barite not shown on Figs. 4 and 5 apart from the 11 designated lodes.

Barite has infilled open fissures between hard limestone blocks and softer matrix. The orientation of the lodes is controlled by two major directions of fracture, viz.

- Lodes 1 and 3-9 have a trend of 245°-280°
- Lodes 2, 10a and 10b have a trend of 190°-220°.

Cross fracturing with a trend of 300° has produced local thickening of Lodes 1 and 2 at Shafts 1 and 2 respectively.

Width of barite, from a mere thread to a maximum of 5 m in Lode 1 at Shaft 1, varies rapidly both vertically and horizontally. Lode 5 is 0.6 m wide in outcrop at Shaft 3 and 1.5 m wide, 2 m below the collar (see Section C-C^1, Fig. 6). Similar thickening is shown in Plate 4.

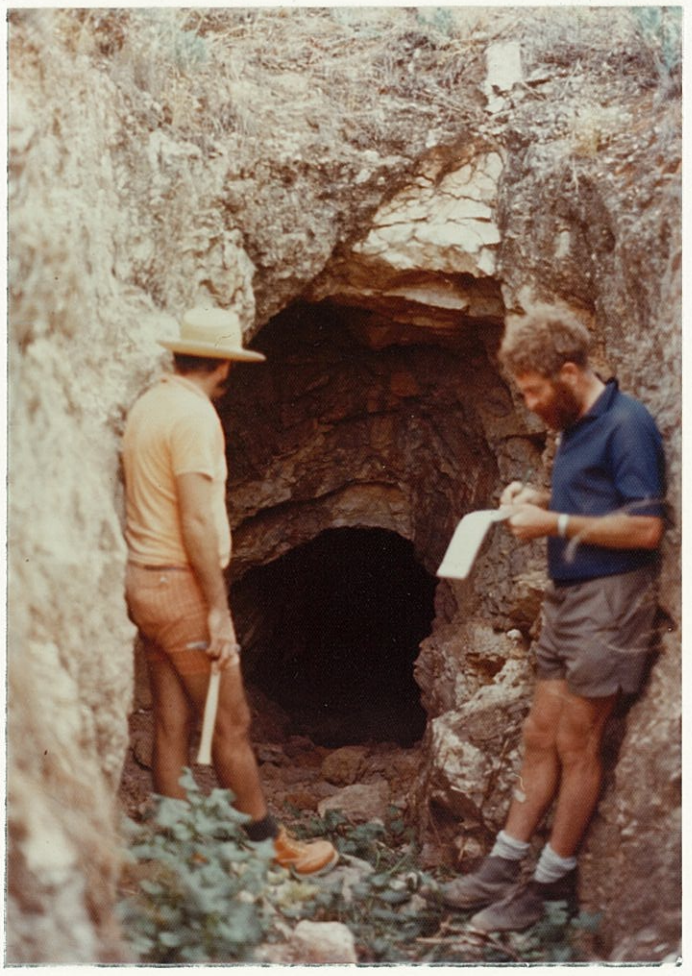


Plate 4 (IBKF015) Mt. John Barite Deposit (June, 1975)

Portal of Adit 3, which has been driven into the hill on a decline of 15°. Lode 5 dips steeply to the south. Lode width increased rapidly from 0.2 m on surface to 0.6 m at back of adit.

Although lodes are generally vertical or near vertical, dip also varies over short distances. Lode 5 is vertical in outcrop at Shaft 3 but dips 40° to the south in the face of Adit 3, 7 m below the surface. Lode 4 is probably a flat dipping link lode between Lodes 1 and 5. In Adit 1, both hanging wall and footwall contacts dip from 30° to 50° to the west (see Plate 3).

In places, the lodes are controlled by near horizontal fractures. In open cut 3, Lode 1 is exposed in the lower half of the northern face below a strong flat fracture (see Plate 2) which displaces the steep east-west fracture along the southern contact of the barite lode.

In general, the footwall of each lode is well defined and regular whereas the hanging wall, in places, is irregular.

As the diapiric country rock has no regular strike and dip, lode terminations are expected to be steep to vertical and not be controlled by the dip of the enclosing strata as at Potato Patch.

Potato Patch

Country rock comprises soft friable bleached white, grey, green and red calcareous siltstones, sandstones and limestones of the Parara Limestone of Cambrian age. In the open cut west of Station 1, bedding dips at 50-55° to the north east. To the east, strike and dip could not be measured due to dangerous conditions. Away from the workings, bedrock is obscured by widespread outcrop and float of ferricrete. Near the southern boundary of ML. 4320, limestones, assumed to be part of the Wonoka Formation of Adelaidean age, strike east-west and dip at moderate angles to the north. Outcrop is subdued and largely obscured by dumps and ferricrete.

The slightly arcuate barite lode extends for approximately 76 m in an overall northeasterly direction. The western limit has been placed about 48 m west of Station 1, where a skin of barite remains on the northern wall. The eastern limit of the main barite lode is within 2 m of the eastern wall of the workings. Lenses and pods of barite extend a further 40 m eastwards and grade into hematite-goethite veins, up to 0.5 m wide, near the

Plate (IBKF009) Potato Patch Barite Deposit (June, 1975)

Eastern face of open cut east of Survey Station showing two splits in grey white barite lode which join at base of plate. Northern split is at ladder and southern split below writer's feet.

eastern corner of ML.4320. The lode is a composite body with bifurcations and junctions as are most barite deposits in the Flinders Ranges.

Dip of the lode varies from steeply southwards at either end (see cross-sections B-B^1 and E-E^1, Fig. 8) to vertical and steeply northwards in the centre (see cross-sections C-C^1 and D-D^1).

Maximum exposed with is 1.7 m in the face west of Station 1, compared to a probable 5-6 m in the worked out shaft to the east. This thickening is caused by a cross fault which is assumed to be nearly vertical striking approximately 340°. Surface indications are obscured by dumps and bulldozing. The location of this fault at Station 1 is suggested by the apparent horizontal displacement of the barite lode for 3 m (see Geological plan, Fig. 7). The alternative explanation is that the lode consists of two distinct lenses, en echelon.

Lode terminations and bifurcations (see Plate 5) are expected to plunge parallel with the dip to the north-east of the enclosing country rock (see longitudinal section A-A^1, Fig. 8). This control of the barite lode is comparable to that at South Australian Barytes Ltd.'s underground mine at Oraparinna. Here, oreshoots, bifurcations and junctions plunge with the dip of the country rock (Hiern and Olliver, 1973).

QUALITY OF THE BARITE

Barite from Mt. John is medium to coarsely crystalline and colourless to white and slightly turbid due to minute inclusions. Although sample P1817/75 is only slightly deformed (see Appendix A) much of the barite is expected to be fractured and recrystallised as a result of cross faulting.

Crosscutting veins and irregular patches of vernadite, a black manganese hydroxide, are the main impurities with minor calcite and quartz.

Lodes 10a and 10b are heavily iron stained in places.

Barite from Potato Patch is coarsely crystalline and relatively clear white to grey. Deformation and fracturing is widespread producing recrystallisation to fine grained barite about the fractures. In places, the fractures are coated with either a white clay consisting of finely comminuted barite (see Sample P1816/75, Appendix A) or a dark grey skin. This skin, up to 10 mm thick, is caused by a concentration of minute colourless opaque inclusions and voids along fractures and cleavage planes. Mottled barite with similar characteristics has been recorded at Matthews Deposit near Oraparinna, 44 km to the south west (Olliver, Cooper and Spencer, 1976). Quartz and calcite are minor impurities.

Samples are described in Table 3 and locations are shown on Figs. 5, 6, 7 and 8. Results of physical and chemical analyses are summarised in Table 4 from Appendix B.

TABLE 3

Description of Samples

Sample No.	Type	Lode	Description
MT. JOHN			
P1817/75	Selected	1	Open Cut 3 - white coarsely crystalline barite with black veins and patches of manganese.
P1871/75	Vertical chip	4	Adit 1, northern face - lode 1 m wide.
P1872/75	Inclined chip	5	Adit 3, northern face - lode 0.8 m wide.
A1873/75	Horizontal chip	1	Shaft 1 - outcrop 5 m wide.
A1874/75	Horizontal chip	2	Shaft 2 - outcrop 1.8 m wide.
A1875/75	Horizontal chip	1	Open cut 3 - lode 3 m wide.
A1876/75	Selected	1	Open cut 3, northeastern corner - best white clear barite, coarsely crystalline with minor dendrites on crystal faces.

POTATO PATCH

P1816/75	Selected	Open cut face - White and pale grey barite, finely crystalline with minor white clay on fracture planes.
A1870/75	Horizontal chip	Open cut, eastern face - lode 1.7 m wide.

TABLE 4

Summary of Test Results

Sample No.	S.G.	$BaSO_4$	$SrSO_4$	$(Ba+Sr)SO_4$	SiO_2
MT. JOHN					
P1817/75	4.44	89.8	0.94	90.74	0.21
P1871/75[x]	4.43	97.0	1.85	98.85	0.96
P1872/75[x]	4.46	97.4	2.15	99.55	0.32
P1873/75[x]	4.36	93.4	1.90	95.30	4.50
P1874/75[x]	4.41	96.4	2.20	98.60	1.33
A1875/75[x]	4.42	96.6	2.30	98.90	0.92
A1876/75	4.46	96.9	2.70	99.60	0.27
Average for 5 chip samples[x]	4.42	96.2	2.10	98.30	1.61
POTATO PATCH					
P1816/75	4.42	96.0	2.87	98.9	0.39
P1870/75	4.33	93.9	2.40	96.3	1.39

The iron content (Fe_2O_3) of all samples was below the limit of detection (0.01%). The high ignition loss of 1.22% for sample P1817/75 (see Appendix B), is due to the presence of minor carbonate.

Selected barite from both deposits is high quality with Sample A1876/75 from Mt. John being particularly pure with 99.6% total sulphate.

The average of the five chip samples from Mt. John satisfies industrial grade specifications for glass, pigments and fillers as outlined by the American Society for Testing Materials (ASTM) Specification D602-42 which requires barite to be white and to contain

- at least 94% $BaSO_4$
- not more than 0.05% Fe_2O_3
- not more than 0.2% soluble salts
- not more than 0.5% moisture and volatiles

. not more than 2% quartz, clays and foreign materials.

The only chip sample with an anomalous impurity content was A1873/75 with 4.50% SiO_2.

The chip samples from Potato Patch, A1870/75, effectively met the specification with a total sulphate content of 96.3%.

All chip samples satisfy the less stringent specifications for oil drilling purposes as outlined by specification DFCP-3 of the Oil Companies Materials Association (U.K.) which requires barite to

- contain at least 92% $BaSO_4$
- have a specific gravity of at least 4.2
- contain less than 250 ppm soluble alkaline earths expressed as calcium (see Appendix B).
- Several percent of iron oxides are permitted.

RESERVES

MT. JOHN

Reserves of barite listed in Table 5 are classed as indicated because of rapid fluctuations in width and dip of the lodes. A specific gravity of 4.4 has been assumed.

TABLE 5

Indicated Reserves of Barite, Mt. John

Lode	Length (m)		Width (m)		Depth (m)	Volume (m^3)	Tonnes
	Total	Mineable	Max.	Aver.			
1	66	50	5.0	2.0	10	1 000	4 400
2 a.	37	16	1.8	1.5	7	168	700
b.		10	2.5	2.0	7	140	600
3	23	18	1.5	1.0	5	90	400
4	50	40	1.0	0.6	10	240	1 000
5	25	23	1.5	1.0	8	80	300
6	28	Nil	1.0	0.2	-	-	-
7	36	30	1.4	0.4	2	24	100
8	17	Nil	0.4	0.2	-	-	-
9	78	23	1.0	0.5	2	23	100
10a	42	Nil	0.6	0.4	-	-	-
10b	73	Nil	1.2	0.3	-	-	-
					TOTAL		7 600

Reserves are inferred below creek level (88 m level) only for Lode 1 where a yield of 600 tonnes per vertical m would realise 6 000 tonnes above the 78 m level.

POTATO PATCH

Reserve calculations are based on the areas outlined on longitudinal section A-A^1 (Fig. 8); an average width of lode .. 1 .m and a S.G. of 4.3.

(1) Measured reserves of barite available for extraction above the floor of the workings (95 m level).

West of the fault	60 tonnes
East of the fault	80 tonnes
TOTAL	140 tonnes

(2) Indicated reserves of barite below the floor to the 90 m level. This material could be extracted by simple open cutting as shown on the cross-section B-B^1 to E-E^1 (Fig. 8).

West of the fault	1 000 tonnes
East of the fault	500 tonnes
TOTAL	1 500 tonnes

(3) Inferred reserves above 80 m level. Extraction will probably require the establishment of benches at the 90 m level as shown on the cross-sections and the removal of large quantities of overburden.

West of the fault	1 400 tonnes
East of the fault	1 300 tonnes
TOTAL	2 700 tonnes

CONCLUSIONS

White crystalline barite is being mined from two deposits near Mt. John in a Class B Environmental Area in the eastern Flinders Ranges. Production from 1942 to 1975 has totalled 1 885 tonnes from the Mt. John deposit and 1 193 tonnes from Potato Patch.

The barite has formed by the migration of barium sulphate from the nearby Adelaidean sediments with later deposition in open fracture zones within or emanating from the Mt. Chambers Diapir. The Mt. John deposit is enclosed by diapiric rocks whereas the Potato Patch deposit occurs in a major east-west fault zone between Cambrian and Adelaidean sediments.

The barite in both deposits is suitable for oil drilling purposes and with selective mining, high quality barite with up to 99.6% $(Ba+Sr)SO_4$ can be obtained for industrial purposes.

Mt. John contains indicated reserves of 4 400 tonnes in Lode 1 with a further 3 200 tonnes in Lodes 2, 3, 4, 5, 7 and 9. A yield of 600 tonnes per vertical metre may be expected from Lode 1 below creek level. Inferred reserves to 10 m below creek level are 6 000 tonnes. Deeper mining is probably not feasible in the narrower lodes.

At Potato Patch, reserves comprise

- 140 tonnes, measured above 95 m level
- 1 500 tonnes, indicated above 90 m level
- 2 700 tonnes, inferred above 80 m level.

Further mining should be designed to minimise impact on the area.

JGO:DCS:FdeA
14/10/76

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APPENDIX A

Petrographic Descriptions

Extracted from AMDEL Report MT 149/76

Petrography

by

R.S. Cooper

Sample: FB34, P1817/75; (TS 34359)

Location:

Mount John Deposit. Wirrealpa 1:63, 360 sheet area.

Rock Name:

White, moderately coarsely crystalline barite which contains veins and patches of a black manganese mineral. (Country rock - Diapiric).

Hand Specimen:

The barite in this sample is white, has probably been somewhat deformed, and contains crystals up to several mm long. Throughout the barite there are veins and patches of a black manganese mineral; the largest vein, which completely traverses the sample, is up to 5 mm across but most of the patches are considerably smaller and only extend for 1-2 mm.

Thin Section:

An optical estimate of the constituents based on the hand specimen and thin section gives the following (the thin section was cut to intersect the largest black vein and contains 20-30% vernadite) :

	%
Barite	80-90
Vernadite	8-12
Calcite	1-2
Quartz	<1

In much of this sample a mortar texture is developed in the barite with deformed crystals or crystal fragments of barite, the largest of which are several mm across and equant but xenomorphic in shape, surrounded by granulated material with a grain size which rarely exceeds 0.2 mm. The barite is faintly turbid and under high magnification this is seen to be due to the presence of minute colourless and opaque inclusions and possibly some minute voids. The inclusions are distributed throughout the barite but appear to be slightly more concentrated in the ungranulated material.

The manganese mineral in the sample was identified by X-ray diffraction techniques as vernadite, which is a manganese hydroxide, the exact chemical formula of which is uncertain.

Most of the vernadite is confined to a cross-cutting vein system. Where it occurs it is intergrown with patches of calcite and barite. The largest vernadite grain is 5 mm across but many patches of the mineral only appear to extend for 1-2 mm. The associated calcite occurs as subidiomorphic grains which are up to 0.3 mm across. These are aggregated into patches and vein-like structures which are orientated in the same manner as the vernadite grains and presumably formed contemporaneously with the vernadite. A few patches of granular quartz are present with the vernadite and calcite.

This is a sample of white barite which has been deformed and veined with vernadite, a manganese hydroxide mineral, and calcite.

Sample: FB26, P1816/75; (TS 34358)

Location:
Potato Patch Deposit. Wirrealpa 1:63, 360 sheet area.

Rock Name:
Deformed/fractured white to very pale grey barite with white clay-like material on fractures. (Country rock - Wonoka Formation)

Hand Specimen:
This sample of barite is white to very pale grey and contains anastomosing fractures. The white barite, which is probably very finely crystalline, is situated about the fractures whereas the very pale grey barite, which in a few places appears to be quite coarsely crystalline, occurs in the unfractured portions of the rock. Along some of the fractures there is a coating of white clay-like material as well as traces of limonite in a few cases.

Thin Section:
An optical estimate of the constitutents gives the following:

	%
Barite	98
Quartz	2

In thin section this sample is seen to consist of barite which has been deformed and fractured. In the fractured/sheared areas of the rock, the barite is granular with a grain size ranging from a few microns up to approximately 0.2mm with a few coarser fragments also being incorporated. The texture of these portions of the rock is strongly schistose. The fractures in the rock form an anastomosing network and are spaced at various intervals with the largest relatively undeformed portions of the rock being up to approximately 1-2 cm across. In the undeformed portions the barite has been broken into lenticular/bladed cleavage fragments which are in close optical continuity with each other. The largest of these cleavage fragments extend for at least 1 cm with some minor deformation and granulation. In a few places twinning is visible within the slightly deformed barite and this twinning consists of narrow discontinuous lamellae which are frequently slightly warped. The finely granulated barite in the sheared portions of the rock is slightly turbid and the reason for its white opacity is uncertain but may be related to its fine grain size. The less deformed barite is relatively clear but there are a few minute colourless and opaque inclusions, and possibly some minute voids, which are concentrated along fractures, twin planes, and in the more distorted areas.

Several patches of granular quartz, ranging from colourless to pale brown, are included in the area of barite thin sectioned. The largest patch extends for several mm and includes grains which range in size up to 0.2 mm. The white clayey material visible in the hand specimen on some fractures is thought, following examination of the thin section, probably to consist largely of finely comminuted barite.

This is a sample of relatively coarsely crystalline barite which has been fractured and sheared. The very pale grey colour of the less deformed barite appears to be due to the presence of minute colourless opaque inclusions, and possibly some minute voids, which are concentrated along fractures, cleavage planes, and in the more distorted areas. The white opacity of the more heavily sheared regions of barite is probably due to the fine grain size of the sheared barite.

APPENDIX B

Physical and Chemical Analyses

Extracted from AMDEL Report MT 148/76

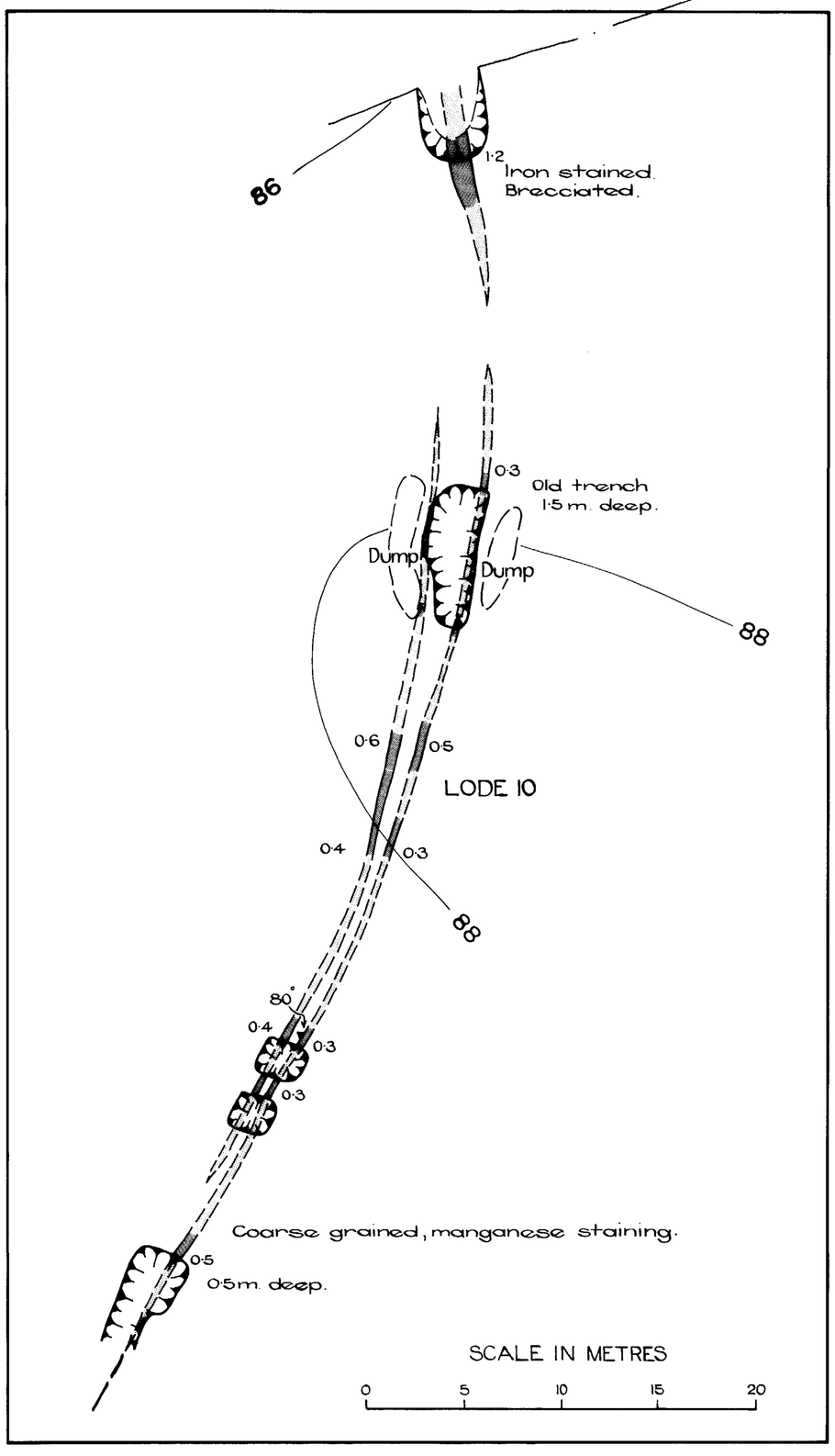
by

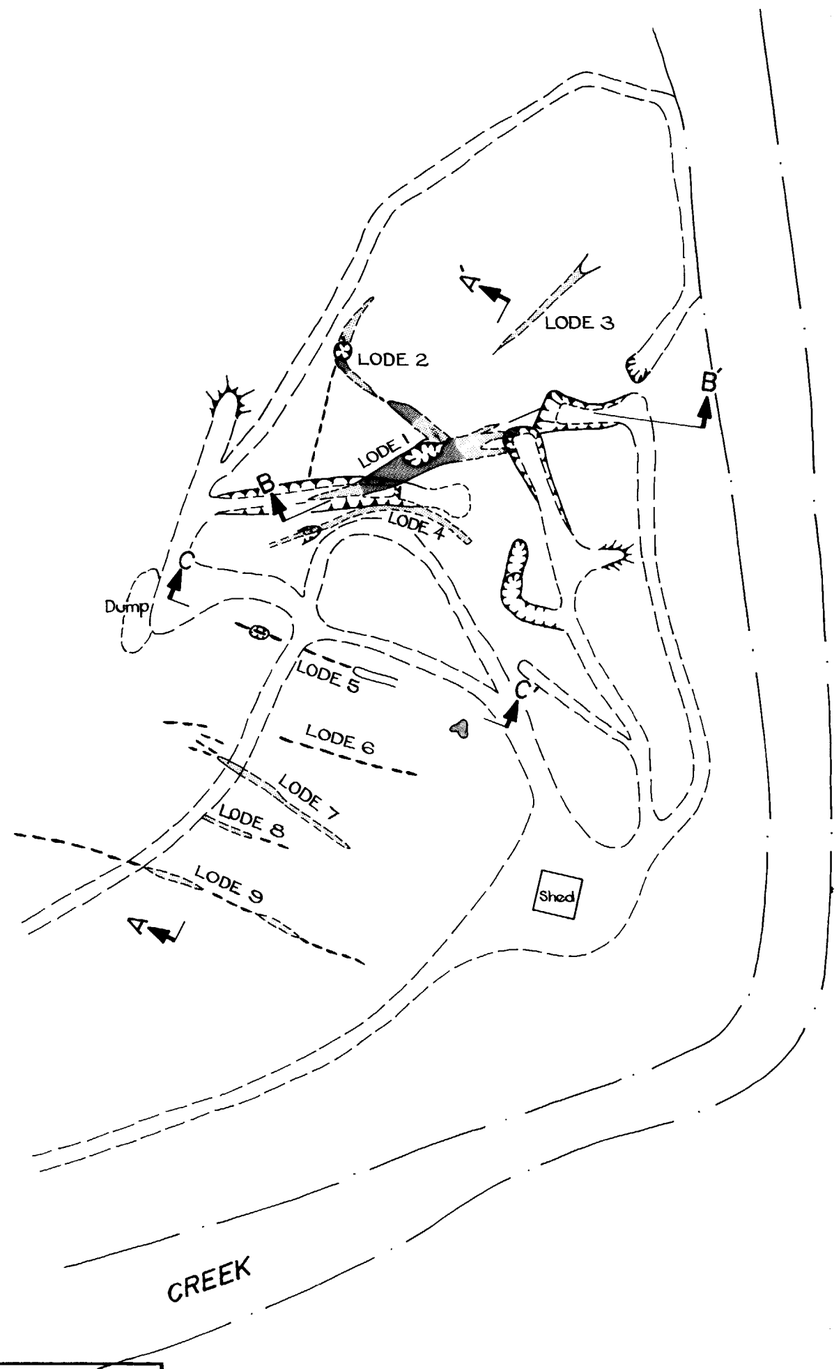
Dr. W.G. Spencer

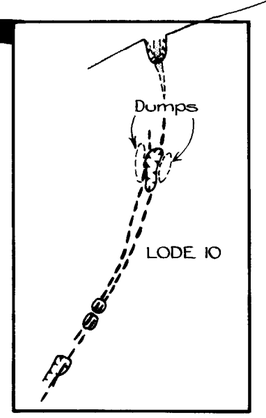
	MT. JOHN DEPOSIT							POTATO PATCH	
Sample No.	P1817/75	A1871/75	A1872/75	A1873/75	A1874/75	A1875/75	A1876/75	P1816/75	A1870/75
Specific Gravity	4.44	4.43	4.46	4.36	4.41	4.42	4.46	4.42	4.33
Reflectance R457	16.5	86.3	85.9	78.6	83.6	78.6	88.9	85.7	84.0
Reflectance R57	22.1	91.7	90.0	89.4	89.5	83.7	93.4	89.3	88.1
Yellowness	5.6	5.4	4.1	10.8	5.9	5.1	4.5	3.6	4.1
$BaSO_4$	89.8	97.0	97.4	93.4	96.3	96.6	96.9	96.0	93.9
$SrSO_4$	0.94	1.85	2.15	1.90	2.20	2.30	2.70	2.87	2.40
SiO_2	0.21	0.96	0.32	4.50	1.33	0.92	0.27	0.39	1.39
Al_2O_3	0.06	0.03	<0.01	0.02	<0.01	0.03	<0.01	0.14	0.75
Fe_2O_3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
CaO	0.74	<0.01	0.01	0.01	0.01	0.01	0.01	0.15	0.46
K_2O	0.03	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.01
Ignition Loss	1.22	0.21	0.13	0.11	0.11	0.14	0.08	0.30	1.04
Soluble Alk. earths as Ca (p.p.m.)	40	30	20	15	20	50	25	25	70

FOR NORTHERN AREA
SEE PLAN NUMBER 76-731

CREEK







SCALE IN METRES
0 20 40 60 80 100

For legend see plan number 76-731

FIG. 4

DEPARTMENT OF MINES-SOUTH AUSTRALIA

MT. JOHN BARITE DEPOSIT
M.L. 4319 J.H. COAD
GEOLOGICAL PLAN
SOUTHERN AREA

	COMPILED: J.G.O. D.C.S.	DRN: J Williams	SCALE: 1:250	PLAN NUMBER
DIRECTOR OF MINES		CKD: A.F.	DATE: 20-9-76	76-732

LEGEND

- Diapiric breccia.
- Barite outcrop with width in metres.
- Barite inferred.
- Barite vein - less than 0·2 m. wide.
- Bedding - inclined.
- Bedding - vertical.
- Barite lode.
- Survey Station. Arbitrary datum station 1 = 100 m.
- Topographic contour in metres.
- P1817/75 Sample location.
- Pit or dump face.
- Section location.

N

SHAFT 2 7m deep
LODE 2
A1874/75
LODE 2A
Stn 1 100·0
LODE 1
SHAFT 1 5·3m deep
A1873/75
Old workings and dump material.
OPEN CUT 1
Floor 96 cm
Dump
LODE 4
Many thin barite veins
Numerous small barite stringers and pods throughout this area.
OPEN CUT 4
Floor 91 m.
LODE 3
A1875/75
P1817/75
FLOOR 91m.
OPEN CUT 3
A1876/75
OPEN CUT 2
Floor 94 m.
BEDDING
A1821/75
Drive blocked
ADIT 1
OPEN CUT 5
FILL
Dump
SHAFT 3 8m. deep.
LODE 5
ADIT 3
ADIT 2
15m deep
LODE 6
Inclusions of country rock.
LODE 7
LODE 8
Vertical
LODE 9
Stn 2
6m deep
Vertical
SHED
CREEK
To Wirrealpa Stn. via Potato Patch Deposit

FOR SOUTHERN AREA
SEE PLAN NUMBER 76-732

SCALE IN METRES
0 5 10 15 20 25

Stadia Survey by R J. Harris S FB 509

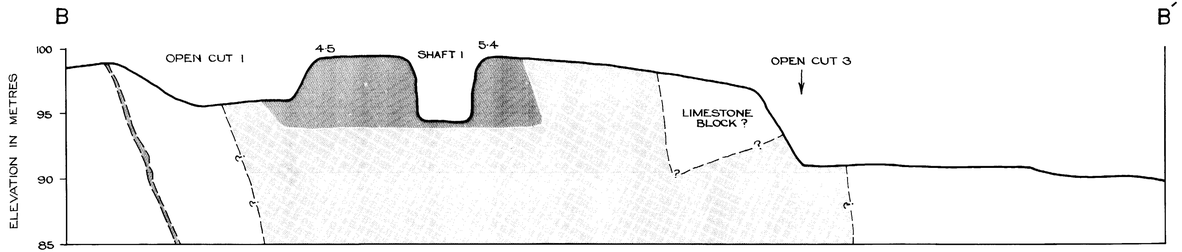
FIG.5

DEPARTMENT OF MINES - SOUTH AUSTRALIA

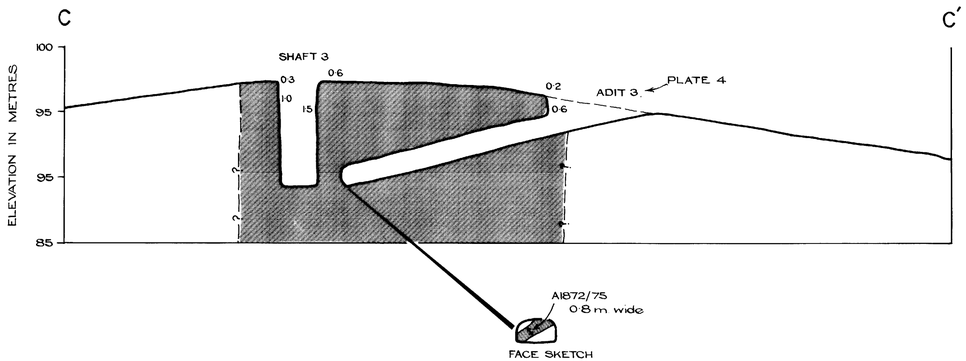
MT. JOHN BARITE DEPOSIT
M.L. 4319 J.H. COAD
GEOLOGICAL PLAN
NORTHERN AREA

	COMPILED J.G.O. D.C.S.	DRN J.M.W.	SCALE 1:250	PLAN NUMBER 76-731
DIRECTOR OF MINES		CKD A.F.	DATE 20-9-76	

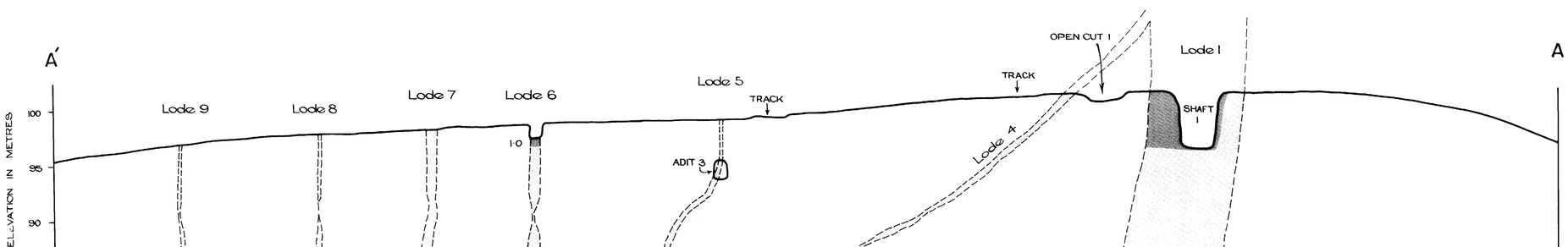
SECTION B–B´
LODE 1



SECTION C – C´
LODE 5



SECTION A´–A
LODES 1, 4, 5, 6, 7, 8, 9



SCALE IN METRES

0 5 10 15 20 25

For legend see plan number 76-731

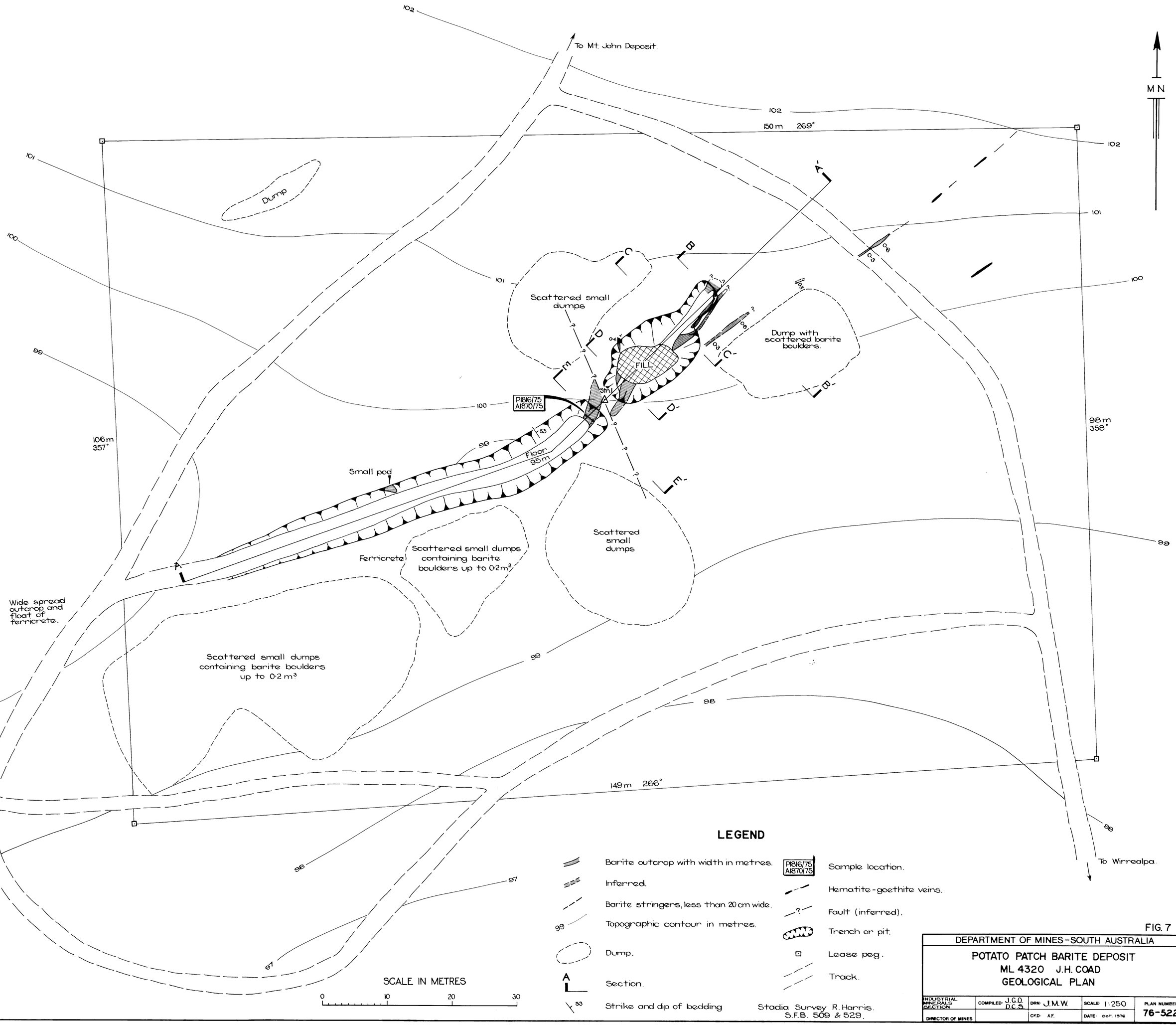
FIG. 6

DEPARTMENT OF MINES–SOUTH AUSTRALIA

MT. JOHN BARITE DEPOSIT
M.L. 4319 J.H. COAD

CROSS SECTIONS

	COMPILED J.G.O. D.C.S.	DRN J. Williams	SCALE 1:250	PLAN NUMBER
DIRECTOR OF MINES		CKD A.F.	DATE 17-9-76	76-733



LEGEND

- Barite outcrop with width in metres.
- Inferred.
- Barite stringers, less than 20 cm wide.
- Topographic contour in metres.
- Dump.
- Section.
- Strike and dip of bedding
- Sample location.
- Hematite-goethite veins.
- Fault (inferred).
- Trench or pit.
- Lease peg.
- Track.

Stadia Survey R. Harris. S.F.B. 509 & 529.

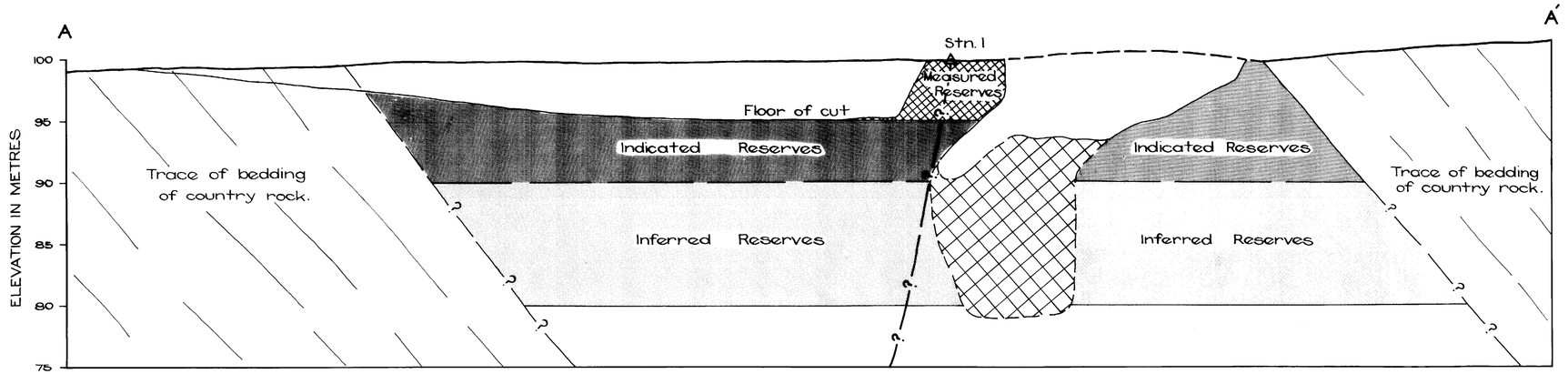
FIG. 7

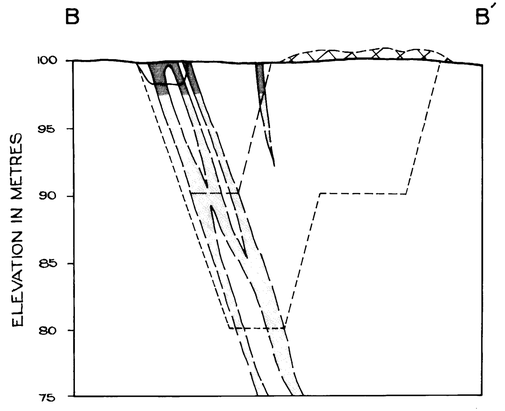
DEPARTMENT OF MINES-SOUTH AUSTRALIA

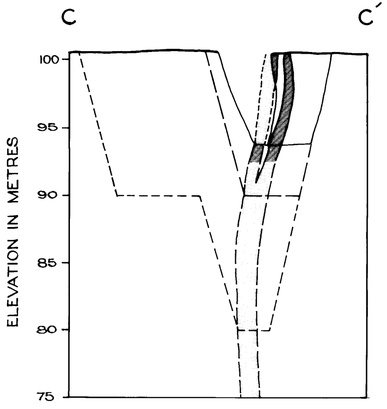
POTATO PATCH BARITE DEPOSIT
ML 4320 J.H. COAD
GEOLOGICAL PLAN

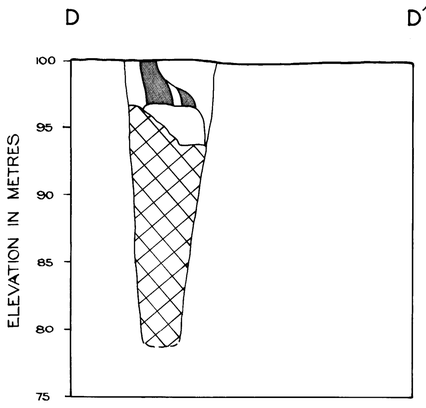
INDUSTRIAL MINERALS SECTION	COMPILED J.G.O. D.C.S.	DRN J.M.W.	SCALE 1:250	PLAN NUMBER 76-522
DIRECTOR OF MINES		CKD A.F.	DATE Oct. 1976	

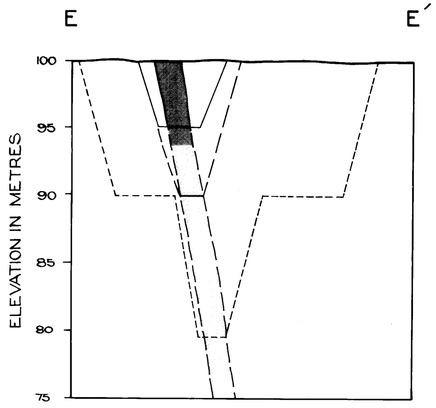
6735 - IV











LEGEND

BARITE LODE ON B-B' to E-E'

Observed.

Inferred.

PIT OUTLINES.

Existing.

To extract indicated reserves.

To extract inferred reserves.

Fill

Fault (inferred).

SCALE IN METRES

0 10 20 30

FIG. 8

DEPARTMENT OF MINES-SOUTH AUSTRALIA

POTATO PATCH BARITE DEPOSIT
ML 4320 J.H. COAD
CROSS SECTIONS

INDUSTRIAL MINERALS SECTION	COMPILED J.G.O. D.C.S.	DRN: J.M.W.	SCALE: 1:250	PLAN NUMBER 76-523
DIRECTOR OF MINES		CKD: A.F.	DATE 20-9-76	

6735 - IV