DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT.BK.NO. 85/38

TEATREE BARITE DEPOSIT
GEOLOGICAL INVESTIGATIONS 1979-80
OUT OF COUNTIES - FLINDERS RANGES
COPLEY 6737-II

GEOLOGICAL SURVEY

by

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MINERAL RESOURCES

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PLANS

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

REPT. BK. NO. 85/38
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GEOLOGICAL INVESTIGATIONS 1979-80
OUT OF COUNTIES - FLINDERS RANGES
COPLEY 6736-II

ABSTRACT

Teatree barite deposit on the eastern margin of the northern Flinders Ranges in an Environmental Class B Zone comprises numerous small, discontinuous barite veins and pods scattered over an area of about 4 hectares in faulted Elatina Formation sandstone and Nuccaleena Formation dolomite. Veins average about 0.3 m wide with a maximum of 1.0 m. Length varies from 1 to 10 m.

Barite is generally white but contains iron oxides, quartz and country rock inclusions. None of the three samples tested met industrial grade specifications. No production has been recorded and reserves are very small.

INTRODUCTION

An area of small barite veins and pods is located 1.5 km southwest of Teatree Outstation ('Old Arrowie') on the eastern margin of the northern Flinders Ranges. Although mineral claims were held over the deposit from 1945 to 1948, there was apparently no production.

K.A. Salgo (Departmental prospector) visited the locality in 1979 and hand dug two pits to test continuity of veins (Salgo, 1980). The author assisted by P.P. Crettenden (Field Assistant) and K.A. Salgo, mapped the deposit using stadia theodolite on 27 and 28 October 1980 (Fig. 2).

Three samples were submitted to the Australian Mineral Development Laboratories (AMDEL) for physical and chemical analysis; results comprise Appendix A. Three petrographic descriptions by AMDEL are included in Appendix B.

LOCATION, ACCESS & TOPOGRAPHY

Teatree barite deposit is located about 85 km by road northeast of Blinman on Block 1164 Wertaloona Pastoral Lease, north out of hundreds, Arrowie 1:50 000 sheet, part of the Flinders Planning Area. The 1982 Development Plan shows the locality in an Environmental Class B Zone.

Access is from the Wirrealpa-Wearing Gorge - Teatree Out Station road, turning off about 1 km west of Teatree O.S. and about 50 km from Wirrealpa and proceeding across country for about 0.5 km. All roads in the region are unsealed.

Topography is undulating with dolomite outcrops forming sharp low ridges. An easterly draining creek system bisects the area. Vegetation is salt bush and sparse low scrub.

HISTORY

Mineral Claim (MC) 751, covering the deposit, was registered on 16/6/45 for Myrtle E.A.J. Talbot and was cancelled on 23/5/46 due to non renewal of the miners right. MC 907, covering approximately the same area, was registered on 12/7/46 for M.E.A.J. Talbot and was cancelled on 7/7/48. Returns for these claims show no production although the raising of 6 tons of barite is recorded.

Several shallow pits and scrapings are the only workings in the area. Pits 2 and 3 (Fig. 2) were dug by K.A. Salgo in 1979.

GEOLOGY

Regional geology, shown on Fig. 1, has been adapted from the COPLEY 1:250 000 sheet (Coats, 1973). The area comprises complexly faulted Umberatana and Wilpena Group sedimentary rocks of Adelaidean age. Blocks of Angepena and Elatina Formation sediments are fault bounded by the stratigraphically younger Nuccaleena and Brachina Formations. Bedding and major faults both trend north-south.

Barite at the Teatree deposit is located mainly in brown and pink, medium to coarse grained feldspathic sandstone of the Elatina Formation. To the east, Nuccaleena Formation comprising brown and purple, laminated dolomite also hosts minor barite mineralisation. Angepena Formation reddish purple shale and

siltstone underlies Elatina Formation to the west. The Nuccaleena/Elatina Formation boundary is displaced by several northwest trending faults and disrupted by a fault block of Brachina Formation purple shale southeast of the deposits. Nuccaleena Formation dolomite has been altered to massive silicified rock along the faults.

Barite occurs as numerous small discontinuous veins and pods scattered over a zone about 700 m long and 60 m wide. Most intense vein development is near a fault displacing the Elatina/Nuccaleena Formations boundary in the south. Orientation of the veins is generally parallel to the northwest trending faults or approximately north-south parallel to bedding. Widths vary from 0.01 m to a maximum of 1.0 m with about 0.3 m most common. Maximum observed strike length is about 10 m but most barite bodies thin rapidly along strike. Veins may contain fragments of country rock or impregnate brecciated country rock.

Several patches of scattered barite fragments indicate the presence of veins in areas of poor outcrop.

BARITE QUALITY

Teatree barite is generally white but often contains veins and patches of iron oxides probably resulting from weathering of sulphide minerals. Fragments of country rock are commonly intermixed with barite veins. Thin section descriptions and chemical analyses show significant amounts of quartz (up to 25% in RS 6736-37) within the barite.

Specifications

Barite is marketed either in a range of industrial grades, or as oil drilling grade.

Industrial grade barite specifications for glass, pigments and fillers as outlined by American Society for Testing Materials Specification D602-42 require barite to be white and to contain:

- at least 94% (Ba + Sr) SO_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

Whiteness is expressed as measured brightness and must be in excess of 90.

Very little industrial grade barite marketed in South Australia meets these specifications and more realistic criteria, based on products from Quorn Mill (McCallum, 1982) are:

- at least 94% (Ba + Sr) SO_4
- not more than 2% quartz
- not more than 0.15% Fe_2O_3
- brightness of 75 or better

Specification BFCP-3 of the Oil Companies Materials Association (U.K.) requires barite for oil drilling grade to:

- contain at least 92% (Ba + Sr) SO_4
- have a specific gravity of at least 4.2
- contain less than 250 ppm soluble alkaline earths expressed as calcium
- several percent of iron oxides is permitted

TABLE 1

Sample No.	Location	Description
A 1171/80	Centre of area. Vein in northern face of Pit 3	Selected typical barite
A 1172/80	Outcropping vein 15 m south of Pit 3	Selected typical barite
A 1173/80	Vein in Pit 1	Selected typical barite

TABLE 2

Summary of Chemical Analysis and Physical Properties

Sample No.	$BaSO_4$ %	$SrSO_4$ %	SiO_2 %	Fe_2O_3 %	LOI.	Brightness R457	Yellowness R57-R457	S.G.
A 1171/80	94.5	2.27	2.45	0.06	0.55	79.1	7.9	4.32
A 1172/80	88.1	1.97	8.40	0.18	0.58	68.2	11.0	4.14
A 1173/80	96.3	1.56	1.35	0.13	0.52	70.2	10.0	4.34

None of the three samples meet Quorn Mill industrial grade specifications. A 1171/80 fails because SiO_2 content exceeds 2% and A 1173/80 passes all chemical specifications but has a brightness of less than 75.

A 1171 and 1173/80 meet oil drilling specifications but A 1172/80 fails due to low Ba + Sr content and S.G.

Hand selection of quartz free and low iron barite may produce a product which meets Quorn Mill industrial grade specifications.

SUMMARY & CONCLUSIONS

Teatree barite deposit comprises numerous small, discontinuous veins and pods scattered over an area of about 4 hectares. Host rock is faulted Elatina Formation feldspathic sandstone and to a lesser extent Nuccaleena Formation dolomite. The barite is generally white but commonly contains quartz, iron oxides and inclusions of country rock. None of the three samples tested met industrial grade specifications. Careful hand selection may produce industrial grade material.

Reserves are small. Even the widest veins, in Pits 1, 3 and 5 and at sample site A1172/80 would produce only a few tonnes of barite per vertical metre. More veins may be located by trenching in the patches of barite float.

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REFERENCES

Coats, R.P., 1973. COPLEY map sheet, Geological Atlas of South Australia, 1:250 000 series. Geol. Surv. S. Aust.

McCallum, W.S., 1982. Oraparinna barite deposits. Geological investigations at the Oraparinna (Bunker Hill) Mine, Co. Taunton, Flinders Ranges. S. Aust. Dept. Mines and Energy report 82/52 (unpublished).

Salgo, K.A., 1980. Mines and mineral occurrences prospected during 1979, in the Flinders Ranges. S. Aust. Dept. Mines and Energy report 80/83 (unpublished).

APPENDIX A

Results of physical and chemical analysis of samples A 1171/80, 1172/80, 1173/80 from Teatree barite deposit.

Extracted from AMDEL report MD 3154/81 by Lyn J. Day

CHEMICAL ANALYSIS

Sample No.	$BaSO_4$	$SrSO_4$	Al_2O_3	SiO_2	CaO	K_2O	Fe_2O_3	L.O.I.	Soluble Alkaline Earths as Ca ppm
A1171/80	94.5	2.27	0.05	2.45	0.02	0.01	0.06	0.55	110
A1172/80	88.1	1.97	0.34	8.4	0.08	0.12	0.18	0.58	45
A1173/80	96.3	1.56	0.02	1.35	0.02	0.01	0.13	0.52	65

Reflectance and Specific Gravity

Sample No.	Brightness R457	Yellowness R57-R457	Specific Gravity
A1171/80	79.1	7.9	4.32
A1172/80	68.2	11.0	4.14
A1173/80	70.2	10.0	4.34

APPENDIX B

Petrographic descriptions of samples
RS 6736-36, 6736-37, 6736-38 from Teatree barite deposit.

Extracted from AMDEL report GS 3153/81 by
Sylvia Whitehead

SUMMARY OF SAMPLES

6736 RS36 TSC31507	Fine-grained dolomite with small veins of quartz and larger veins of calcite, much of which resembles calcrete.
6736 RS37 TSC31508	Coarse-grained barite with interstitial patches and veinlets of iron oxide-stained quartz associated with minor sericite and oxidized pyrite. The rock shows evidence of deformation.
6736 RS38 RSC31509	Fractured or brecciated, dolomite Country rock (similar to 6736 RS36) has been invaded by barite which also shows evidence of deformation. There is a little migratory quartz.

Sample: 6736 RS36; TSC31507

Location:
Tea Tree Barite. Country rock (Nuccaleena Formation)

Hand Specimen:
The rock is pale brown, very fine-grained and shows a pattern of weathering typical of that of carbonate. Differential weathering suggests that there are thin layers which contain some silica but layering is not readily apparent in the interior of the rock. There is a network of small veins, some of which contain quartz and some, which are partly leached contain calcite. Part of the weathered surface is also encrusted with calcite resembling calcrete.

Thin Section:
A visual estimate of the constituents in the area sectioned is as follows:

	%
Dolomite	>70
Quartz (veins)	2-3
Calcite (veins)	20-25
Visible sericite	trace
Opaque grains	trace
Goethite staining	

The rock is composed almost entirely of very fine-grained dolomite, most of which has a grain size of less than 0.03 mm and some of it could be described as micritic. It is turbid and lightly stained dull orange to brown by iron oxide and there are also some small grains which have been replaced, or partly replaced by goethite. It is possible that this mass of fine-grained dolomite contains a little argillaceous material obscured by the optical properties and staining of the dolomite but this cannot be determined microscopically. There are, however, a few very small flakes of muscovite and sericite visible in the dolomite. There are a few very small opaque grains, most of them less than 0.02 mm in size which may represent oxidized pyrite.

There are no clearly defined bedding planes but there is some evidence of layering on a scale of 1 to 2 mm due mainly to slight variations in staining. In some of the layers there are also poorly defined oval, elongate and almost spherical patches up to about 0.5 mm in size which are more turbid and finer-grained than the surrounding dolomite.

There are a few small quartz veins about 0.2 mm wide and most of these are almost at right angles to the direction of bedding but there are a few which cut the rock in other directions. These are cut by larger veins 1 to 2 mm thick containing calcite, minor quartz and some crystals and patches which have been replaced by goethite. In some of the larger veins the textures in the calcite are similar to those commonly found in calcrete.

Conclusion:
The Country rock is fine-grained dolomite with a few small quartz veins and some larger veins of calcite which is possibly mainly calcrete.

Sample: 6736 RS37; TSC31508

Location:
Tea Tree Barite. Barite vein

Hand Specimen:
The sample is composed mainly of coarsely crystalline barite with irregular patches of brown-stained material along many grain boundaries and in small fractures. Differential weathering of the sample on the exposed surface suggests the presence of a harder mineral, probably quartz in these brown-stained, interstitial patches and in a network of small fractures.

Thin Section:
A visual estimate of the constituents in the area sectioned is as follows:

	%
Barite	75-80
Quartz	20-25
Supergene goethite and hematite including oxidized pyrite	1-2
Un-oxidized pyrite	trace
Jarosite	trace
Tourmaline	very minute trace

Most of the barite in this portion of the vein is very coarse-grained with crystals several millimetres in size and they have very turbid zones and planes in which there are clouds of minute voids or vacuoles and at least a few of these contain fluid inclusions visible under very high magnification. A few inclusions of unoxidized pyrite were found in one area of coarse-grained barite but in other areas small inclusions have generally been oxidized. Some have been replaced by iron oxides and a few by jarosite. The coarse-grained barite shows abundant evidence of deformation which has resulted in fracturing of many of the crystals and the development of strain shown by undulose extinction in zones which were not fractured.

There are irregular concentrations and vein-like patches of fine-grained quartz scattered throughout the rock and most of this occurs in interstices and along grain boundaries between the large barite crystals but there is also a little fine-grained quartz along some of the fractures which have developed in the large barite crystals. Most of this quartz is fine-grained, varying in grain size from microcrystalline to about 0.2 mm but there are a few larger quartz grains about 0.5 mm in size which appear to be remnants of coarser-grained quartz surrounded by finer-grained, granulated quartz. Most of these areas of quartz show patchy iron oxide staining and they contain trace to minor amounts of very fine-grained muscovite or sericite. One small tourmaline grain was found and there are a few crystals of oxidized pyrite. In some of these small fractures in barite crystals, however, there is clear quartz which has migrated and recrystallized and along one of these small fractures containing quartz, there were once small pyrite crystals which have now been replaced by jarosite. Most of these oxidized pyrite crystals are between 0.02 and 0.05 mm in size but there are a few larger oxidized pyrite crystals in a zone containing a higher concentration of iron oxide-stained quartz and sericite. Some of these patches of sericite and quartz, which once contained pyrite, could represent partly dispersed and recrystallized remnants of Country rock or wall rock.

Conclusion:
Coarse-grained barite shows evidence of deformation and the vein contains interstitial patches and veinlets of iron oxide-stained quartz associated with a little sericite and oxidized pyrite.

Sample: 6736 RS38; TSC31509

Location:
Tea Tree Barite. Barite vein. Note on bag states near Station B.

Hand Specimen:
This sample contains some relatively large zones and fragments or remnants of pale brown Country rock which has been invaded by almost white vein material.

Thin Section:
A visual estimate of the constituents in the area sectioned is as follows:

	%
Dolomitic Country rock	50-55
Barite	45-50
Quartz	2-3
Opaque iron oxide	trace
Goethite staining	varies

The brown zones in this sample are composed predominantly of very fine-grained dolomite which is essentially similar to the dolomite in sample 6736 RS 36 and it is cut by a few small, and in places, intersecting quartz veins 0.2 to 0.3 mm thick. Along these small quartz veins there is a considerable amount of brown goethite staining but, except for a few rhombohedral dolomite crystals partly replaced by goethite, there are no definite pseudomorphs of goethite. The dolomite Country rock has been fractured or brecciated and invaded by medium-grained to coarse-grained barite.

In a zone of relatively massive barite, there are numerous crystals up to 8 mm long and some of these are curved. Some of this barite contains a few small inclusions of opaque iron oxide and deep red hematite and in a few of the crystals there are relatively small fragments or remnants less than 1 mm in size of the fine-grained turbid dolomite. Textures around the boundaries of some of these fragments suggest that some of the dolomite Country rock has been actually replaced by barite and inclusions of fine-grained iron oxide in the barite have probably been derived from this replaced Country rock. Most of the barite crystals also contain clouds of minute voids or vacuoles in which there are, at least, a few fluid inclusions and along some of the boundaries between barite crystals there are a few small quartz crystals 0.05 to 0.2 mm long. Adjacent to the larger concentration of dolomitic Country rock, the barite is finer-grained varying in grain size from less than 0.1 mm to 1 mm and textures suggest deformation and granulation. In this deformed and brecciated zone adjacent to the dolomite, many of the small grains and fragments of barite are separated by thin zones and films of very fine-grained, turbid material which contains at least some dolomite and probably quartz but may also contain trace amounts of other minerals with relatively low refractive index and birefringence. There are a few small patches of coarser-grained migratory quartz but in general, there is less quartz associated with barite in this sample than in other samples previously described in this report. In a few places clear quartz has filled interstices between small barite grains and has completely surrounded a few small barite grains in the brecciated and granulated zones.

Conclusion:
Brecciated dolomitic Country rock has been invaded by barite which shows evidence of later deformation. There is a little migratory quartz.

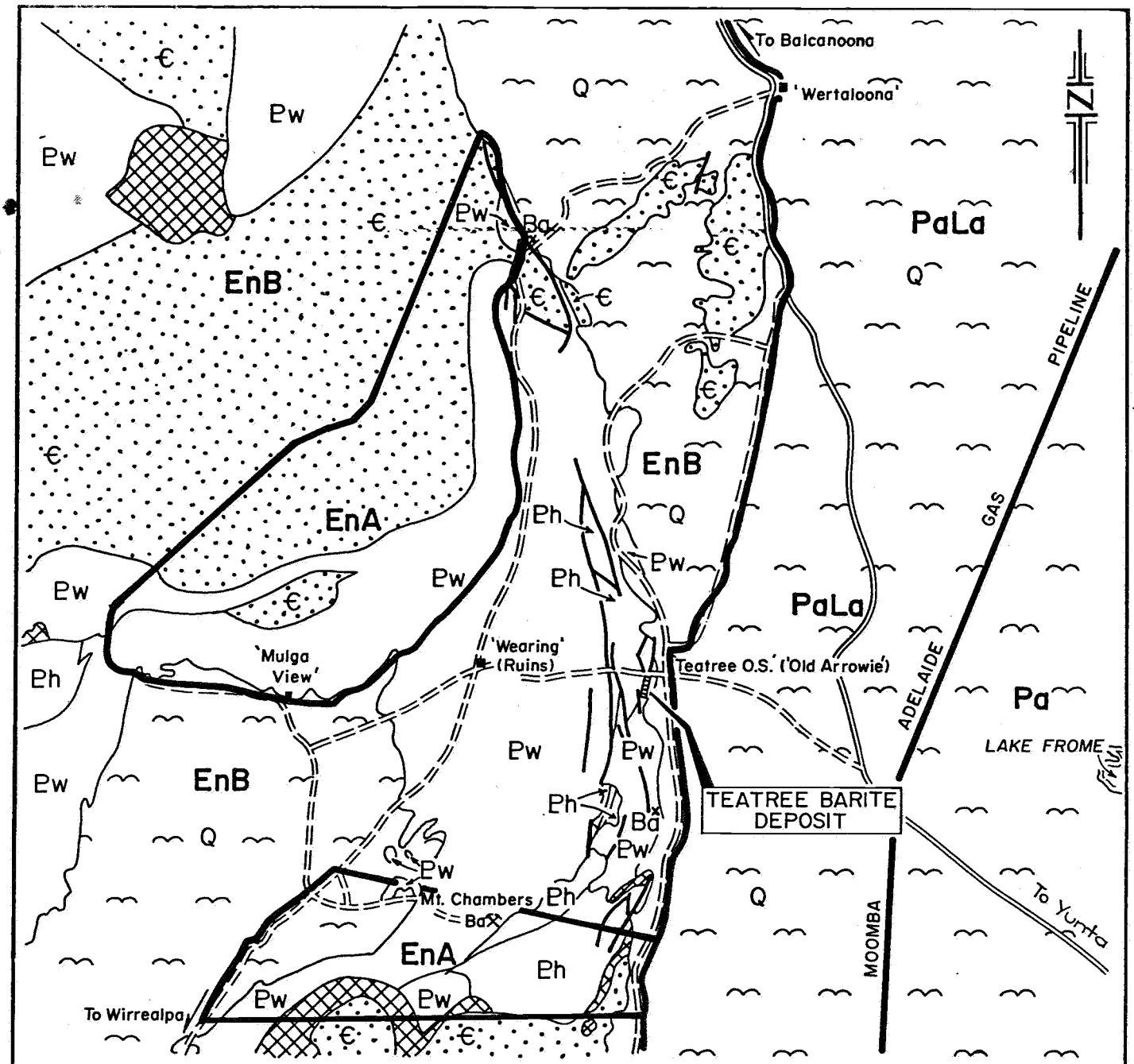


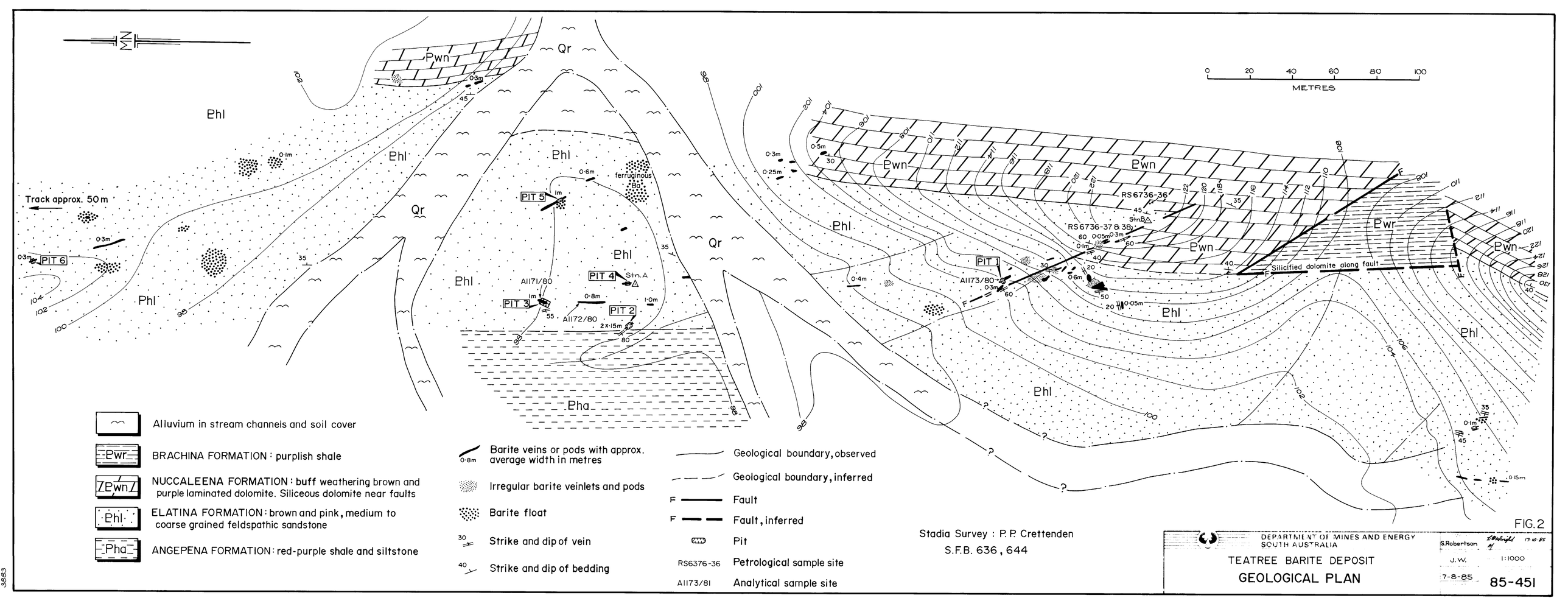
Fig. 1

DEPARTMENT OF MINES AND ENERGY
SOUTH AUSTRALIA

COMPILED S.Robertson	A/C D O	17.10.85. DATE
DRAWN J.W.	SCALE 1:250,000	
DATE 7-8-85	PLAN NUMBER S 18317	
CHECKED		

TEATREE BARITE DEPOSIT
LOCATION AND REGIONAL GEOLOGY

3883


0 20 40 60 80 100
METRES
Track approx. 50 m
PIT 1
PIT 2
PIT 3
PIT 4
PIT 5
PIT 6
RS6736-36
RS6736-37 & 38
Stn A
Stn B
Silicified dolomite along fault
ferruginous
Alluvium in stream channels and soil cover
BRACHINA FORMATION : purplish shale
NUCCALEENA FORMATION : buff weathering brown and purple laminated dolomite. Siliceous dolomite near faults
ELATINA FORMATION : brown and pink, medium to coarse grained feldspathic sandstone
ANGEPENA FORMATION : red-purple shale and siltstone
Barite veins or pods with approx. average width in metres
Irregular barite veinlets and pods
Barite float
Strike and dip of vein
Strike and dip of bedding
Geological boundary, observed
Geological boundary, inferred
Fault
Fault, inferred
Pit
Petrological sample site
Analytical sample site
Stadia Survey : P.P Crettenden
S.F.B. 636, 644
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SOUTH AUSTRALIA
TEATREE BARITE DEPOSIT
GEOLOGICAL PLAN
S.Robertson
J.W.
7-8-85
1:1000
85-451
FIG.2

3863